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# Non-wood forest products in Europe:

Seeing the forest around the trees

Bernhard Wolfslehner, Irina Prokofieva and Robert Mavsar (editors)



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EUROPEAN FOREST  
INSTITUTE

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# Non-wood forest products in Europe:

Seeing the forest around the trees

**Bernhard Wolfslehner, Irina Prokofieva and Robert Mavsar (editors)**



This publication presents the results of the EU FP7 project "Multipurpose trees and non-wood forest products: a challenge and opportunity (StarTree)". This project received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No. 311919.





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# Non-wood forest products – an introduction

**Bernhard Wolfslehner**

The bioeconomy is an important EU lead principle, intrinsically replacing a fossil-based economy by a stronger uptake of natural resources. The EU bioeconomy strategy launched in 2013 identified the following issues as major challenges: (i) ensuring food security; (ii) managing natural resources sustainably; (iii) reducing dependence on non-renewable resources; (iv) mitigating and adapting to climate change; and (v) creating jobs and maintaining European competitiveness. While this approach – from a forest-based perspective – directly implies biotechnology, bioenergy, and wood use, there is much more. Indeed, the role of ecosystem services has since then been taken up in the revised bioeconomy strategy in 2018.

Forests make up 35% of the landmass in the EU, and provide multiple goods, both wood and non-wood, as well as services. These forests capture 10% of CO<sub>2</sub> emissions in the EU, are a major home of biodiversity, and provide high-quality water, to name just a few of the benefits these forests provide to rural communities and society in general. The forest-based sector in Europe delivers a wide variety of bio-based products which represent 8% of EU manufacturing and provides income for about 16 million forest owners while creating 3 to 4 million jobs, many of them in rural areas. In this context, forests and the forest-based sector play an increasingly important role in fostering smart, sustainable and inclusive growth in Europe based on the production of eco-services and eco-efficient products from wood and non-wood-based products.

The forest-based sector has mainly developed around wood-based products. This is due to the significant relative economic importance of wood and the well-developed and competitive value chains based on wood as a raw material (e.g. wood products, pulp and paper, bioenergy). However, there is increasing evidence that non-wood forest products (NWFPs) constitute an important and underrated segment of forest goods and services. In this report, NWFPs are defined as wild and semi-wild non-wood forest species and products thereof, as well as products in early stages of domestication, e.g. fruit trees, bushes, orchards, and with reference to specific services related to NWFPs such as well-being and tourism. Despite the finding that NWFPs play a substantial role in forestry marketing and rural development, the full potential of NWFPs (e.g. forest fruits, mushrooms, cork, pine nuts, acorns, medicinal herbs, essential oils, chestnuts) needs to be better scrutinized. This is especially important to increase the socio-economic opportunities and competitiveness of rural economies. It is also particularly true for regions

where wood is not the most profitable product, such as regions where cork is a dominant forest product, e.g. in Portugal and Spain.

According to the Millennium Ecosystem Assessment, more than 150 NWFPs are of importance within international trade. The 2015 report on the State of Europe's Forests estimated that the total value of NWFPs in the FOREST EUROPE region reached €2.28 billion, of which 73% was generated by plant products. In addition, there are significant differences in the access, utilization and economic importance of NWFPs in Europe. The reasons for these differences will be discussed in this publication, which follows the complete value chain from primary production to marketing, and the accompanying institutional frameworks.

The following statements form a starting point for the discussion:

- Production and forest management operations are not usually tailored towards optimization and integration of NWFP production.
- NWFP marketing chains – in terms of both quantity and quality – are not fully understood, a major reason why NWFPs are currently undervalued.
- As a consequence, the political and institutional framework for developing targeted policy instruments to regulate NWFPs and their use is underdeveloped and needs further clarification.
- Innovative approaches will play a vital role in transforming a traditional business into a modern business through the emergence of new processes in production and marketing, and development of new products.

From these starting points, this publication goes into further depth: giving new insights into NWFPs in Europe; presenting new findings on markets in Europe; sketching out the needs for a new policy framework that addresses both EU and national specifications; and presenting examples of innovation in the sector.

It is important to state that NWFPs cover both the dimension of natural resources and materials, but are also strongly connected to the provision of ecosystem services, conservation issues, traditional knowledge, cultural values, and the complex of drivers in the context of rural development. These aspects have to be recognized when discussing stronger marketing and commercialization of NWFPs and the related trade-offs.

Why is this important? In a bioeconomy based on natural resources, there is a need to more fully understand the complete spectrum of resources available, to identify potentials and niches of these resources, to clarify use rights, and also trade-offs and synergies between forest and other land-use forms. The Europe 2020 Strategy calls for 'smart, sustainable and inclusive economic growth'. NWFPs can contribute substantially to this objective.

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# 2.

## A spotlight on NWFPs in Europe

Jennifer L.G. Wong and Freerk K. Wiersum

### 2.1 From the past to the present

Modern patterns of NWFP use can be understood in the context of the history of migration and settlement in Europe. The latest research identifies three waves of migration into Europe: hunter-gatherers around 45 000 BP (years before present); Neolithic farmers around 9000 BP; and the Yamnaya cattle herders with horse-drawn wheeled wagons from Siberia around 4500 BP. Each of these waves of migration included groups of people with distinct cultures and it is not fanciful to suppose that some of this variation lies underneath the large-scale patterns that we currently see in the use and appreciation of different types of wild products in Europe today. For instance, whereas in some European countries many people tend to be mycophile (loving mushrooms) as reflected in the prominence of mushrooms in every-day foods and gastronomy, in other countries people are more mycophobe (fearing mushrooms) as reflected in the relatively minor role of mushrooms in the cuisine of some regions.

Wild products have historically played an important role for human societies for both household use and as a commercial product. Due to their domestic use for food production and health, several formerly wild products have gradually been incorporated in the farming systems of many societies. Such domestication started with the incorporation of wild plants into the domestic environment by propagation of popular species near homesteads. Gradually, these plants were further developed through the creation of cultivars, which are genetic variants of the plants found in the wild. Such domestication was driven by the inability of wild resources to supply either the quantity or quality of products required from areas that are easily accessible to the consumers. An example of this process for a former NWFP is the domestication of pear (*Pyrus communis*) trees, which commenced around 6000 BP using vegetative propagation to overcome the uncertainties associated with the quality of fruit from trees raised from seed. Control over the quantities produced was secured by the incorporation of wild species and cultivars into agrarian systems such as orchards. As populations grew and became more urban, demand for pears stimulated trade which provided a further impetus for domestication and larger scale production. For pears, these processes were sufficiently advanced that Pliny the Elder reported they were grown in orchards around 2950 BP. Current

commercial production of pears is estimated to be around 22.6 million tonnes in 2013. The process of domestication of useful wild species continues to this day with bilberry (*Vaccinium myrtillus*) domesticated in the 20<sup>th</sup> century, and bog myrtle (*Myrica gale*) in Scotland and Arctic bramble (*Rubus arcticus*) in Finland being domesticated within the last few decades.

Some products, even though in high demand and traded for millennia, were never domesticated and continued to be harvested from the wild often from remote locations. Originally, this collection was simply to provide for household needs. Gradually, however, several highly valued species were commercialized. An example of continuing use of wild harvested plants is the group of lichens known collectively as 'orchil'. These lichens were first used as a dyestuff in the Bronze Age and were already a valuable trade commodity for use in purple dyes from northern Europe to Phoenicia and ancient Rome. Large-scale trade in orchil continued until the advent of synthetic dyes, which were first made in the mid-1800s. Trade in orchil continues at low levels to supply artisanal uses, such as production of handwoven Harris Tweed made in the Outer Hebrides of Scotland on the islands of Lewis, Harris, Uist and Barra.

Another example of an industrial use of an NWFP is the use of pine resin, which until the advent of petroleum refining in the late 18<sup>th</sup> century was the main source of oil-based solvents, turpentine, tars and pitches used to manufacture paints, varnishes, waterproofing for wooden ships, dye, lubricants, paper size, polish, glues, soap, face cream, medicines and as a chewing gum. The bark of oak (*Quercus* spp.) and chestnut (*Castanea sativa*) was also traded in large volumes as a source of tannin. In contrast to foodstuffs these tree-based products did not become gradually domesticated into agrarian systems, but were incorporated into forestry either as a by-product of timber production or as the primary product e.g. the oak bark coppice systems used in Wales for tannin production. Thus, the domestication of tree species in response to the increasing scale of demand for these industrial materials resulted in specialized silviculture, forest management and plantation development. As with orchil, production of these natural products declined as manufactured, synthetic and cheaper alternatives were found. Much of this substitution was based on the use of mineral oil as a raw material. The growing interest in the bio-economy, which seeks to reduce dependence on mineral oil – may foster a resurgence of interest in the use of forests as a source of industrial raw materials including resin.

Another important use of NWFPs is for medical purposes. The pharmacopeia of the traditional plant-based medicinal practice includes a large number of species, each required in relatively small quantities. As European medical practice moved away from its herbal roots, the standardization and the volume of medicines required for a growing population increasingly resulted in industrial-scale manufacturing of medicines. Nevertheless, wild plants continue to be used for medicinal purposes to the present day. Such uses include: traditional herbal remedies prescribed by qualified medical practitioners – e.g. the leaves, berries and flowers of hawthorn (*Crataegus* spp.) are used to treat heart disease; health tonics – e.g. birch (*Betula* spp.) sap drinks; folk remedies – e.g. home-made cough syrup made from elder (*Sambucus nigra*) berries and flowers; nutraceuticals – e.g. cranberry (*Vaccinium oxycoccos*) juice considered beneficial for maintaining urinary tract health; and phytochemicals – e.g. docetaxel is a chemotherapy medication used to treat cancer and is extracted from yew (*Taxus baccata*) leaves.

A prominent recent development is the emergence of forest products embedded within 'experiential' services related to personal use such as survival training, hobby crafts and cooking, often in the context of regional tourism. There are many drivers for this

including greater awareness of the value of 'natural' products, and also growing interest in 'wilderness' concepts. Although the use of NWFPs by local households for subsistence has been in decline, there has been a reversal of this trend in more recent decades, with the collection of NWFPs growing in popularity.

## Significance to modern society

This section outlines the significance of NWFPs to modern society in three areas: (i) contemporary use of rights to collect NWFPs for personal use; (ii) expression in modern forest culture; and (iii) role in present economic activity.

### 2.2.1 Personal use

In 2016 the StarTree project commissioned a household survey of consumption, sourcing and use of a range of 45 NWFP plant and fungi products in 28 European countries. The 14 864 responses arising from this survey represents the first comprehensive overview of the scale of NWFP activity in Europe. The key result of this survey is shown in Figure 1, which indicates the percentage of households which reported picking NWFPs. Across all 28 countries, an average of 25% of households directly took part in collecting or using NWFPs. However, there is a wide variation in picking activity, ranging from 4% of households in the Netherlands to 68% of households in Latvia taking part in NWFP activities. Most picking occurred in forests, but picking also took place on farmland (from wild field margins and cultivated plants) and urban greenspaces. Most of the land is not owned by the household and picking is based on the exercise of ancient rights to wild natural products for subsistence purposes. These rights are expressed in several ways as ‘common rights’ or ‘everyman’s rights’ and there are distinct differences in associated norms and regulations from country to country and between regions (more on this in Chapter 4).

Recent trends in picking for personal use are illustrated using a long-term dataset from the Czech Republic (Box 1). This dataset reveals that there has been a small increase in the number of households picking NWFPs; this is in line with increasing interest in wild and natural foods. It also shows that the volumes harvested are subject to the vagaries of state interventions, economic forces and political stability in traditional tourism destinations as well as annual variation in weather conditions.

### 2.2.2 Culture

The numbers of people engaged in picking NWFPs (Figure 1, Vidale et al., 2015) suggest that this is a component of everyday life and represents a personal connection with nature and forests for many Europeans. Such activity has been, and continues to be, central to forest culture. This culture is transmitted through experience and stories passed down through the generations. There is reason to think that this is not secure as shown in Box 2.

Changes in the relationship between people and forests, as observed in Greece (Box 2), is happening across Europe. This has led to an erosion of the traditional subsistence-based connection between people and nature as traditional land use and lifestyles are increasingly abandoned. Countering this is a trend towards greater appreciation and use of natural, traditional and wild resources. This is evident in the proliferation of popular

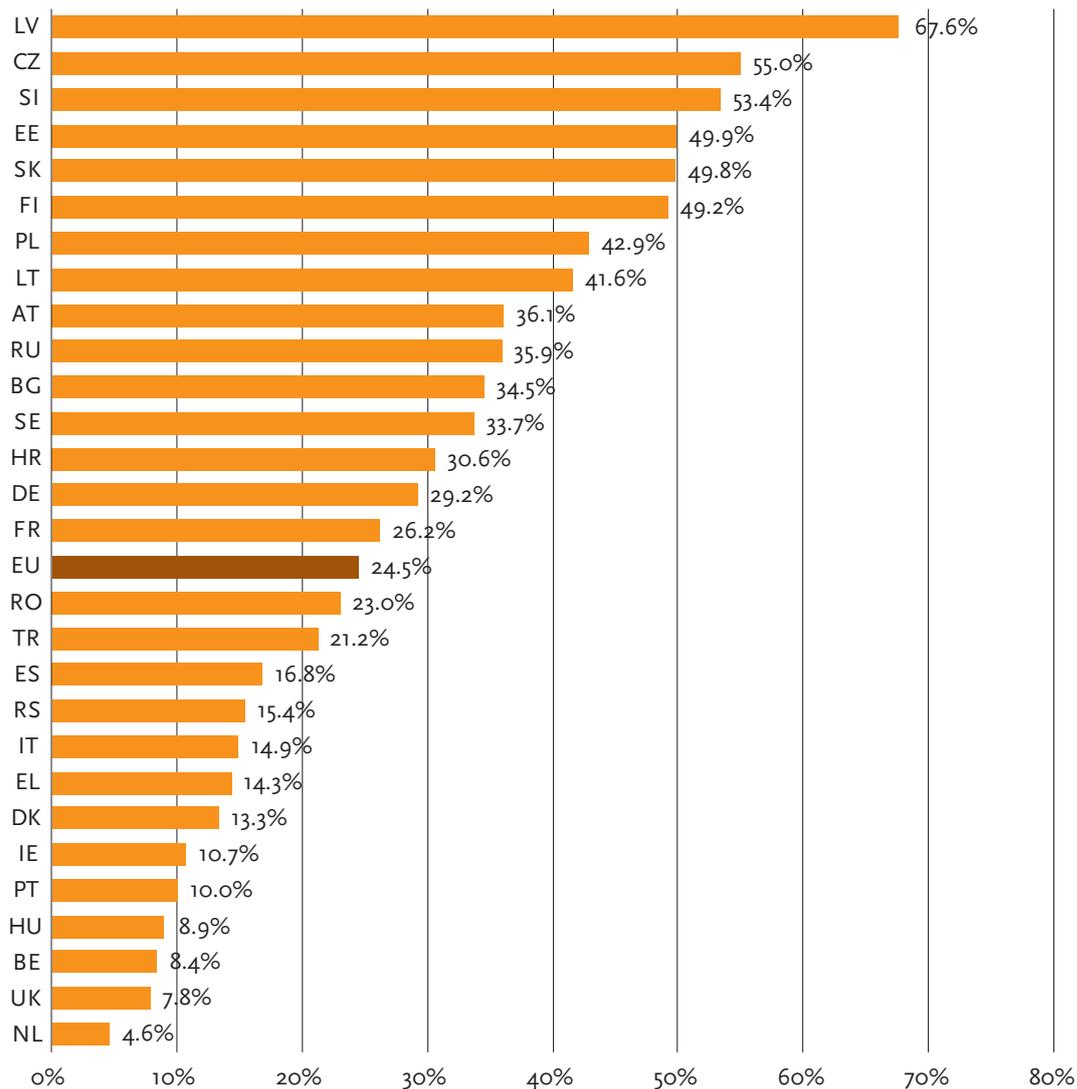


Figure 1. National percentage of households picking NWFPs in 2016 (Source: Vidale et al., 2015).

culture around ‘wild foods’, ‘survival’ and ‘foraging’, and also in the emergence of ‘back to nature’ lifestyles. This trend is expressed in several ways, but is most obviously commercialized in the resurgence of interest in traditional crafts and foods, and the provision of products and services based on these crafts and foods. Use of traditional medicines is also becoming increasingly popular. Part of the explanation for these trends is perhaps globalization as people learn of products and uses from other cultures. Despite the increasing interest in certain aspects of the wild products and NWFPs, the more general trend is that detailed local knowledge continues to be eroded.

### 2.2.3 NWFPs in present economic activity

NWFPs provide the basis for a wide range of enterprise activity but there are very few statistics available on the scale of economic activity based on NWFP use. Figure 2 illustrates the data provided by country respondents to the 2015 State of European Forests (SoEF) report. These data are incomplete for a number of reasons, which will be further explored in Chapter 3. Nonetheless, the data give a flavour of the variety and scale of NWFP-based commerce.

Figure 3 illustrates the results for countries responding to the SoEF enquiry and this reveals some interesting features. It seems that product groups are not equally important for every country and there is some degree of specialization. Some of these differences are obviously related to forest type. For example, cork oak (*Quercus suber*) only grows in a handful of Mediterranean countries, and it is therefore not so surprising that large-scale marketing of cork is restricted to two countries (Portugal and Spain). However, there are also differences related to culture – the association of greenery with pre-Christian mid-winter festivals and rites is a northern European tradition, which became associated with Christmas, and has since spread across Europe. This may explain why Christmas tree production is concentrated in northern countries even though conifers grow throughout Europe.

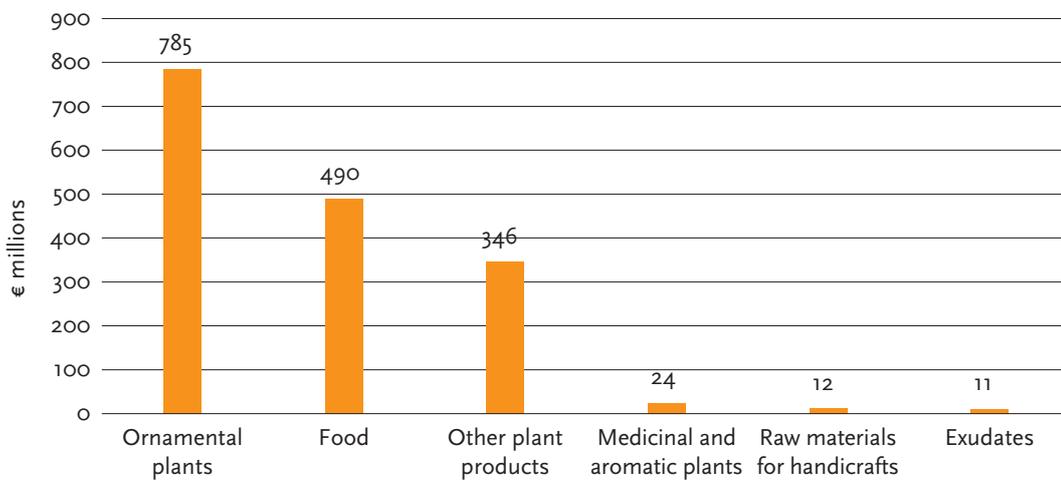


Figure 2. Value of marketed plant products/raw materials in 2010. Source: State of European Forest (FOREST EUROPE 2015) data for 28 countries.

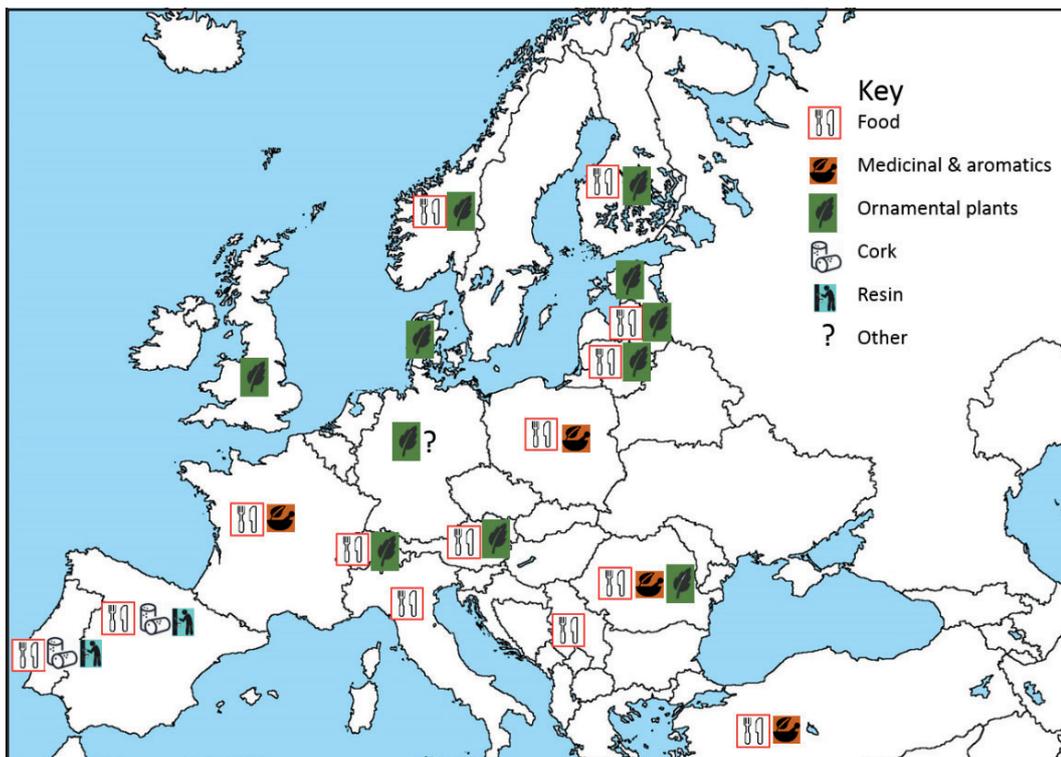


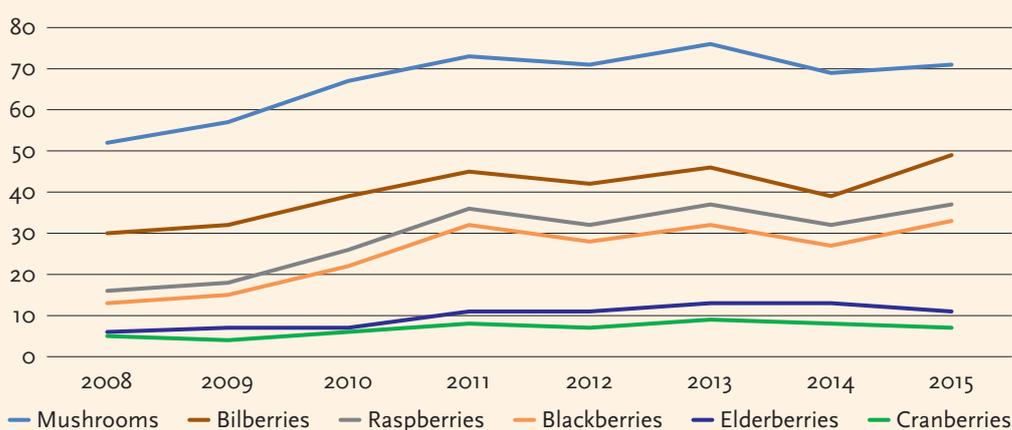
Figure 3. Marketed plant products / raw material 2010 by country. Source: Table 20 of Annex 8 in the State of Europe's Forests 2015 (FOREST EUROPE). Voluntary returns from 28 countries.

### Box 1. Trends in NWFP picking in the Czech Republic.

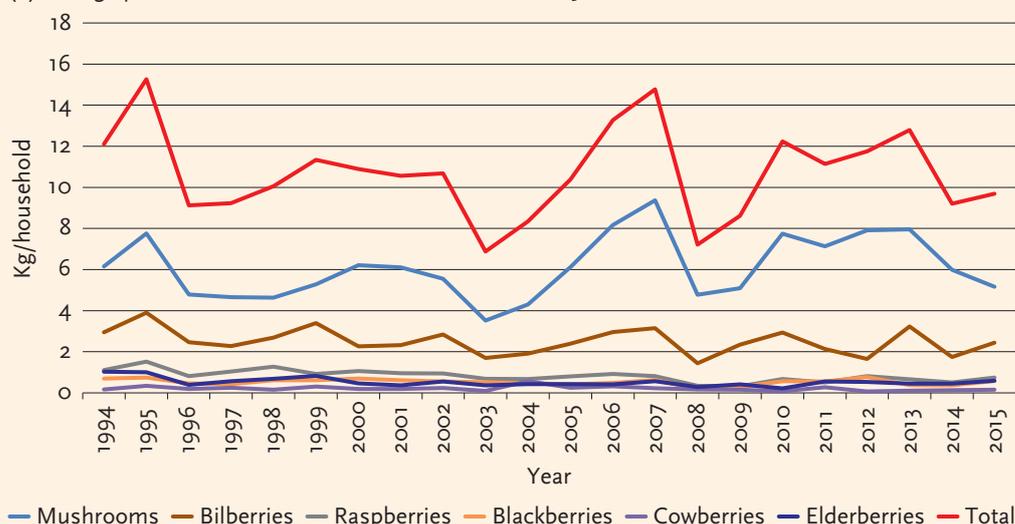
Marcel Riedl, The Czech University of Life Sciences Prague – FP1203 COST Action member

Since 1994 an annual household omnibus survey of a range of wild fruit and fungi has been conducted to determine the intensity of forest visits, the number, and the total value of NWFPs collected by the general population. There are two aspects to quantification of the production of wild fruit: (i) the number of households who pick; and (ii) the volume collected per household.

(i) Percentage of households picking wild fruit in Czech Republic 2008–2015



(ii) Average per household harvest of wild fruit 2008–2015

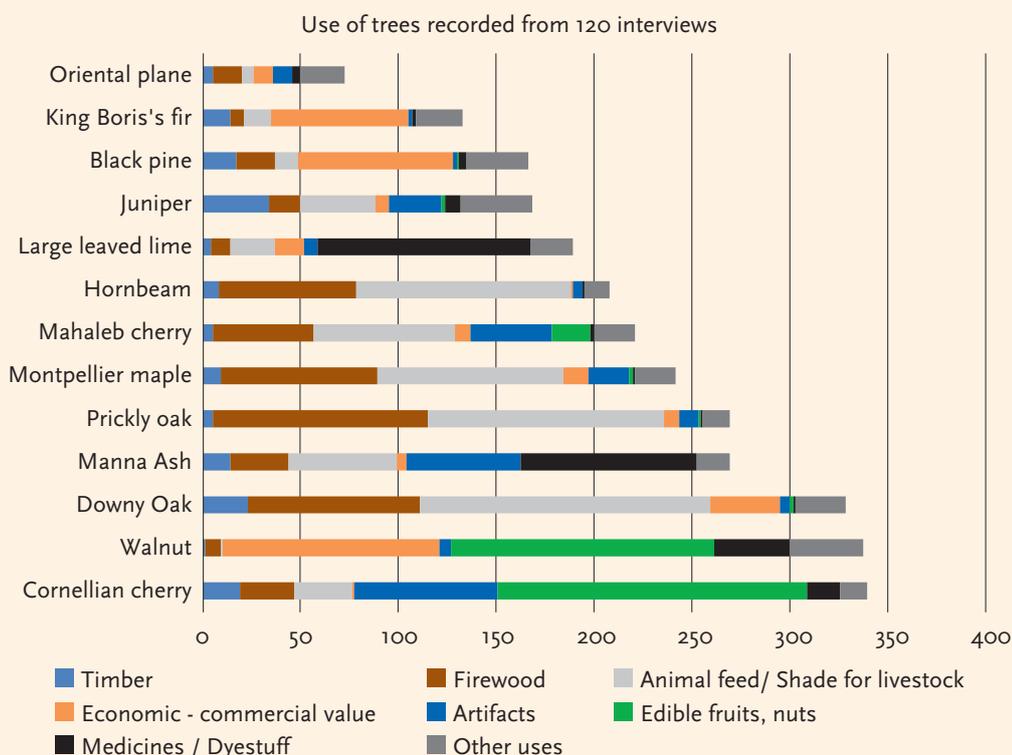


For all fruits, the number of households picking rose gradually from 2008 to 2011 and has been roughly stable since then. The average volume of fruit picked per household is much less stable and fluctuates in response to a number of factors. There is a natural variation in productive potential arising from factors such as annual rainfall and weather conditions as well as variation between locations related to soil type, altitude and forest conditions. Weather influences the intensity of forest visits especially during the summer holidays when bad weather means people stay at home, and really good weather draws them towards rivers and lakes and away from forests. Other factors may also influence the number of visitors to forests. For example, the exchange rate of the Czech currency and the general economic situation can strongly influence whether people go abroad on their main holidays or stay in the Czech Republic, which would mean more visits to the forest. In this regard, instability in the political situation in some traditional destinations for Czech tourists can influence the wild fruit harvest.

**Box 2. Intergenerational values in appreciation of multi-purpose trees in northwest Greece.**

**Kalliopi Stara, University of Ioannina, Greece – FP1203 COST Action member**

In 2006, 120 local inhabitants in the Zagori region of the Epirus mountains of northwest Greece were asked to relate their appreciation for 13 common tree species – oriental plane (*Platanus orientalis*), King Boris fir (*Abies borisii-regis*), black pine (*P. nigra* subsp. *nigra* var. *nigra*), juniper (*Juniperus excelsa*, *J. foetidissima*), large-leaved lime (*Tilia platyphyllos*), hornbeam (*Carpinus orientalis*), Mahaleb cherry (*Prunus mahaleb*), Montpellier maple (*Acer monspessulanum*), prickly oak (*Quercus coccifera*), manna ash (*Fraxinus ornus*), downy oak (*Quercus pubescens*), walnut (*Juglans regia*), Cornelian cherry (*Cornus mas*). In total, 4511 separate statements about these tree species were collected. Categorizing and counting statements revealed that all 13 species are effectively 'multi-purpose', although some are markedly more so than others.



Interviews with different generations of people showed that some trees, such as the oaks, hornbeam and manna ash, have lost value (i.e. younger people value them less than older people). Some trees have retained value, but the uses have changed (e.g. younger people do not use lime as fodder, but continue to collect lime flowers for tea). For a few species new values have emerged (e.g. black pine is now highly appreciated as an ornamental species and the King Boris fir as a Christmas tree). Lastly the oriental plane tree, even with only a few use values, unknown known by young people, was highly appreciated by everyone as a specimen tree emblematic of the community's vitality and social life. Changing life styles, new uses for trees (in this case timber cutting) and a new appreciation for natural foods and 'traditional cuisines' are becoming the dominant values for trees and this will inform management decisions and shape the landscape of the future.



Cornelian cherry (*Cornus mas*)  
Photos: Kalliopi Stara



Lime flowers (*Tilia x europea*)



Walnuts (*Juglans regia*)

## Main characteristics of NWFPs

### 2.3.1 Species and where they grow

There are many plants and fungi that can be considered as NWFPs in Europe. Many of these are not exclusive to forests and can be sourced from a range of land-use types and habitats. The source for the data in Table 1 is an expert assessment of NWFP species and sources in 14 European regions carried out within the StarTree project (Wong and Chapman, 2019).

The experts assessed that around 50% of these NWFP species were exclusively harvested from the wild and can be conceived of as being “in a natural state without human intervention i.e. not cultivated”<sup>1</sup>. Just over 40% of the considered species can be cultivated as well as harvested from the wild. About 7% of the NWFPs species were only cultivated and are not collected from the wild; these were mostly trees (17 taxa), mushrooms (10 taxa including *Cordyceps* and *Ganoderma* which are not native to Europe), shrubs (six taxa mostly cultivars) and a handful of herbs (three taxa including ginseng which is not native to Europe) and flower bulbs (three taxa all of which are native species which are protected from wild harvesting by conservation regulations).

The diversity of habitats in which NWFPs are harvested illustrates that NWFP production systems do not fit neatly into the institutionalized sectors of agricultural, horticultural and silvicultural production. To understand NWFP production it is advisable to go beyond the traditional differentiation in land-use sectors. Rather, it is useful to recognize the diversity in production on a continuum from wild to intensively managed as well as the diversity in marketing system on a continuum from personal use to mass markets.

**Table 1.** How many species are used as NWFPs and where do they grow?

Where they grow	Number of taxa		
	Fungi	Lower plants	Higher plants
Semi-natural forest	72	16	216
Timber plantation	20	7	128
Timber harvesting residues	-	-	4
Agroforestry / Farmland	61	1	56
Urban (parks, gardens etc.)	5	1	20
Scrub / range / moorland	1	1	7
Cultivated	4	-	130

<sup>1</sup> Amalgam of sensu 1 and 2 for ‘wild’ as an adjective in Oxford English Dictionary.

**Table 2.** Production systems on the continuum from wild to cultivated.

		Production system	Notes
Control of NFP production process	None	Wild	Resources derived from plants and animals that arise without human intervention. These can be weeds in plantations, free-range game and species which are part of partially or wholly natural ecosystems.
		Nature conservation	By-products of ecologically-oriented management, e.g. in the form of game and 'nature' meat or mowing residues (nature grass) and specifically managed products from rewilded areas.
		Traditional agriculture	Production from features commonplace within traditional agricultural landscapes such as hedgerow trees or riverbank management.
	Low	Agroforestry	Integrated into agroforestry systems such as production of cork.
		Multi-functional forestry	One of a series of products for which a forest stand is co-managed such as resin production managed together with wood production from pines.
		Forestry	Forests or tree crops managed for single products such as willow coppice for withies (flexible, strong stems or twigs used for e.g. tying, basketry).
	High	Horticulture	Production of domesticated plants in intensive production systems in a range of growing environments from open fields to greenhouses.
		Industrial green resources	Provision of raw materials for industrial production supplementing timber production for the 'greening of the economy' by stimulating forest plantations for commercial production of raw materials for the food, chemical and pharmaceutical industries.

### 2.3.2 Production – management intensity

There is a range of NFP production systems that can be characterized on the basis of the intensity of the management for the resource under consideration (Table 2).

An important consideration in appreciating this diversity in production systems is the observation that there are a range of products that can be wild harvested in one country and grown in intensive horticultural systems in another. For example, bilberries (e.g. *Vaccinium myrtillus*) may be wild harvested from natural ecosystems in Finland, grown in gardens as traditional cultivars in France, or grown in greenhouses in the winter in Morocco. This rather begs the question about when a product should be termed 'wild' – especially when considering marketing and the emotive values associated with 'wildness'. From a marketing perspective, it may be tempting to apply the term wild to the product regardless of the production system – e.g. 'wild strawberries' are often cultivated. However, it is also important to recognize that along with increasing appreciation for natural products, there is a need to be able to distinguish genuinely wild products, if only to adhere to trading standards regulations. Such products should be harvested according to the Addis Ababa principles of sustainable use derived from the Convention on Biological Diversity. Such production can be relatively costly compared to cultivation (increasing production is after all a primary motive for domestication) and any marketing cachet or price premium should be reserved to support these systems and the incomes of people who depend on them. This should not detract from appreciation of other production systems, which have their own merits.

Interestingly, fine distinctions between production systems are emerging in some markets – for example 'nature meat' derived from re-wilded cattle in the Netherlands, the 'Scottish Working Woods' label in Scotland for coppice products, and 'woodland chicken' raised free-range in woodlands in England. The future may be for marketing to rely more on stories of the actual production process and less on broad application of simple tags; such marketing is likely to be most relevant for niche markets.

**Table 3.** Exploring production dimensions of non-wood forest products. The shading highlights three distinct opportunities: (i) those related to wild species (orange); (ii) products derived from management of traditional and multi-functional forest landscapes (grey); and (iii) intensive production of non-native species (blue).

		Increasing species management →		
		None (fully wild production)	(production from both wild and cultivated sources)	High (cultivated)
		Wild - No intentional human interference with species or populations other than harvesting	Manipulation of varieties or population density of native species	Introduced species, highly modified populations
Effort expended on resource production	Low	Wild - Non-intervention conservation or abandoned land	A great many species used as food, drinks, medicines and in material culture	Excluded by definition
		Land managed for conservation using traditional management techniques, re-wilding etc.	Game	Coppice Hay Control of re-introduced species
		Multi-functional production from close to nature silviculture, extensive agroforestry systems, managed urban greenspace, etc.	Moss	Cork ( <i>Quercus suber</i> ) Chestnuts ( <i>Castanea sativa</i> ) Birch ( <i>Betula</i> spp.)
	High	Maximize production	Intensive use of labour to maximize harvests	Pine nuts ( <i>Pinus pinea</i> , <i>P. cembra</i> ) Basket willow ( <i>Salix</i> spp.) Bilberry ( <i>Vaccinium myrtillus</i> ) Truffle orchards Christmas trees Timber by-products e.g. turpentine
				Non-native species e.g. <i>Aronia</i> , <i>Eucalyptus</i> By-products of non-native timber species by-products e.g. bark

Considering the continuum between wild and domesticated, the assessment of the production potential of a resource requires consideration of both the intensity of species management and the amount of effort expended in the production of that species (Table 3).

### 2.3.3 Consumer engagement in value chains

The extent of commoditization provides us with another means of understanding activity and opportunities for NWFPs. Table 4 illustrates the differentiation of the commodity dimension according to the involvement of the consumer in production and consumption processes. The consumer of the products is obviously intensely involved in personal collection for use at home or as gifts – in such cases, the producer and consumer are the

**Table 4.** Commodity dimensions of NWFP and their specificities.

		Type of commodity	Main characteristics	Examples
Personal involvement of consumer in production	High	Personal consumption	Personal collection and use of NWFPs within household	Collection of berries and wild mushrooms for use at home
		Gifts	Personal collection to be given as gifts to family and friends	Making wild berry jam to give as gifts to family living in the city
		Experiential products	Services related to the growing, collection or use of forest products	Paying for a basket weaving course
	Low	Territorial products	Regional specialities only available in local markets with or without specific territorial marketing such as local jams and liqueurs which are generally not available outside the region	Farmhouse made traditional mushroom pate sold through tourist shop as local delicacy
		Niche products	Products aimed at a small, specialized market segment but not regionally constrained	Internet sales of boar bristle brushes
	None	Mass market / industrial raw materials	Sale of bulk raw materials for industrial use	Cork auctions to factories making bottle stoppers

same person and the resources collected are usually wild. Consumers of experiential services (e.g. basket weaving classes) are also very much involved in the use of the embedded NWFP mediated by the service provider who sets the terms on which production takes place. For regional or local specialities, the consumer knowingly selects the product because of its relation to a specific locality, which usually indicates a specific production regime. For niche products depending on the extent to which location and production system is part of the marketing messages, the consumer may or may not be able to make choices related to production. For mass market products, the consumer is likely completely detached from production of what maybe a minor or processed component in the final product and so their influence on production is negligible or non-existent. Certification is a market mechanism which seeks to label mass market products with information on the production system and source to facilitate consumer choice related to production.

Traditionally most attention has focused on mass market products for industrial use. However, at present there is increasing demand for territorial and niche products for urban consumers interested in nature and identity products for health and food. A further evolution of this urban-consumer demand takes the form of increased interest in experiential products related to combining NWFP collection for personal consumption with recreation/leisure activities. Of the market types listed in Table 4 the one which has only recently been recognized is for experiential products. This is an emerging sector for NWFP-based entrepreneurship and has been little investigated, except perhaps where it intersects with rural tourism. It is possible to distinguish four rough groupings of experiences: (i) foraging (courses to identify, pick and prepare wild foods); (ii) bushcraft (survival training and experiences); (iii) gastronomy and regional tourism (for example truffle hunting and fine dining as a holiday); and (iv) traditional skills and hobbies (courses and clubs). The experiential sector represents an interesting innovation that creates enterprise opportunities from serving the needs of the large numbers of people who pick NWFPs for personal use rather than manufacture and sale of products, and it is apparently a growing sector as illustrated in Box 3.

The range of possible species, product and enterprise type provides income opportunities for a wide range of people with different skills and interests along the value chain. However, collection of NWFPs, which are often de facto treated as common property, means that the forest owner can struggle to capture any income from these activities.

### Box 3. Growth of experiential markets in Wales.

**Maria Wilding, Llais y Goedwig, Wales – StarTree consortium member**

Wales has 13% forest cover, most of which is used for timber production from plantations of exotic conifers. There have been relatively few opportunities for NWFPs though a survey of NWFP enterprise activity in 2003 discovered “a wide range of commercial enterprises that are based on or use woodland products” but besides some emerging activities related to education, there were very few experiential products mentioned. A similar survey in 2014, undertaken as part of the StarTree project, revealed the emergence of the experiential market sector. New and existing businesses were found to be selling ‘experiences’ – such as foraging walks, traditional craft courses or bushcraft and wilderness skills – all of which have NWFPs as an integral component of the business. These experiential products tend to be place-based, relying on the consumer travelling to take part in the course, and therefore they are heavily connected to the tourist industry and the rural landscape.



The low population density in much of rural Wales, coupled with a reliance on a seasonal influx of tourists in many areas to provide much needed income, means that small businesses can rarely rely on one source of income. The growth in experiential markets has meant that the selling and running of courses and workshops – the ‘experience’ connected to the products – added to the sale of the product itself can often turn a non-viable business into viable one, or, in some cases provide enough of a market for a business based solely on selling the NWFP-based experience.

It is likely that the growth of the experiential market in Wales has been aided by a combination of factors, and has been fuelled by:

- the growth in survival and bushcraft markets has been driven by media interest and championing by celebrities, and television survival programmes making the idea more accessible;
- the availability of funding streams such as the LEADER aspects of the Rural Development Programmes which enabled research into new production methods and aided business start-ups (e.g. the GLASU Leader “Willows in Powys” project which contributed to the development of enterprises offering hobby-orientated basket-making courses);
- an increasing awareness of the value of the outdoors as places for learning and as a therapeutic tool (e.g. the Coed Lleol Activ Woods project which provides opportunities for health and well-being activities in areas of social deprivation);
- a general increase in ‘food tourism’ with a correspondingly high profile in the media, and the growing popularity of programmes on wild and local cooking (e.g. the Really Wild Festival is a weekend food and countryside festival featuring wild foods and crafts based in Pembrokeshire which is now in its eleventh year – in 2016 it attracted 83 exhibitors);
- it is also, perhaps, linked to a growing wish to reconnect to the land, and people making lifestyle choices about where they live and work, and a desire to go back to a simpler, healthier way of life.

Whatever the reasons, the growth in this area has meant local people, those choosing to come and live and work in Wales, as well as visitors, find opportunities to experience something new, immerse themselves in traditional culture and crafts and reconnect with the countryside, while giving a much needed boost to the rural economy of Wales. The growing number of examples of experiential markets alone, or in combination with (niche, often internet-based) product sales, is increasingly seen as having the potential to provide a viable and full-time income. It will be interesting to track the progress of the sector to see whether the trend continues or if we have reached, or are nearing, our capacity for ‘experiencing the wild’.

## Drivers of NWFP development

In order to discern future directions in NWFP development, there is a need to appreciate current drivers for change in forestry and consumer demands. These, sometimes contrasting, drivers are briefly outlined in this section.

### 2.4.1 Payment for ecosystem services

During the last decade, the concept of ecosystem services has emerged as a conceptualization of the relationship between human health and well-being and natural resources. Ecosystem services are the contribution of nature and landscapes to human well-being, which depends on the production and regulation of clean air, water, food and materials used by people. One supporting instrument is the concept of payment for ecosystem services (PES) where consumers pay directly or indirectly for non-market services provided by forests. Although there have been many projects seeking to quantify the nature and value of ecosystem services (e.g. The Economics of Ecosystems and Biodiversity – TEEB project; the Mapping and Assessment of Ecosystems and their Services – MAES project; and various Millennium Ecosystem Assessments), these have failed to explicitly address NWFPs. As a more operational approach, the TEEB concludes “Wild foods from forests are often underestimated”. This means that the contribution of NWFPs to the well-being of the 25% of European households that engage in personal use of NWFPs is missing. NWFPs should not be excluded from the discourse related to ecosystem services, but rather their contribution should be recognized and highlighted. Otherwise, there is a danger that rather than promoting NWFPs, PES may, by omission, be obscuring their significance.

### 2.4.2 New consumer demands

There is a marked growing demand across Europe for foods which are in some sense ‘authentic’ – meaning they are ‘natural’, ‘healthy’ or ‘pure’. This is most often expressed as a demand for organic or local produce. Coupled with this is an increasing interest in speciality, gourmet foods, which is exploited by food tourism initiatives. Wild foods are an important sector within these markets and have experienced sustained growth over the past decades. In particular, there has been rapid growth in interest in ‘foraging’ (personal collection of wild foods) and ‘bushcraft’ (education and practice of survival skills) led by popular TV programmes, which has made celebrities of their presenters. Some of this interest is perhaps a fashionable whim, but there is enough demand to suggest this will spawn an enduring sector. This presents both an opportunity for income generation, and also challenges for forest management, especially for the areas that are the focus of foraging activities.

There is also growing interest in production of hand-crafted products and also in craftwork as a hobby activity, which is driving the development of new craft-based enterprises and production of raw materials for the crafts (see Box 3 for examples).

Both of these trends represent a ‘back to nature’ ethic and can be part of conscious life-style choices of people moving to rural areas and establishing new NWFP enterprises. This increases the market for NWFPs and also the pool of potential entrepreneurs.

### 2.4.3 Contribution to the well-being of society

The collection and use of NWFPs is an intrinsic component of personal well-being and collective forest culture. This awareness is not itself something new and ideas about the role of natural foods and an active lifestyle in health and well-being have changed remarkably little over the past 500 years (Box 4).

#### Box 4. Tacuinum Sanitatis.

The Tacuinum Sanitatis is a mid-fifteenth century handbook on wellness, based on the eleventh century Taqwin al-sihha (“Tables of Health”, an Arab medical treatise by Ibn Butlan of Baghdad). The book describes the beneficial and harmful properties of foods and plants and also proposes six essential elements for well-being:

- sufficient food and drink;
- fresh air;
- activity and rest;
- sleep and wakefulness;
- secretions and excretions of humours;
- the effects of states of mind.



In modern times, formal scientific enquiry into well-being (the capacity to be well and achieve a state of health, happiness, or prosperity) and its use in policy formulation has progressed rapidly, and is recognized as a fundamental service derived from ecosystems. There is increasing evidence that nature provides more than just provisioning (good quality foods and medicines), but also nourishes the human psyche. For example, embodied cognition theory postulates that “the way in which we interact with our environment helps guide how we think and who we are – and thus impacts the core of our well-being”<sup>2</sup>, while the biophilia theory proposes that humans possess an innate tendency to seek connections with nature and other forms of life. The delivery of these psychological well-being benefits is well recognized in the growing movement for urban and peri-urban green infrastructure projects (e.g. Green Surge). NWFPs are a component of nature and the personal experience of seeking out, harvesting and using products from wild nature represents the most complete and intense nature experience. This

<sup>2</sup> Bratman et al. 2015. The benefits of nature experience: Improved affect and cognition. Landscape and Urban Planning 138: 41–50. <https://doi.org/10.1016/j.landurbplan.2015.02.005>

finds expression in a growing interest in urban foraging as shown by the emergence of social networks where people source and share information on NWFPs to be found in the city (e.g. [www.fallingfruit.org](http://www.fallingfruit.org)). Nevertheless, despite these obvious linkages there has been relatively little consideration of the provision of NWFP opportunities within green infrastructure projects.

Well-being is increasingly recognized as a valid goal for public policy with several initiatives to set policy goals to enhance the well-being of citizens – for example, development of national measures of general well-being. To be effective this requires the quantification of well-being at national level and there has been considerable progress on this, but only a few occasions in which green space features in assessment of well-being. The UK (National well-being index generated by the Office for National Statistics) includes a measure for ‘access to green space’ which revealed that 60% of the population make use of green space at least once per week, and that this had a small positive impact on life satisfaction and happiness, and a larger impact on reduced anxiety. The European Social Survey work on ‘social well-being’ looks at assessment of personal well-being, but does not include any elements related to access to green space. This is despite the proven link between green space and well-being, which is also further served by access to NWFPs. This is a significant oversight in both the development of research and policy based on social well-being. Further work is required to quantify the additional well-being benefits of NWFPs in both urban and rural environments. Given the large proportion of households who collect and use NWFPs (Chapter 2.2), and the undoubted contribution this makes to personal and national well-being, perhaps there is scope to include some measure of access and use to NWFPs with a fuller recognition of NWFPs in rural as well as urban policy. Broadening the enquiry in this way could well raise questions about how to provide the greatest net benefit for society at large. There are two strategies: (i) securing access for the greatest number of people for personal use; or (ii) securing access for commercialization. The former is almost certainly connected to general well-being, while the latter contributes to the gross domestic product of a country. As always, a trade-off may well be required and the compromise point will need to take into account national and local circumstances.

#### 2.4.4 Conservation and rewilding

Across the 28 EU Member States, 26 000 sites representing 18% of the territory have been protected for nature conservation under the Habitats Directive<sup>3</sup>. Much of this area is inhabited and used by people, and conservation in these areas often means the maintenance of traditional land use and practices and pro-active management such as control of invasive species, etc. These practices often generate large volumes of products, such as coppice material, hay and cut bracken, many of which are, or could be, marketed as traditional forest products. In a time of decreasing conservation budgets there is increasing interest in income generation to fund essential conservation practices.

In addition, there is growing interest in the ‘re-wilding’ of forests. The aim of this new approach to conservation is to conserve biodiversity and increase naturalness by

<sup>3</sup> Sundseth, K. 2012. The Habitats Directive: Celebrating 20 years of protecting biodiversity in Europe. European Commission. <https://doi.org/10.2779/15019>

re-establishing natural ecological processes. This approach has several orientations including:

- re-creating wilderness by securing large and well-connected core protected areas and releasing (carnivorous) keystone species; and
- re-introducing wilderness in ecologically degraded areas by releasing domestic stock to become feral and/or captive bred wild species for natural regulation of the vegetation.

Consequently, re-wilding does not just involve setting aside areas in which autonomous ecological processes can proceed, but also the development of more nature-analogue forest systems that respond to the emerging demands for different types of ecosystem services. The principles of re-wilding can be applied at a range of scales and intensity, and it is evident in the establishment of naturalistic grazing systems using domestic stock as well as in the development of fruit collection forests in which (traditional varieties of) historical orchard trees and shrubs are planted.

Generally, nature conservation areas are frequently sites for wild product harvesting by the public and commercial collectors, and this form of provisioning ideally should be recognized in the management plans for the sites.

#### **2.4.5 Forest income diversification**

As timber revenues fall, attention often turns to other sources of income that can be derived from a forest. This is in turn a stimulus to innovation, which has led to the emergence of mass markets for timber by-products such as bark for mulch and animal bedding. However, there are relatively few opportunities for development of new mass market products from other resources in forests. This is mostly because forests are managed on long time scales, and this makes it difficult to react to rapidly expanding market opportunities. However, as shown in the rapid emergence of experiential markets, this does not mean that new markets and activities cannot emerge. With sufficient innovation and business planning it is possible to develop incomes from NWFPs.

## A global perspective

Although our focus is Europe, it is not possible to appreciate what is happening here without considering the global context. Chapter 3 considers trade flows of products – such as wild mushrooms – which are derived from European resources. On the other side, Europe is a significant importer of NWFPs from the tropics. For example, Europe imports 37% of global trade in bamboo products estimated as being worth more than € 700 million (mainly from China), and 80% of global trade in ‘gum arabic’ (the hardened sap of a variety of African thorn trees – mainly *Senegalia senegal* (syn. *Acacia senegal*) and *Vachellia seyal* (syn. *A. seyal*) worth around € 125 million (principally from Sudan, Chad, Nigeria and Mali). This demand for tropical NWFPs coupled with interest in their role in sustainable and socially equitable tropical forest management has resulted in a close coupling of research, development aid projects and ethical sourcing (especially fair trade) from European institutions to tropical forests since the early 1980s. The main findings from tropical experience are that:

- overharvesting resulting from commercialization can be a significant threat to many species especially those used as medicinal or aromatic products;
- carefully constructed local governance is key to achievement of sustainable forest management;
- NWFP-based enterprises are not a panacea for rural development and careful attention to regulation, market access and the mechanics of global trade are required to create sustainable NWFP-based livelihoods;
- there are many forms for NWFP livelihoods from subsistence, income diversification to specialized enterprises.

However, despite the accumulation of research and experience of tropical NWFPs, rather little of this has been applied to European NWFPs. There is much to be gained by sharing experiences of both production, governance and marketing of NWFPs in tropical and temperate forest zones.

Europe also imports NWFPs from other temperate zones. For example, moss from Canada and New Zealand, and blueberry (the cultivated American species *Vaccinium corymbosum* which is not indigenous to Europe) from North America and New Zealand. The notable difference with imports from these countries is that the product is often processed and pro-actively marketed, e.g. from 2011 to mid-2015, nearly 5000 new products containing blueberry were launched in Europe. Fashions for new NWFPs – e.g., Açai (*Euterpe oleracea*) is a palm species cultivated for its fruits as well as other products; and Argan oil produced from *Argania spinosa*, is used as a food oil and in cosmetics – can also spread quickly, though most innovations seem to be imported into Europe rather than flow out.

In terms of global production of NWFPs, data is even more lacking than for trade although there are a few figures for certified production. The case in point being the global statistics for wild collected products certified as organic shown in Figure 4 for 2005.

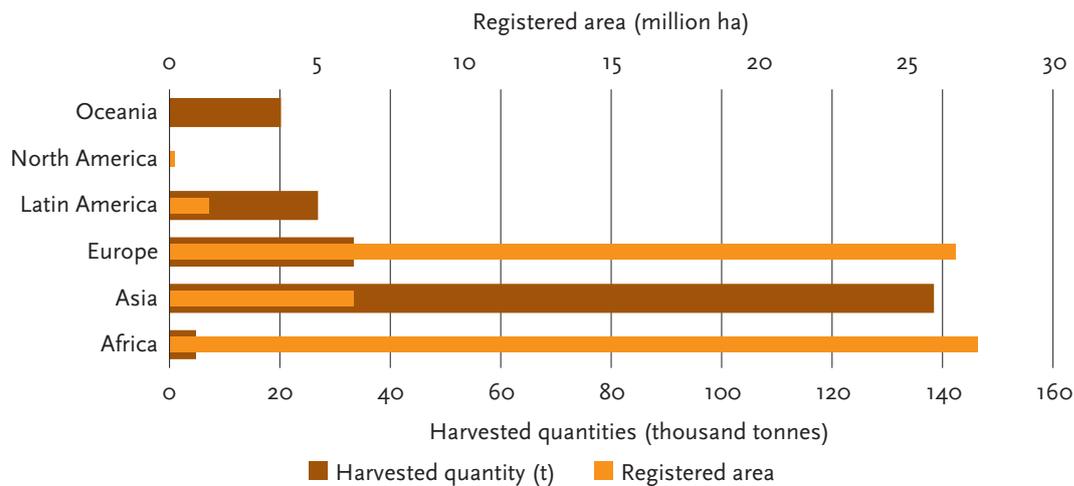


Figure 4. Global registered area and production of organic wild collection (UNCTAD/WTO 2007).

Although Europe has the second largest area of land under organic certification, it produces a relatively small amount of certified wild products.

### Key messages

- There are many plants and fungi harvested from European forests for use as foods, medicines, materials and decoration. Many of these are deeply rooted in local culture and traditions with many innovations which update these for the 21<sup>st</sup> century consumer.
- NWFPs are present in a wide range of land-use types and habitats from forests to urban greenspace. Furthermore, they are derived from a wide range of production systems on a continuum from wild to domesticated and intensively cultivated. This means NWFPs provide a myriad of opportunities to enhance personal well-being of citizens and enterprises for the entrepreneurial. This is largely under-recognized in forest and rural development policy.
- Personal picking and use of NWFPs is a key component of forest culture and is practiced by 25% of households in Europe. Much of this personal picking is based on non-wood forest species. Provision of services to these users is an emerging market opportunity for NWFPs embedded in experiential markets such as traditional forest crafts and speciality wild foods.
- There is a strong NWFP collecting culture in Europe, but the associated knowledge is under threat as uses related to traditional, subsistence lifestyles are not passed on to younger generations. At the same time, there is increasing interest in natural foods, artisanal crafts and back-to-nature lifestyles.
- The provisioning of NWFPs under Everyman’s rights means that NWFPs are largely under-represented in ecosystem service accounts despite being an important component of forest-derived well-being and societal benefits. A consequence of this is that NWFP provisioning does not figure as prominently in policy based on ecosystem services as it deserves.

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# 3.

## NWFPs in Europe – consumption, markets and marketing tools

**Davide Pettenella, Giulia Corradini, Riccardo Da Re, Marko Lovrić  
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Pattern of consumption, trade trends and market organization of NWFPs are of fundamental importance to promote their sustainable production, to orient the demand and supply, and eventually to deliver additional sources of income from forests, while supporting rural development.

In this chapter figures are presented on household consumption of NWFPs in Europe, documenting the widespread use of many NWFPs by Europeans. A brief review of the trade trends in international markets is followed by presenting the key features of NWFPP supply chains and the effects of different policies on their structure. The last part of the chapter describes the main marketing tools for NWFPP promotion, focusing on the role of standards development, certification and labelling.

## NWFP consumption in Europe

While until now much of the attention has been devoted to the study and understanding of the socio-economic contribution of NWFPs to rural livelihoods, consumption of NWFPs has received less attention. The wide variety of NWFPs, the diversity in the final uses with the relevant role of self-consumption, and the non-homogeneous market organization has prevented the sector from being clearly defined and also prevented the development of a European statistical information service related to production, trade and consumption of NWFPs. European consumers generally have a weak perception of NWFPs and they rarely distinguish whether a product is gathered wild or cultivated. An emblematic example is the case of berries (i.e. blueberries, cranberries, etc.), which are frequently considered wild products by consumers, while globally their trade is mostly made up of cropped products. In most European countries, wild harvested berries represent a small to negligible share of the berry market. Other products like wild mushrooms, forest greenery, medicinal and aromatic plants, and sap and resins are also widely used with a similar share between wild and cultivated products. Consumption also refers to a broad range of products that are often processed (pickled, frozen, dried, or otherwise transformed); in general, consumers do not pay attention to whether the product is based on wild or cultivated products. There is very little information available on processed end-products because companies try to find the cheapest raw materials, and therefore wild and cultivated materials are often mixed. 'Wild product' labelling is now emerging in the retail market, but it is still in its infancy if compared to organic and ecolabel labels.

A StarTree web-panel survey of 28 European countries – EU-28 minus Cyprus, Luxembourg and Malta, plus Serbia, Turkey and the European part of Russian Federation – collected responses from 14 864 households (Vidale et al., 2015). The results show that there is widespread use of NWFPs in European households (Figure 1). Some 24.5% of European households have at least one member collecting NWFPs from the wild; the percentage of households that pick NWFPs varies widely between countries, from 4.6% in the Netherlands to 67.6% in Latvia. 15.0% of households stated that NWFPs are received as gifts; 22.0% of households stated that they purchase NWFPs from a collector or harvester; 84.6% of households stated that they purchase NWFPs from shops; and 4.5% of households stated that they obtain NWFPs from other sources. Some fresh NWFPs are very commonly consumed (Table 5): 71% of the households consumed nuts; 59% consumed berries; 41% consumed mushrooms; and 37% consumed edible and medicinal plants.

Table 5. Household consumption of NWFPs (%).

Country	Forest foliage and greenery		Wild Nuts		Wild mushrooms		Truffles		Wild berries		Wild edible and medicinal plants		Resin and sap	
	Non-hand-crafted	Handcrafted	Fresh (naturally dried)	Preserved or prepared	Fresh	Dried, frozen or prepared	Fresh	Frozen or prepared	Fresh	Dried, frozen, juiced or prepared	Fresh	Extracts or prepared	Fresh	Prepared
AT	14	15	72	21	46	36	3	12	76	48	37	36	18	11
BE	20	8	59	40	48	26	4	10	46	27	36	27	9	5
BG	20	22	85	36	39	26	4	9	79	40	43	54	38	18
CZ	17	31	84	32	30	30	1	6	62	54	64	49	4	2
DE	18	21	71	21	41	40	6	12	70	46	26	32	14	6
DK	22	15	63	22	33	25	4	5	57	43	35	23	16	6
EE	8	8	82	23	31	31	3	4	66	54	45	31	17	8
EL	17	13	77	41	32	34	4	10	18	25	40	41	40	7
ES	17	15	72	39	62	47	10	21	48	39	39	47	9	12
FI	18	8	71	19	18	27	1	4	52	57	31	38	1	4
FR	26	13	57	54	53	44	5	7	34	25	41	31	4	7
HR	25	19	84	29	47	35	4	12	59	58	40	52	28	14
HU	19	30	61	29	28	30	4	8	49	53	46	41	3	8
IE	11	10	66	31	32	19	4	9	76	37	25	42	10	6
IT	23	22	82	42	44	63	11	23	55	54	52	50	7	17
LT	23	18	81	21	38	36	4	5	70	52	43	47	12	5
LV	21	22	77	28	54	36	3	6	79	51	57	36	39	14
NL	11	7	59	19	19	15	5	8	38	31	16	22	21	6
PL	52	31	75	33	49	53	10	16	79	64	51	57	36	27
PT	17	12	80	55	40	55	5	6	44	36	34	38	3	7
RO	28	34	75	55	65	55	7	13	69	62	55	67	10	14
RS	17	22	80	29	35	24	4	5	66	54	45	49	20	13
RU	31	19	76	53	40	58	5	6	64	61	25	56	33	20
SE	19	10	70	44	45	27	3	7	66	62	26	33	2	4
SI	22	22	77	26	26	32	2	12	73	60	34	49	7	9
SK	17	26	70	15	25	42	5	6	47	50	36	49	2	4
TR	56	29	79	42	40	26	17	15	75	44	74	44	26	17
UK	9	8	55	21	22	16	3	5	59	26	15	25	6	5
Average	25	19	71	37	41	41	7	11	59	45	37	41	16	12

Notes: 14 864 households surveyed with the reference years of 2015 and 2016.

## The international dimension of NWFP markets

In Europe, the main NWFP categories collected in the wild and transferred along supply chains to end-users are: sap, resins, greeneries, fruits, nuts, mushrooms, berries, medicinal plants, and aromatic plants. The commercialization of NWFPs occurs at different spatial scales from local to national to international. However, information related to the trade and characteristics of supply chains have been scarcely investigated due to difficulties in gaining access to data. Apart from some mass products like cork, Christmas trees, chestnuts and a few other NWFPs, for many NWFPs there is a lack of data on stocks, harvesting, prices, operators, and even detailed trade flows. By comparing statistics published in different years by FAO, FOREST EUROPE and the UN Economic Commission for Europe it appears that there is a clear problem regarding availability of data; this is not related to the economic, social and environmental importance of NWFPs, but rather to a problem of data collection and coordination by national statistical agencies. The estimation of trade values and volumes may be very challenging since there is no clear distinction between cultivated products and products collected in the wild.

It would be useful to modify the trade classification system to allow separation of wild from cultivated products; this would provide more transparency in trade relations and enhance the information that could be provided to the final consumers. Specifically, an improved classification system under the Harmonized System (HS)<sup>4</sup> for certain target species (e.g. by creating new specific codes for *Vaccinium vitis-idaea*, *Boletus edulis*, etc.) or NWFP categories (e.g. wild berries, wild mushroom separated by cultivated ones) would be useful for enhancing knowledge on NWFP markets.

Despite the lack of data and the difficulty of tracking the international market of NWFPs, the StarTree project confirmed – by compiling data from different sources and through new studies – that the international trade of wild and cultivated forest products is increasing, both as a consequence of trade within Europe and as a consequence of increased imports from non-European countries, reflecting a general increase in global

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<sup>4</sup> The Harmonized Commodity Description and Coding System, generally referred to as “Harmonized System” (HS) is a multipurpose international product nomenclature, developed by the World Customs Organization. As the term suggests, the HS is harmonized with other existing major international and national product classification systems. It comprises about 5000 commodity groups. More than 200 countries use HS, and over 98% of the merchandise in international trade is classified in terms of the HS. The HS adopts multi-digit coding, making it flexible for incorporating the reporting on NWFPs. Within the HS, a NWFP commodity group can refer to: a single species, traded as raw material or an ‘end-use’ product; or it may also refer to a group of different species used for the same ‘end product’ category. This indicates problems in the NWFP classification. A further complication that occurs within the HS is the change in coding definition over time (i.e. the merging of two codes, or the splitting of one code into two or more different codes). This is commonly due to a change in the economic value of a commodity. When the commodity group changes its coding definition, the time series has to be rebuilt for any trade analysis.

demand for these products (Pettenella et al., 2014). There are high fluctuations in production of NWFPs harvested in the forest at regional and country levels, but at the global scale markets are more stable both in terms of volumes and values. Scale matters in NWFP production, and over the last decade companies working at the global level have experienced an increase of NWFP prices that was greater than the increase in production volume.

Table 6 presents a general overview of the traded commodities that contain NWFPs. However, a clear overview of the traded value of the ‘pure’ NWFPs is rather complex to estimate. Cork, tannins, chestnuts, truffle, mosses are mostly supplied from the wild, though a small but undefined share is sourced from agriculture, or even greenhouses in the case of mosses. The same occurs for all the commodities reported in Table 6 in which the share of wild product may be zero (e.g. commodities linked to cultivated mushrooms, nuts and berries), minimal (e.g. cranberries, raspberries and other berries) or important but undefined (e.g. honey, foliage, mushrooms other than *Agaricus* spp.).

If commodities that are mainly cultivated (i.e. cultivated mushrooms, nuts and berries) are excluded, then the total world traded value of the commodities that are exclusively or partly from wild sources was €8.7 billion in 2011. The EU exports of commodities exclusively or partly from wild sources totalled about €3.4 billion and the EU imports totalled about €4.2 billion in 2011. These values would be still overestimated.

Despite the important problem of distinguishing between wild and cultivated products, we can anyway understand the position of the EU toward the global trade of the listed commodities. For instance, the EU is a global leader in the supply of cork, cork-based products and chestnuts; it is also the leader in processing and exporting some other NWFPs, namely refined vegetable tannins<sup>5</sup> and wild mushrooms. Apart from these products, the EU is a net importer of NWFPs and it accounts for almost half of the overall global NWFP imports. The high EU demand and dependence on international market for several NWFPs may represent both a threat and an opportunity for Europe. It is a threat for EU companies in terms of the possibility for loss of competitiveness with some emerging economies. There is an opportunity with regard to the potential to enhance the internal supply and to preserve the industrial processing and local and traditional know-how (see Box 2). The enhancement of the production may be a key aspect of the future forest policies in order to reduce the dependency of NWFP producers in Europe on international markets, while at the same time re-establishing an economic bridge between European consumers of NWFPs and producers located in remote rural areas.

<sup>5</sup> Vegetable tannins (as opposed to synthetic tannins) are plant polyphenolic compounds derived from plant sources that bind to and precipitate proteins and other organic compounds. Tannins are extracted from wood and wood bark of different trees and they are used in the food industry and, especially, in the process of tanning animal skins to make leather.

**Table 6.** Global EU trade values of commodities that contain (totally or partially) NWFPs in the year 2011 (million €). Source: data extracted from COMTRADE for Pettenella et al. (2014).

Products	HS6 Code	Level of processing	Part of wild harvest	World 2011	From EU28 2011	To EU28		EU28 balance	World-EU28		Top three world traders in value	
						2011	2011		Exp. %	Imp. %	Exporters	Importers
Honey	040900	Raw	Yes	1370	443	733	733	-290	32	53	CH, AR, NZ	US, DE FR
Mosses	060410	Raw	Yes	42	24	26	26	-3	56	63	CL, NL, DE	NL, DE, US
Fresh foliage	060491	Mix	Yes	870	524	637	637	-113	60	73	-	-
Dry foliage	060499	Mix	Yes	264	122	166	166	-44	46	63	-	-
Fresh & frozen Agaricus	070951	Raw	No	936	792	699	699	93	85	75	-	-
Fresh & frozen truffles	070952	Raw	Yes	1	0	0	0	-	-	-	-	-
Fresh & frozen mushrooms	070959	Raw	Yes	565	297	345	345	-48	53	61	-	-
Preserved Agaricus	071151	Processed	No	72	23	38	38	-15	32	53	-	-
Preserved mushrooms	071159	Processed	Yes	85	12	61	61	-49	14	72	CH, PL, NL	DE, JP, FR
Dried Agaricus	071231	Raw	No	83	30	42	42	-12	36	50	-	-
Dried Auricularia	071232	Raw	Yes	141	3	11	11	-9	2	8	-	-
Dried Tremella	071233	Raw	Yes	39	1	1	1	0	2	3	-	-
Other dried mushrooms	071239	Raw	Yes	985	51	123	123	-72	5	12	CH, PK, DE	CH, VN, TH
Prepared Agaricus	200310	Processed	No	848	411	408	408	3	48	48	-	-
Prepared truffles	200320	Processed	Yes	21	17	12	12	5	82	60	-	-
Prepared mushrooms	200390	Processed	Yes	164	60	62	62	-2	37	38	-	-
Almonds	080211	Raw	No	750	26	40	40	-14	3	5	-	-
Shelled almonds	080212	Processed	No	2422	483	1229	1229	-746	20	51	-	-
Hazelnuts	080221	Raw	No	130	18	30	30	-12	14	23	-	-
Shelled hazelnuts	080222	Processed	No	1281	213	965	965	-752	17	75	-	-
Walnuts	080231	Raw	No	710	118	222	222	-104	17	31	-	-
Shelled walnuts	080232	Processed	No	1111	157	487	487	-330	14	44	-	-

Table 6. continued.

Products	HS6 Code	Level of processing	Part of wild harvest	World		From EU28		To EU28		EU28 balance	World-EU28		Top three world traders in value	
				2011	2011	2011	2011	Exp. %	Imp. %		Exporters	Importers		
Chestnuts	080240	Mix	Yes	215	110	110	87	87	22	51	41	IT, CH, KR	JP, FR, IT	
Pistachios	080250	Mix	No	2166	376	376	925	925	-549	17	43	-	-	
Fresh strawberries	081010	Raw	No	1854	1153	1153	1102	1102	51	62	59	-	-	
Fresh raspberries, blackberries, mulberries and loganberries	081020	Raw	No	843	295	295	318	318	-23	35	38	-	-	
Fresh currants, gooseberries	081030	Raw	No	0	0	0	0	0	-	-	-	-	-	
Fresh cranberries, bilberries and other fruits of the genus Vaccinium	081040	Raw	Yes	1026	248	248	351	351	-103	24	34	CL, US, CN	US, CN, GB	
Fresh other fruits and nuts	081090	Raw	No	2119	513	513	657	657	-144	24	31	-	-	
Frozen strawberries	081110	Raw	No	784	344	344	507	507	-163	44	65	-	-	
Frozen raspberries, blackberries, mulberries and loganberries	081120	Raw	No	684	299	299	499	499	-200	44	73	-	-	
Frozen fruits and nuts	081190	Raw	Yes	1819	742	742	1067	1067	-324	41	59	-	-	
Quebracho tannins	320110	Raw	Yes	61	5	5	23	23	-18	8	37	AR, BR, ZA	IN, IT, CH	
Wattle tannins	320120	Raw	Yes	94	3	3	17	17	-14	3	18	-	-	
Other vegetable tannins	320190	Mix	Yes	140	66	66	41	41	25	47	29	-	-	
Natural Cork	450110	Raw	Yes	106	101	101	95	95	6	95	90	-	-	
Cork in pieces	450190	Processed	Yes	67	57	57	50	50	7	85	74	-	-	
Cork squared	450200	Processed	Yes	52	45	45	30	30	15	88	58	-	-	
Cork Stopper	450310	Processed	Yes	534	507	507	292	292	215	95	55	PT, ES, FR	FR, US, ES	
Total overview				25448	8687	8687	12398	12398	-3710	34	49			

Notes: The World-EU28 percentage is calculated as the fraction of the EU28 exports with regard to the global trade in 2011. The export and import values consider also the trade within the EU. In the column of "level of processing" the "mix" category denotes that the commodity code put together raw and processed products.

# 3.3

## Enhancing production potentials – the theory

The increasing global demand for NWFPs may have different impacts on production. After the phase of market expansion characterized by increased harvesting and income for the collectors, there is a phase of maturity with stabilization of the supply of NWFPs, which can be more or less prolonged (Figure 5). If a condition of increasing demand does not result in an effective response of increasing the sustainable production of the raw material, the market may face a problem of rapid decrease due to overharvesting and depletion of the natural production potential. This for example happened with vegetable tannins extracted from the bark of various trees. After the discovery of quebracho as a source of tannin at the end of the 19<sup>th</sup> century, the quebracho trees in some areas were overexploited, and the resource has still not recovered completely. Despite largely being replaced by synthetic tannins, recently there been a renewed interest in tannins from plant sources.

Alternatively, a process of domestication (manipulation of NWFPs to enhance and improve their production through silvicultural measures or cultivation) is possible in some cases. The main, direct, consequence of domestication is the increase of production, but other effects include increase of size, quality, durability and homogeneity of the products, and a related decrease in the price of the product for consumers. Figure 6 shows the example of the world cranberry production, which in recent years experienced a huge

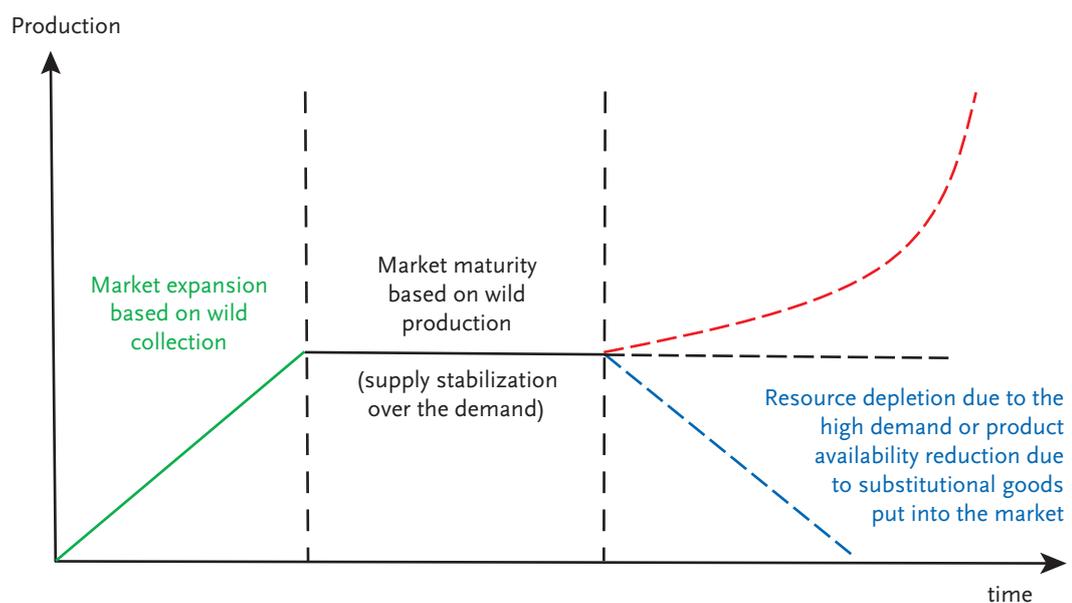


Figure 5. NWFP market development paths. Source: Modified from Homma (1992) by D. Pettenella.

increase due to the process of domestication of the American cranberry (*Vaccinium macrocarpon*). Domestication may enhance the quality of the NWFP, or on the contrary, may result in a loss in terms of taste, vitamin content and in an increased presence of some chemicals due to the use of fertilizers and pesticides. Also, it can serve as an example where domestication loses connection to forests and gives way to cultivation techniques.

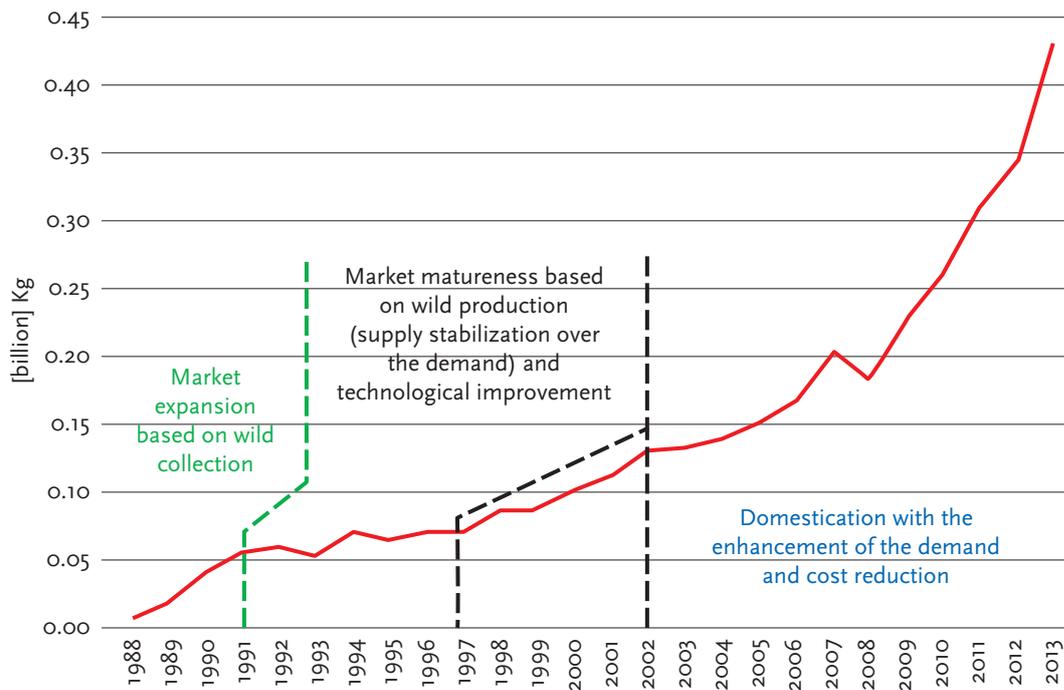


Figure 6. The development of world cranberry production after domestication (own elaboration on COMTRADE data).

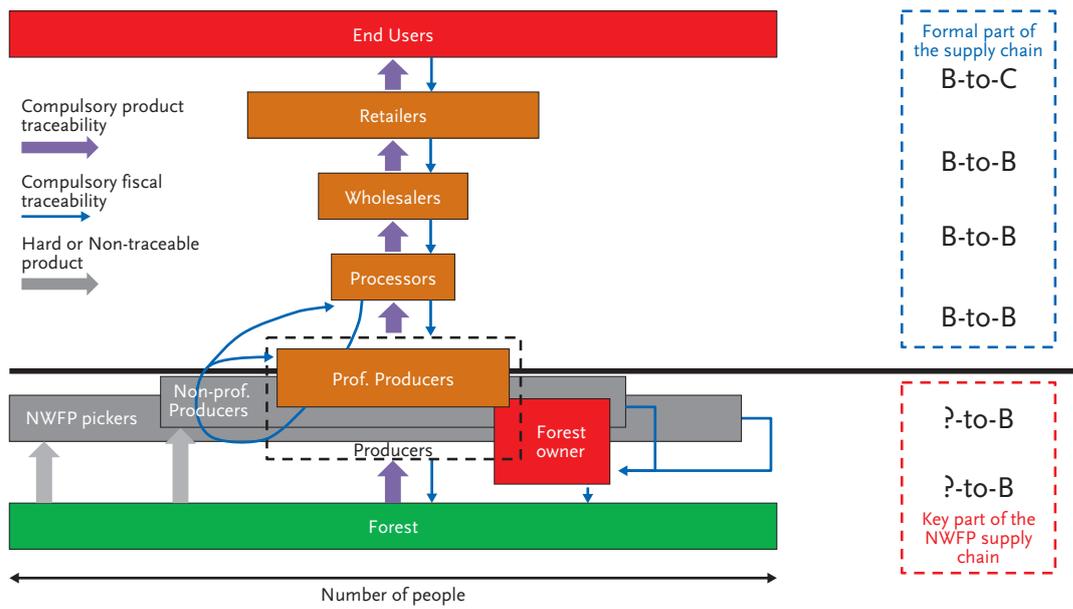
## Enhancing production potentials – supply chain organization

NWFP supply chains do not differ from the supply chains for other products, as far as the asset of property and harvesting rights allow the economic actors to organize themselves transparently. Through producers, processors, wholesalers and retailers, the supply chain links forests with end users.

In some cases (e.g. for mushrooms, truffles, berries), recreational pickers or non-professional NWFP producers provide most of the raw material. A theoretical NWFP supply chain is illustrated in Figure 7; the chain includes the different economic actors involved, the product and cash flow, and highlights the parts of the supply chain where the product and cash flows are difficult to trace. The figure does not show all possible combinations of interactions between the actors that there would be in an actual supply chain. A core problem of the NWFP supply chain is linked to the transfer of the product, either formally or informally, from the forest to the first formal economic actor of the supply chain.

As a matter of fact, income generation opportunities depend on a set of public policies dealing with property rights, fiscal and labour legislation, rural development, industrial supply chain, tourism, etc. Policies dealing with these issues may be extremely effective in shaping the level of profit along the value chains. Policies differ from country to country and from product to product and, for this reason, value chain incomes also vary for the different actors. Fiscal policies applied on the NWFP collection affect the production prices along the supply chain. High taxation regimes and complex bureaucracy procedures for purchasing raw NWFPs from local collectors may reduce the price performance of local supply chains and indirectly support competitiveness of foreign suppliers. Property and harvesting rights regulations (e.g. permits for collection, concessions, licences, etc.) may lead to two opposite outcomes: on one side they may support income generation for the forest land owner, and on the other side they may increase the production costs for the collectors that introduce NWFPs into the supply chain.

An adaptation of the actual legal framework should be promoted at EU and national levels for supporting the commercialization of NWFPs, with special attention given to the products harvested by recreational NWFP pickers or non-professional producers: the weakest actors in the supply chain.



Note: B-to-B: Business-to-Business relationships; B-to-C: Business to Consumers

Figure 7. Actors in the NWFP supply chain: a theoretical structure.

## Marketing and rural development opportunities

Being perceived as ‘green’, ‘traditional’ and ‘local’, NWFPs may play a relevant role in the design and implementation of strategies for rural development. There is empirical evidence that successful NWFP-based rural development initiatives rely on strong networks among local economic actors, high social capital among stakeholders, resilient local economies, though they may rely initially only on one or a few key entrepreneurs or policy makers. Vertical integration of the supply chain actors is a rather complex and challenging task despite the fact that such integration may allow higher levels of economic performance (e.g. associations of pickers that define stable contractual relations with processors). Horizontal integration among the same actors can be reached when there is room for scale economies in providing some services (e.g. an association among forest owners to control the access by illegal pickers). Horizontal integration among the different actors may also be difficult to achieve, but can dramatically enhance the economic opportunities for local markets. An example is the case of the implementation among forest owners and tourist actors for establishing a system of wild mushroom picking permits for recreational harvesting as an additional service provided by hotels or tourist agencies.

As for any other products in the commercialization of NWFPs, a transparent and well organized market structure may help in a more equal distribution of the created economic value among the actors. Marketing is, therefore, important for all enterprises from small- and medium-sized enterprises to large-scale industrial enterprises, and also for forest communities. Since NWFPs comprise a wide variety of products, sourced from a great variety of contexts and traded through a large number of supply chains, marketing of NWFPs is a very broad topic. Marketing of NWFPs may occur under different marketing mixes, which may vary in accordance to the internal and external factors influencing a company’s decision. Traditionally marketing has been divided into a set of interconnected decisions, known as the “marketing mix” (or the four Ps), which is the set of the marketing tools that the organization uses to pursue its marketing objectives in the target market, aiming at responding to their wants and needs. The four Ps are: product, price, place and promotion. It may be useful to refer to the traditional distinction between products and services (tourism and recreation, environmental protection, cultural services, etc.) and to make a broad classification in three types of markets:

- i. **Mass market:** products or services on the mass market are undifferentiated and are aimed at reaching a wide range of potential buyers. In this market the company decides to ignore market segments and to appeal to the whole market, with a unique strategy.
- ii. **Specialized market:** specialized NWFPs have high added value, they have recognizable characteristics, such as quality or specific origin, or they are innovative products. They are not aimed at reaching a wide number of consumers, but rather a smaller, niche, segment of the market.

- iii. **Embedded NWFP market:** NWFP-embedded product within a forest-based recreational activity offered together in a specific area. This type of market connects products with activities, in many cases related to tourism and recreation.

Some NWFPs have been traditionally commercialized under the mass market strategy. In this type of market, NWFPs are produced in high quantities, with low levels of differentiation, and reach a wide number of consumers. This is, for example, the case for cork in some Mediterranean countries or the case of berries, which are harvested in very large quantities, for example, in Finland. In the mass market of NWFPs, the marketing mix tends to focus more on the 'product' (with an orientation towards commoditization) and on the 'price' (aiming at achieving cost minimization and low prices as a result of economies of scales). With little differentiation in terms of products, producers have to be competitive on the price. The 'place', and in particular the design of efficient supply chains and logistic is likewise fundamental: products, and especially fresh products, have to reach a given place within a certain time after collection/harvest. 'Promotion' plays a less important role.

Other NWFPs are produced in limited quantities from small-scale activities, often under special or seasonal environmental conditions. Examples include many medicinal and aromatic plants, truffles, birch sap, etc. These NWFPs are more suitable for specialized markets – i.e. specific targeted markets. In particular, for the connection that NWFPs retain with forests and traditional activities, they have the potential of interesting the LOHAS (Life Style of Health and Sustainability) target market, which is a recognized market segment in western countries for which environmentally, socially friendly and healthy products and activities are especially important. Within the specialized market, the 'product' assumes a fundamental importance in the marketing mix. The product has to have pronounced characteristics and it has to be very well differentiated from other competing products (e.g. products of certified origin or products made using traditional local know-how). 'Promotion' is also of particular importance. E-marketing, in this case, may play an important role: through the web it is possible to reach a large number of consumers, responding to their special needs for niche products. On-line sales of NWFPs through specialized web-sites selling natural, organic, traditional, region-specific products, are very common all around Europe. From the consumer's point-of-view, the assurance of the claimed characteristics of the product has a strong importance and support the exchange of information among buyers and, in this way, selecting and giving more visibility to the best suppliers. While in the past the logistics and distribution (the 'place') was a major obstacle to marketing of specialized niche products, e-marketing is now one of the driving forces for this category of products.

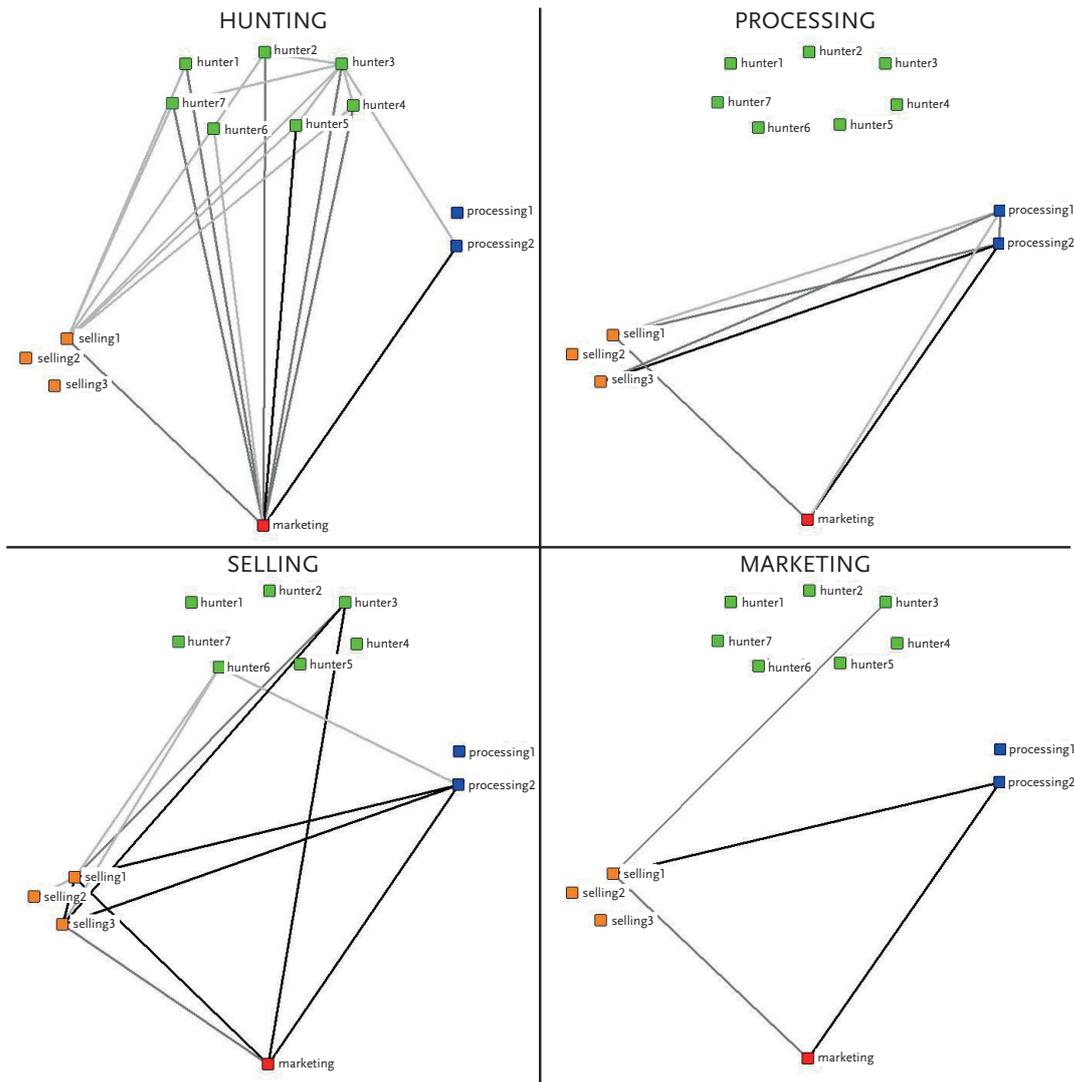
In other cases, the commercialization of NWFPs better occurs in embedded markets, and are complementary to other services. This happens in specific territories where NWFPs are offered in combination with other products (usually traditional products) and services, typically those related to tourist and recreational activities. This typically happens during festivals and seasonal events, and in particular regions that may be particularly important for a particular product (e.g. mushrooms, chestnuts), which connects different parts of the territory and different stakeholders (e.g. restaurants, farmers, etc.). The characteristic of embedded products and services is the combination of relationships and territorial features, which gives additional value and allows differentiation from other areas. The embedded NWFP market plays an important role in the promotion of local rural development strategies that foster local business and networks. In

the marketing mix of embedded NWFPs, the 'place' plays a special role. The geographic area from which NWFPs are traditionally sourced, the development of roads and the organization of services are of fundamental importance. Also, in a similar way to what happens with specialized NWFP markets, 'product' and 'promotion' are also important. Products and services have to have distinguishable characteristics; direct marketing, advertising, as well as public relations are essential. The lack of coordination among public organizations and private economic actors is the main obstacle to enhancing the production of NWFPs, particularly in the case of embedded NWFP markets. Marketing strategies coordinated by local producers and processors, contractual agreements, and different forms of vertical and horizontal integration are powerful tools that can be used to increase both production and marketing of NWFPs.

The SMEs and the public operators who deal with marketing of a product or place must address the physical, cultural and legal barriers that prevent creation of additional value from NWFPs. In the forest sector, the concept of added value is often associated with processing operations, and is mainly linked to wood-processing industries, but this is not the only way to create value. It is the sum of the value for the society, the difference between purchasing and selling price of the NWFPs, and the services associated with those NWFPs, at each step of the supply chain, and the tangible benefits that the final consumer obtains from using the product. Innovative products are often more expensive, due to the costs of new technologies and to the use of other more advanced production factors, so they must attract more consumers and/or a set of consumers that are prepared to pay a premium for the product. Policy initiatives can create a positive environment to enable creation of added value for NWFPs.

There are several examples at local level of creation of added value as a result of an innovative governance approach or marketing strategy. A good governance approach may be introduction of permit systems to regulate mushroom collection in a protected area or introduction of a marketing label to certify that NWFPs originate in a national park. A market approach may be an integrated vertical supply chain, an innovative channel to communicate to customers or collaboration among local producers to create regional standards for NWFP.

Based on the use of Social Network Analysis, Figure 8 illustrates an example of collaboration networks among different actors involved in NWFP value chains for hunting in Forsthof Schildfeld, Germany. Actors involved in the vertical supply chain are divided by main activity (hunting, processing, selling and marketing). The innovative aspect concerns the fact that the supply chain seems to be very efficient: actors are involved only if necessary; there are key referring employees for the main activities; and everybody is very involved in the hunting part, which is the motivational factor for the whole process.



**Figure 8.** Collaboration network and contact frequency for hunting, processing, selling and marketing (attribute-based layout) in Forsthof Schildfeld (Germany). (Source: Da Re et al., 2016)

Node colour: actors' prevalent activity (red for marketing, orange for selling, blue for processing, green for hunting)

Arrow colour: frequency of contact in a grey scale (black for weekly, dark grey for monthly, light grey for yearly)

## Branding, standards and certification

In NWFP marketing a special role is played by the assurance of quality of the products, as well as their communication to the customers, through the use of branding, labeling and certification. A brand is a “*name, term, design, symbol, or any other feature that identifies one seller’s good or service as distinct from those of other sellers*”<sup>6</sup>. A brand is usually associated with a label, which is an identifier placed on the product that is used to tell a customer what he is buying as well as who made it. To avoid misleading messages and ‘greenwashing’ (i.e. unproven or irrelevant claims to create the impression that a product is ‘sustainably produced’ or otherwise ‘environmentally friendly’), systems of assurance (standards and certification) of the product quality and about how the product is produced can be put in place. Certification is “*the provision by an independent body of written assurance that the product, service or system in question meets specific requirements*” (ISO)<sup>8</sup>. Numerous studies underline that opportunities (as well as limitations) exist to promote NWFP management and trade through certification. A review of the main standards and certification that can be applied to NWFPs is presented.

**Sustainable Forest Management certification.** Forest certification is a relatively recent market-based instrument that aims at encouraging sustainable forest management (SFM). SFM assesses the impact of forest exploitation through a set of principles, criteria and indicators to proof the sustainable use of the forest. Forest certification refers to two processes, namely forest management certification (FM) and chain of custody (CoC) certification. Forest management certification is a process which verifies that the area of forest/plantation is being managed according to a standard, while CoC certification tracks forest products from the certified forest to the sale point. Currently, there are more than 50 SFM certification standards in the world, with national, regional or global scopes. The two largest certification schemes are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of the Forest Certification (PEFC). Both FSC and PEFC certify NWFP production and CoC.<sup>9</sup>

The Forest Stewardship Council was the first global forest certification programme to be established in 1993, and discussions for incorporating NWFPs into the FSC standards

<sup>6</sup> American Marketing Association, <http://www.ama.org>

<sup>7</sup> The certification process refers to the so-called ‘third-party certification’. Third-party certification involves an independent assessment declaring that specified requirements have been met. In this respect, a third-party certification body is an accredited body which is entitled by an accreditation body. First-party audit (or internal audit) occurs when someone from the organization itself audits a good or service to ensure it meets the procedure that the organization has specified. Second-party audit is an external audit: one organization audits another under a contract or agreement.

<sup>8</sup> International Organization for Standardization (ISO), [www.iso.org](http://www.iso.org)

<sup>9</sup> The FSC documentation refers to non-timber forest products (NTFPs). The main difference between the definition of NTFPs and NWFPs is that NTFPs include fuel wood and small wood products (e.g. tools, household equipment and carvings).

began in the mid-1990s. Chicle-gum from Mexico was the first FSC-certified NWFP in June 1999. Since then, several NWFPs have been certified all around the world, either within SFM certification or as CoC, like cork in Portugal, Spain and Italy, maple syrup in USA, pine resin in Belarus, essential oils in Nepal and Brazil, venison in the UK, and mushrooms in Poland.

**Wild certification.** The most significant example of a certification scheme for NWFPs is the one developed by FairWild Foundation. The FairWild Foundation was established in 2008 and it created a unified standard and certification system that is based both on ecological and social aspects. The ecological part is based on the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants. It defines guidelines and provides tools to collectors/harvesters, producers and other stakeholders for the creation of a sustainable resource management system based on the Good Agricultural and Collection Practices. FairWild does not specifically target NWFPs, but rather focuses on wild collection. The certification does not only assess the wild origin of the products, but also aims to assure that the collection is sustainable. In this certification scheme, plants and fungi growing in the wild should be collected in a way that: (i) *plant populations do not decrease*; (ii) *the species survive in the long term*; (iii) *their surroundings are not damaged*; and (iv) *no other plants or animals are disturbed*. Because FairWild certification requires the endorsement of species on a case-by-case basis, only a few FairWild certified ingredients derived from only 20 species had been certified by August 2015. The certified ingredients are supplied by ten companies.

**Organic certification.** Organic agriculture is “*a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved*” (IFOAM, 2008).

An increasing number of consumers, in some countries more than in others, have changed their purchasing behaviour to favour organic products. Worldwide, there are currently hundreds of organic third-party standards and certification programmes. Organic certification is of major interest for NWFPs because most of the standards consider as organic both wild collected and semi-domesticated NWFPs (chestnuts, hazelnuts, pine nuts, berries, etc.). At the same time, organic certification is well recognized and appreciated by the end-users.

Also the EU organic framework considers collection of wild plants and parts thereof a sufficient action for obtaining the organic certification if:

- (i) *the plants have grown naturally in natural areas, forests and agricultural areas*; (ii) *those areas have not, for a period of at least three years before the collection, received treatment with products other than those authorised for use in organic production [...]*; and (iii) *the collection does not affect the stability of the natural habitat or the maintenance of the species in the collection area.*

Similarly to wild certification, organic certification does not specifically mention the NWFP concept, and does not specifically focus on forest ecosystems, but rather concentrates on the quality of the land in which the product is sourced, like uncontaminated areas.

A large and increasing number of NWFPs have been certified according to organic standards all over the world, including berries, as well as mushrooms, and medicinal and aromatic plants.

**Environmental performance certification.** Interest in environmental performance certification (EPC) has increased as a result of concerns about how some products (not necessarily NWFPs) can be harmful to the environment. EPC does not specifically focus on NWFPs, but it can still certify NWFPs that meet environmental performance criteria. ‘Ecolabels’ are a sub-group of environmental labels. They are third-party certified. Ecolabels help to identify products and services that have a reduced environmental impact throughout their life cycle, from extraction/harvesting/production to disposal. An example of a regional ecolabelling scheme, coming from a public initiative, is the EU Ecolabel. With respect to NWFPs, the EU Ecolabel has been applied to cork and cork products, such as coverings and panels.

**Quality and food safety certification.** Quality control and food safety certifications aim at assuring appropriate preparation and quality of the products that enter the market. Products have to be in compliance with legal requirements and meet certain quality parameters defined to ensure high quality. The International Organization for Standardization (ISO) develop the most important standards in this sector. In particular, the ISO 9000 family of standards addresses various aspects of quality management, and the ISO 22000 family of standards addresses food safety management along the entire supply chain. Quality and food safety certification does not directly target NWFPs; however, it can be applied to edible NWFPs. An example of a food safety certification programme based on the principle of the ISO 9000 standards, as well as on the requirements of the Codex Alimentarius system<sup>10</sup>, is the BRC (British Retail Consortium) Global Standards. This standard can be awarded to edible NWFPs like other standards used in the food processing industry and in the food retail sector (e.g. FSSC22000, GACP, IFS).

**Certification of socio-economic aspects.** Some certification schemes have a social and economic focus. This is the case, for example, for the international Fairtrade system. Fairtrade standards aim to ensure that fair prices are paid to producers and thus to empower producers in the poorest countries of the world. There are Fairtrade standards specific for small producer organizations, hired labour, contract production and trader standards. Standards also include requirements for application of environmentally friendly agricultural practices, such as safe use of agrochemicals, waste management, maintenance of soil fertility and water resources, and no use of genetically modified organisms. Fairtrade standards do not specifically target NWFPs; however, several NWFPs and products containing NWFPs have been certified according to Fairtrade standards, such as herbs, herbal teas, spices, juices, honey. For each category of products, a specific standard has been developed.

**Origin, geographical indications and traditional specialties certification.** Increasing numbers of consumers are opting for products with a recognizable, traditional identity. NWFPs are good candidates for this type of certification, because their collection is, in most cases, connected to traditional practice and local culture.

According to the EU Regulation 509/2006, three EU schemes promote and protect names of quality agricultural products and foods: (i) Protected Designation of Origin (PDO); (ii) Protected Geographical Indication (PGI); and (iii) Traditional Speciality

<sup>10</sup> The Codex Alimentarius is a system of international food standards, guidelines and codes of practice (established by the Food and Agriculture Organization of the United Nations and the World Health Organization) to contribute to the safety, quality and fairness of international food trade. Application of the Codex is voluntary, but in many cases Codex standards serve as the basis for national legislation. <http://www.fao.org/fao-who-codexalimentarius/about-codex/en/>

Guaranteed (TSG). This type of certification does not specifically target NWFPs or wild collection; however, there are several cases of NWFPs labelled with this type of certification. Although the framework can be applied in all EU countries, some countries have made more use of it than others. The use of the schemes by two countries is presented to show the range of the use by different countries: one in the north of Europe, Finland, and one in the south, Italy. According to the EU Door database<sup>11</sup>, in Finland there are in total 10 products labelled as either PDO, PGI or TSG. Of those, only one product is made with NWFP ingredients, 'sahti' a beer made with juniper berries. The Italian case is different: there are in total 299 products, of which 29 are made with NWFPs or NWFP ingredients. Of these, 24 are raw (or semi raw) NWFPs: 13 types of chestnuts, 4 types of honey, 4 types of nuts, 1 mushroom. Even if Finland does not make as extensive use of the EU labels as other countries, the message of origin, geographical indications and traditional specialties still plays an important role in the Finnish market, where there are four schemes that target the origin issue: *Maakuntien parhaat*; *Hyvää Suomesta*; *Kotimaiset Kasvikset*; and *Avainlippu*. In order to be able to display the labels, products are required to be produced, manufactured or packaged in Finland to differing degrees, depending on the system. For instance, *Hyvää Suomesta* requires that no less than 75% of the ingredients come from Finland and that the labour is 100% domestic. In the Finnish market, several NWFPs and products made with NWFP ingredients, such as juices, jams, frozen and dry berries, are labelled with these "Made in Finland" certifications. Other examples of territorial branding and certification can be found at smaller, typically regional, scales.

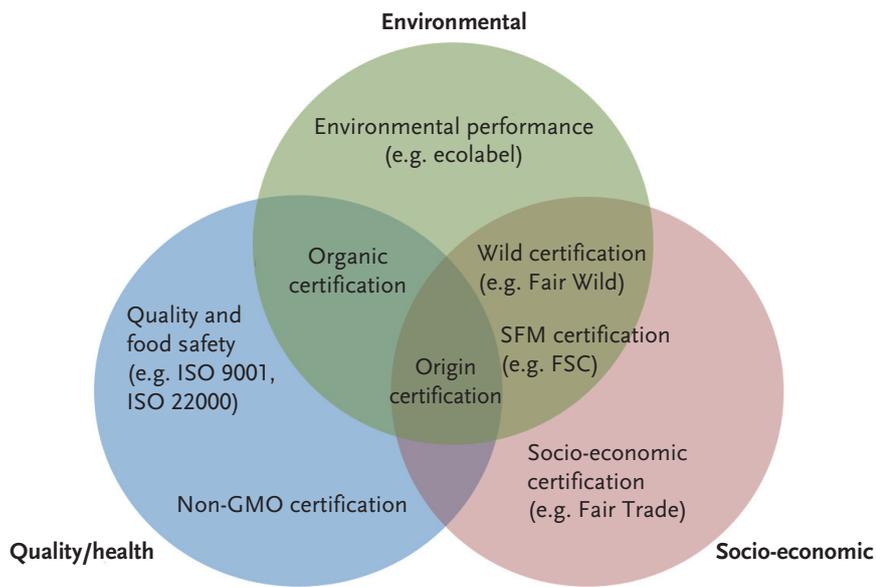
**Other certification schemes of relevance for NWFP.** In countries where genetically modified organisms (GMO) are allowed, there is an increasing discussion on their harmful potential (to the environment and to human and animal health), and a consequent increasing attention for Non-GMO products. The Non-GMO project is a non-profit organization committed to providing verified non-GMO choices in North America. The Non-GMO label on a product indicates that the product bearing the label has gone through a verification process that certifies that the product contains less than 0.9% of GMOs. Non-GMO certification does not specifically target NWFPs. Products such as berries, herbs, spices and honey have been third-party verified by the Non-GMO project.

Other certification schemes that can be applicable to some NWFPs are those that focus on: non-use of animal ingredients as in the case of the vegetarian and vegan certification (e.g. VegeCert, Vegan Action); or the non-use of animal testing (this mainly applies to cosmetic products).

The aforementioned certifications schemes have different scopes, which to differing degrees take into account socio-economic and environmental sustainability issues and assurance of product quality and health benefits (Figure 9).

The application of these certifications can provide numerous benefits, such as market visibility of products and a price premium for economic actors, together with the benefits strictly related to the objectives of the specific certification. In undertaking a certification process, a company should take into account the target market's preferences in terms of labels as well as the rationale for their choice. There are huge differences among countries and contexts. Despite the broad range of certifications that are applicable to NWFPs, only some specifically target NWFPs or wild collection, and these

<sup>11</sup> <http://ec.europa.eu/agriculture/quality/door/list.html>



**Figure 9.** Sustainability spheres to which NWFP certifications schemes belong to according to their main scope.

are sustainable forest management certification, wild certification and organic certification. They look at the harvesting stage of the supply chain, including general or detailed ecological specifications for sustainable harvesting. Only in these cases do the economic actors give signals that the ecological impact of the NWFP harvesting is positive, or at least not negative. Table 7 summarizes the main scope of each certification type and whether each certification directly targets NWFPs or wild collection.

**Table 7.** Direct target to NWFP or wild collection and presence of ecological specifications, according to the certification schemes and standards.

Certification field	Standards	Main scope	Specificity to NWFP or wild collection		Inclusion in the standards of ecological specifications
			To NWFP	To wild collection	
SFM	FSC; PEFC	Assessment of Sustainable Forest Management	Yes	-	Yes
Wild certification	Fair Wild	Assessment of sustainable wild harvesting	-	Yes	Yes
Organic	EU scheme and many other national and private	Insurance of organic production (e.g. no use of pesticides, not contaminated areas)	-	Yes	Only general specifications
Environmental performance	EU Ecolabel	Assessment of low environmental impact	No		No
Quality and food safety	ISO 22000 and 28000	Assessment of quality of the products	No		No
	BRC, FSSC22000, GACP, IFS,	Assurance of use of good agricultural and food processing and storage practices	No (but some species in the NWFP category)		Only general specifications
Fair Trade	Fairtrade International	Assurance of fair prices paid to producers and empowerment of producers	No (but some species in the NWFP category)		No
Origin, geographical indications and traditional specialties	EU PDO, PGI, TSG	Assessment of the origin and the traditional know-how	No		No
	National (e.g. Finland)	Assessment of origin	No		No
Genetically modified organisms	Non-GMO	Assurance that the product contain less than 0.9% of GMO	No		No
Vegan	Vegecert; Vegan Action	Assurance that the product does not contain animal ingredients	No		No

Note: BRC: British Retail Consortium; FSC: Forest Stewardship Council; FSSC: Food Safety System Certification Scheme; GACP: Good Agricultural and Collection Practices; GMO: Genetically Modified Organisms; IFS: International Featured Standards; ISO: International Organization for Standardization; PDO: Protected Designation of Origin; PEFC: Programme for the Endorsement of Forest Certification (schemes); PGI: Protected Geographical Indication; SFM = Sustainable Forest Management; TSG: Traditional Specialities Guaranteed.

### Key messages

- Analysis of consumption patterns is important for a number of reasons: (i) to understand the organization of the value chain; (ii) to provide guarantees (e.g. of quality or origin) for consumers; (iii) to create a system through which all the actors in the value chain receive fair returns for their contributions; and (iv) to support the supply of healthy and valuable products.
- While often not differentiated between wild or cultivated NWFPs, collection is particularly popular in Northern and Eastern Europe.
- There is a lack of information on NWFP trade flows in Europe. An improved NWFP classification system to be used in production and trade statistics would be useful in order to clearly separate wild from cultivated products, to promote standards, and to provide transparency in trade relations and better information to the final consumers.
- Despite this lack of information, it can be stated that the international trade of NWFPs is increasing, both as intra-trade flows within Europe and as imports from non-European countries. The increase is a consequence of an increasing global demand for these products.
- An adaptation of the actual legal framework should be promoted at EU and national levels to support the commercialization of NWFPs. Fiscal policies, in particular, currently hamper income generation opportunities along the NWFP value chain.
- Better market creation and marketing require better coordination of actors and actor networks, i.e. among producers, processors and retailers. Fostering a co-operation environment will help overcoming physical, cultural or legal barriers to create added value from NWFPs.
- Branding and certification of NWFPs with regard to sustainability, quality, and specific origin are a major instrument to differentiate NWFPs from industrial mass products.

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# 4.

## Policy framework for NWFPs – demands and barriers

**Irina Prokofieva, Laura Bouriaud, Giulia Corradini, Elena Górriz, Irina Kouplevatskaya-Buttoud, and Liviu Nichiforel**

NWFPs have emerged in the international policy discourse as a significant component of the modern concept of multi-functional forest management and sustainable forestry; this has been reflected by the inclusion, starting from the United Nations Conference on Environment and Development in 1992, of NWFPs in several international agreements and processes related to biodiversity, forestry and climate change. For example, the United Nations Convention on Biological Diversity (CBD) “*promotes and builds capacity for the sustainable management of forests, including the management of non-timber forest products and resources*”, explicitly connecting conservation, sustainable use and equity. The recently adopted 2030 Agenda for Sustainable Development, recognizes a combined look on food, livelihoods and management of natural resources. Hence, many of the sustainable development goals can be referenced to shaping national NWFP-related policies in the next decades.

In Europe, a revival of interest in NWFPs is frequently associated with: (i) the decreased profitability of traditional forestry based almost exclusively on timber; (ii) increased consumer demand for wild foods; and (iii) a general increase of forest cover. NWFP collection also represents a significant recreational activity in many countries, ensuring healthy lives and promoting well-being of citizens. The variety of NWFPs and their uses (from household consumption to industrial use), alongside the diversity of production systems (from wild harvesting to semi-cultivation or full domestication), results in a complex institutional framework, which encompasses multiple policy domains (forestry, agriculture, rural development, nature conservation, food and product safety, trade, etc.) and multiple stakeholders (landowners, harvesters, processors, traders, entrepreneurs, policy makers, certification agencies, etc.) involved in different sets of value-chain activities (cultivation, collection, storage, processing, transportation, etc.) at different spatial scales (local, national, international).

Therefore, policies and regulations addressing NWFPs require a comprehensive and coordinated vision, and at the same time a recognition of the involved diversity. Moreover, the assurance that NWFPs are sustainably harvested and that their collection does not hinder other ecosystem services is also a key element to be kept in mind.

There are no overarching regulations concerning land tenure, access to forests and NWFP harvesting rights at the EU level, and so policies concerning these issues are set and implemented at national and sub-national levels (see Chapters 4.1 and 4.2). Once NWFPs move from forests into a supply chain to consumers, however, they are subjected to fiscal measures such as value added and sale taxes as well as a plethora of policies and laws related to the quality of products in compliance with industrial, governmental or international trade and health and safety standards (Table 8). Therefore, local harvest, trade and use of NWFPs are not only affected by policies and laws in the countries where they grow and are collected, but also by wider and global scale dynamics, and in the case of Europe, by relevant EU regulations (see Chapter 4.1).

**Table 8.** Major EU and national policies and regulations affecting different segments of the NWFP value chain, and the extent to which they are binding.

Policy area	Value chain segment									
	Forest tenure	Forest management	Harvesting <sup>a</sup>	Production <sup>a</sup>	Processing	Trade	Sale	Use and consumption		
Land tenure	N	N	N	N						
Forest	EU	EU	EU	EU						
Biodiversity and nature conservation		EU*	EU*	EU*						
Agriculture and rural development <sup>b</sup>		EU	EU	EU						
Harvesting rights		N	N	N					N	
Fiscal			N	N		EU	N			
Food safety				EU	EU			EU	N	
Product labelling and packaging				EU	EU		EU	EU	N	
Trade and movement of products						EU	EU			
Plant health				EU		EU				
Certification schemes of public initiative (e.g. organic)				EU	EU		EU	EU	EU	
Green public procurement				EU			EU	EU	EU	

**Notes:** EU = set at EU level; N = set at national level;  
 \* = in some lands and for some species.

- Binding
- Not binding or voluntary instrument/economic incentive
- Not binding, but influencing national policies and laws which are binding

<sup>a</sup> In this table harvesting refers to collection for purposes different from sale, while production refers to harvesting for sale.  
<sup>b</sup> Agriculture and rural development policies can be set both at EU level (Common Agricultural Policy – CAP, and Rural Development Programme – RDP) and at national or subnational level, and are then implemented at national and subnational levels. They can provide both binding rules and a non-binding framework in which economic incentives are provided, such as direct payments for producers that comply with defined rules on a voluntary basis.

## NWFPs in the European policy arena

### 4.1.1 Policies and supporting mechanisms

The policy framework on NWFPs firstly relates to forest policies on a gradient of different levels and means of enforcement. In the EU, the formulation of national forest policy is the responsibility of each Member State. The role of the EU is the provision of general rules, which each Member State is free to adopt and transcribe into national legislation, according to the principle of subsidiarity. Although there is no common forest policy, the EU can influence national forest policies through common political processes.

The willingness to promote NWFPs is highlighted in several EU and international forest policies and agreements in which the EU participates (e.g. European Forest Strategies, EU Forest Action Plan<sup>12</sup>, the resolutions of FOREST EUROPE – The Ministerial Conferences on the Protection of Forests Europe<sup>13</sup>, Convention on Biological Diversity). Albeit non-binding, European forest-related policies call for a commitment by the Member States to update their National Forest Programmes and framework legislation in order to address the concept of multi-functionality, which includes the provision of NWFPs. Today, most Member States include at least a reference to NWFPs in their national forest policies, strategies and programmes.

In 1993, during the Second Ministerial Conference on the Protection of Forests in Europe, the various ministries responsible for forests agreed that:

*“... the demand for non-wood products and services is increasing in absolute and relative importance ...” and that “... because of the expanding European forest resource, the use of wood and non-wood forest products should be encouraged on a basis compatible with the sustainable management of forests, thereby providing and increasing the potential for traditional and new forest products, sales of which can provide, for both the owner and society, a ready means of financing forest management.”*

In 1998, the European Forest Strategy<sup>14</sup> explicitly identified as an important element:

*“... the promotion of the use of wood and non-wood forest products from sustainably managed forests as environmentally friendly products in line with the rules of the open market.”*

<sup>12</sup> Communication (COM(2006) 302 final) to the Council and the European Parliament on an EU Forest Action Plan, 15 June 2006.

<sup>13</sup> FOREST EUROPE – the Ministerial Conference on the Protection of Forests in Europe) is the pan-European voluntary political process for dialogue and cooperation on forest policies in Europe. Ministerial conferences represent the most important events of the FOREST EUROPE.

<sup>14</sup> Council Resolution 1999/C56/01 of 15 December 1998 on a forestry strategy for the European Union.

**Table 9.** Policies/regulations and their status and legal implication for the forest sector.

Policy/regulation		Developer	Status and legal implication	Notes
Resolutions of FOREST EUROPE- The Ministerial Conferences on the Protection of Forests Europe		46 European countries and the EU	Not binding	Influences national policies and laws, which are binding
European Forest Strategies		EU	Not binding	Influences national policies and laws, which are binding
EU Forest Action Plan		EU	Not binding	Influences national policies and laws, which are binding
Common Agricultural Policy	Direct payments	EU	Economic instrument	Direct payments based on farmer producer requests
	Market measures		Economic instrument	
	Rural development programmes		Economic instrument	Direct payments based on national/ subnational priorities
Biodiversity policies		EU	Binding	
Food safety policies		EU	Binding	
Product labelling and packaging policy		EU	Binding	
Plant health and biosecurity policy		EU	Binding	
Green public procurement policy		EU	Voluntary instrument	
Trade regulations		EU/countries	Binding	
Intellectual property rights policies	Patents, trademarks, designs	EU	Binding	
	Geographical indications and traditional specialities		Voluntary instrument	
Fiscal policies		Countries (some standards are defined at EU level)	Binding	
Access to forest		Countries	Binding	
Harvesting rights		Countries	Binding	

Note: the EU policies are in compliance with international agreements and regulations. For example, EU trade policies are usually in compliance with World Trade Organization rules and CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) rules.

The EU Forest Strategy<sup>15</sup> adopted in 2013 stated that integration of policy activities from the different policy areas affecting forests is needed and that aspects of the whole supply chain generated by forest products should be addressed. The strategy stated the importance of considering the impacts that policies and developments that take place beyond forest boundaries may have on forests. This is indeed crucial, as NWFPs are not only affected by forest policies, but also by a plethora of other policies and laws (Table 9).

<sup>15</sup> Communication (COM(2013) 659 final) from the Commission to the European Parliament, The Council, the European Economic and Social Committee and The Committee Of The Regions. A new EU Forest Strategy: for forests and the forest-based sector. 20 September 2013.

For example, nature conservation policies and regulations may impose rules on land and species management. In particular, the EU Biodiversity Strategy for 2020<sup>16</sup> and the specific EU directives and related instruments (Birds Directive<sup>17</sup>, Habitats Directive<sup>18</sup>, Natura 2000 network), even if not explicitly targeting NWFPs, determine in a binding way how some forests and other wooded lands have to be managed, and the level of protection of the species of interest (Box 5).

#### Box 5. The EU biodiversity policy.

To halt biodiversity loss in the EU by 2020 and in line with the international commitments, the EU Biodiversity Strategy defined six targets: (i) protect species and habitats; (ii) maintain and restore ecosystems; (iii) achieve more sustainable agriculture and forestry; (iv) make fishing more sustainable and seas healthier; (v) combat invasive alien species; and (vi) help stop the loss of global biodiversity. The EU also defined how to achieve these objectives. The Birds Directive and the Habitats Directive are the backbone of the biodiversity policy and the pillars of EU nature legislation. New laws now address specific questions such as invasive alien species. Over the last 25 years, the EU has also built the world's largest network of protected areas, Natura 2000.

The Habitats Directive seeks to guarantee the conservation of flora and fauna and promote environmental education. According to Annex II of the Habitats Directive, about 900 core areas of their habitat must be managed in accordance with the ecological needs of the species. Over 400 species listed in Annex IV are under a strict protection regime. For other species listed in Annex V, Member States must ensure that their collection in the wild is compatible with a favourable conservation status. Among these species, there are several NWFPs, such as mosses (*Sphagnum* spp.) and medicinal plants (e.g. *Arnica montana*, *Artemisia genipi*).

#### 4.1.2 Agricultural policies and instruments

Other EU policies that affect the production and the use of NWFPs include the Common Agricultural Policy (CAP) and Rural Development Programme (RDP). Both encourage the diversification of rural activities, considering forestry an integral part of the strategy of rural development. The CAP and RDP are oriented at helping farmers in:

*“... making more productive use of forests and woodland ...”, “... enhancing the viability/competitiveness of all types of agriculture, and promoting innovative farm technologies and sustainable forest management ...” and “... enhancing the quality of production and products, improving the marketing for food specialties of the rural regions.”*

The three broad objectives of the new CAP 2014–2020 are: (i) viable food production; (ii) sustainable management of natural resources and climate action; and (iii) and balanced territorial development. These objectives all have implications for NWFPs (Box 6). Although not specifically and directly targeting NWFPs, there are several CAP measures that can be used to support NWFPs.

<sup>16</sup> Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the regions “Our life insurance, our natural capital: an EU Biodiversity Strategy to 2020/\* COM/2011/0244 final \*/

<sup>17</sup> Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

<sup>18</sup> Directive 92/43/CEE (21/05/1992) on the conservation of natural habitats and of wild fauna and flora

**Box 6. CAP 2014–2020 measures.**

With an annual budget of about €59 billion (in 2015), the new CAP finances a range of support measures, notably:

**Direct payments** provide annual payments to farmers. With the CAP reform, 30% of direct payments are linked to respecting sustainable agricultural practices – the so-called “Greening” measures. The measures include: diversifying crops; maintaining permanent grassland; and dedicating 5% of arable land to “ecologically beneficial elements”. The growth and the production of NWFPs can benefit from these direct payments.

**Market measures** provide tools to address the situation if normal market forces fail. The European Commission can, for example, activate market support measures if there is a fall in prices because of a temporary oversupply on the market. NWFP producers are also eligible for this funding.

**Rural development programmes (RDP)** provide a framework to invest in individual projects on farms or in other activities in rural areas (farm investments, agri-environment measures, organic conversion, etc.). NWFP producers can apply for these measures. The financing is given on the basis of economic, environmental or social priorities, which are designed at national or sub-national (regional) levels. These funds account for about 25% of the programme and are generally co-financed by national, regional or private funds.

Under the former CAP 2007–2013, some RDP measures supported the production of NWFPs such as nuts or cork. Examples of activities funded include: the restoration and maintenance of chestnut forest and the revitalization of chestnut production, with funding for cleaning under the canopy, pruning and grafting with traditional varieties (e.g. under RDP measures 226 and 227 in Italy); funds for educational training, seminars and courses (as occurred in Italy for the chestnuts association under RDP measure 111); and broader support to multi-functional management of forest stands or improvement of forest stand productivity (e.g. PRODER Programme in Portugal). However, the production of truly wild products such as wild mushrooms or berries, have barely received support from RDP funds. The difference may be due to the characteristics of the production systems involved (cultivation vs. wild production) and the difficulty in establishing a cause-effect relationship that associates increased productivity of certain NWFPs to particular CAP measures. Nevertheless, models prescribing, for example, ideal thinning regimes for increasing the production of some wild products have already been developed – e.g. for berries in Finland and for mushrooms in Spain – suggesting that semi-cultivation of certain NWFPs can be a reality. Therefore, inclusion of these activities in the RDP list of fundable activities would be beneficial for NWFPs.

**4.1.3 Food safety regulations**

Food safety regulations are set to protect consumers’ health and interests and they apply especially to botanicals, personal care and cosmetic products, as well as to food and beverages based on NWFPs. An example at the EU level are the Directives that define maximum levels for specific contaminants in foodstuffs<sup>19</sup>. Despite their role in preserv-

<sup>19</sup> Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs and amending and implementing acts.

ing public health, there are documented instances where food safety regulations have proved a barrier for trade. For example, the EU-imposition for a maximum level of aflatoxin in nuts in the 1990s initially disrupted the trade of Brazil nuts from Bolivia, until the Bolivian government passed a series of measures concerning Brazil nut sanitation practices and aflatoxin sampling, which allowed Bolivia to maintain access to international markets for Brazil nuts.

Similarly, the EU regulation concerning novel foods and novel food ingredients<sup>20</sup> may represent a barrier to NWFP commercialization. According to this regulation, “*novel foods are food and food ingredients that have not been used for human consumption to a significant degree in the EU before 15 May 1997*”. Before such products can be placed on the market, an authorization from the competent authority of the Member State is required based on the assessment of their safety for health or the environment. The safety assessment is circulated also to other Member States, and an additional assessment by the European Food Safety Authority (EFSA) or the involvement of the Standing Committee on Plants, Animals, Food and Feed might also be needed. The costs of submitting a novel food application vary across the Member States, with average estimates ranging between €20 000 and €45 000 depending on data requirements set for applications. The overall cost can differ significantly according to the quality of the scientific information required, ranging from a few hundreds to many hundreds of thousands of euros. This process can considerably hinder the trade and use of some traditionally consumed NWFPs, for which there is no written proof of previous consumption. Potentially, this may result in an increasing homogenization of NWFPs across Europe and gradual disappearance of non-documented NWFP uses (Box 7).

#### 4.1.4 Trade regulations

While NWFPs traded at local and national scales are subject to domestic trade regulation, those traded at international scale may face additional requirements, such as the imposition of import or export tariffs and customs duties, although with the creation of the World Trade Organization (WTO) in 1994, the imposition of tariffs on products has been strongly discouraged. The EU supports the work of the WTO on multilateral rule-making and trade liberalization. Within the general framework of WTO, the EU has a communitarian regulation (Council Regulation No 2658/87 of 23 July 1987 and implementing acts) on the tariff and statistical nomenclature and on the common customs tariff. According to the EU regulation, different tariffs and measures are applied to products (among them NWFPs) that are imported into the EU or exported from the EU (Table 10). Within the EU, the EU Customs Union is in force, and there are no customs duties at the EU internal borders. All goods circulate freely within the EU, whether they are produced within the EU or imported from outside the EU.

For protecting specific products, some restrictions are, however, still in place, and they directly affect some NWFPs. This is the case with the trade restrictions introduced by the Convention on International Trade in Endangered Species of Wild Fauna and Flora

<sup>20</sup> Regulation (EC) No 258/97 of the European Parliament and of the Council of 27 January 1997 concerning novel foods and novel food ingredients and amending acts and Commission Regulation (EC) No 1852/2001 (laying down detailed rules concerning public and protected information provided by the applicants).

### Box 7. EU Novel Food regulation: the case of edible insects.

Edible insects intended for human consumption are examples of NWFPs that encounter obstacles due to European food safety regulations.

Globally, more than 2000 insect species have been documented as edible. Several organizations, including FAO, have reported the environmental, economic and food security benefits of using insects for food and feed. In a context of high population growth, with an increasing demand for meat and a decreasing land availability, edible insects represent a smart solution: they can be produced in farms with less environmental impact than livestock, reducing waste disposal problems, and they contain satisfactory protein quantity and quality, as well as high content of unsaturated fatty acids and minerals.

However, most of the insects are eaten in tropical countries. In the EU, insects as food for human consumption are a small and niche market, and only occasional consumption has been reported by Member States. For this reason, insects are considered a novel food in the EU, and therefore, they have to be subjected to a strict risk assessment before being placed on the market. Contamination of insects with pathogens is a major concern.

Some Member States (Belgium, France and the Netherlands) have performed risk tests, and the European Commission has recently co-financed a research project considering how to develop a policy concerning the use of insects both for human and animal consumption. The scientific opinion of the European Food Safety Authority (EFSA) was requested to support this work. In October 2015 the opinion was published. EFSA established that:

*“when currently allowed feed materials are used as substrate to feed insects, the possible occurrence of microbiological hazards is expected to be comparable to their occurrence in other non-processed sources of protein of animal origin. The possible occurrence of prions in non-processed insects will depend on whether the substrate includes protein of human or ruminant origin. Data on transfer of chemical contaminants from different substrates to the insects are very limited. Substrates like kitchen waste, human and animal manure are also considered and hazards from insects fed on these substrates need to be specifically assessed. It is concluded that for both biological and chemical hazards, the specific production methods, the substrate used, the stage of harvest, the insect species and developmental stage, as well as the methods for further processing will all have an impact on the occurrence and levels of biological and chemical contaminants in food and feed products derived from insects. Hazards related to the environment are expected to be comparable to other animal production systems” (EFSA Scientific Committee, 2015).*

The opinion also defined that today there is still a lack of knowledge, and therefore uncertainties related to possible hazards when insects are used as food and feed. Since there are no systematically collected data on animal and human consumption of insects, further data collection is recommended.

Table 10. Examples of import tariffs imposed on goods entering the EU.

Product	Import tariff
Fresh chantarelles	3.2%
Truffles	6.4%
Preserved mushrooms (except gen. <i>Agaricus</i> )	9.6%
Natural cork (raw)	0.0%
Chestnuts (in shell or shelled)	5.6%
Cowberries, foxberries or mountain cranberries (fruit of the species <i>Vaccinium vitis-idaea</i> )	0.0%
Fruit of the species <i>Vaccinium myrtillus</i>	3.2%

Source of data: TARIC database – Integrated Community Tariff.

(CITES) in 1975. CITES aims at ensuring that international trade of specified wild animals and plants does not threaten their survival. The provisions of CITES are implemented uniformly in all EU Member States through the EU Wildlife Trade Regulations<sup>21</sup>. These regulations define the provisions for import, export and re-export as well as internal EU trade in specimens of species listed in the four annexes of Council Regulation (EC) No 338/97 on the protection of wild fauna and flora by regulating trade, and in some aspects they even go beyond the requirements of CITES. Among the listed species, there are some commonly used plant NWFPs (e.g. great yellow gentian – *Gentiana lutea*, devil's claw – *Harpagophytum* spp.). The enforcement provisions must be transferred into national legislation, as these are tasks under the sovereignty of each Member State, which must ensure that infractions are punished.

#### 4.1.5 Intellectual property rights

NWFPs and biogenetic resources derived from NWFPs are increasingly subject to intellectual property rights (IPR) agreements. This especially concerns medicinal and cosmetics compounds derived from NWFPs. Globally, the protection of IPR is promoted by the World Intellectual Property Organization (WIPO; a self-funding agency of the United Nations) and by the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreements, created and administered by the WTO.

In compliance with the international rules, the EU set a uniform policy of IPR protection (with the use of patents, trademarks, designs, copyrights, etc.) that also applies to NWFPs. In the EU an increasing role is played by labels that define the geographic origin of products. Globalization and increasing homogenization of products (“commoditization”) has led to more and more consumers choosing products with a recognizable, traditional identity. Derived from EU Regulation 509/2006, three EU schemes promote and protect, on a voluntary basis, the use of names associated with the source of quality agricultural products and foods: (i) Protected Designation of Origin (PDO); (ii) Protected Geographical Indication (PGI); and (iii) Traditional Specialty Guaranteed (TSG)<sup>22</sup>. Several NWFPs, as well as products made from nuts, berries, mushrooms and honey have been labelled under these schemes. Across Europe, the use of these schemes has been quite extensive in some countries (such as Italy, France and Spain) while in others they are less used (e.g. Ireland, Finland, Poland). While time-consuming and costly for producers, the use of these schemes allows NWFPs to be marketed at higher prices in niche market segments, thereby increasing their value (see Chapter 3.6).

21 Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein, Commission Regulation (EC) No 865/2006 (as amended by Commission Regulation (EC) No 100/2008, Commission Regulation (EU) No 791/2012 and Commission Implementing Regulation (EU) No 792/2012) laying down detailed rules concerning the implementation of Council Regulation (EC) No 338/97, and Commission Implementing Regulation (EU) No 792/2012 of 23 August 2012 laying down rules for the design of permits, certificates and other documents provided for in Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating the trade therein and amending Regulation (EC) No 865/2006. In addition, a Suspensions Regulation is in place to suspend the introduction into the EU of particular species from certain countries. Moreover, a Commission Recommendation to Member States (Commission Recommendation No 2007/425/EC identifying a set of actions for the enforcement of Regulation (EC) No 338/97 on the protection of species of wild fauna and flora by regulating trade therein (referred to as the EU Enforcement Action Plan) specifies the measures that should be taken for the enforcement.

22 Council Regulation (EC) No 509/2006 of 20 March 2006 on agricultural products and foodstuffs as traditional specialties guaranteed.

## National and sub-national policies addressing NWFPs

### 4.2.1 Inclusion of NWFPs in sectoral and non-sectoral policies

Across European Member States, references, measures and specifications regarding NWFPs differ from country to country. Depending on the political system and on the administrative order, instruments are established and managed either at national or sub-national levels (regional, provincial and sometimes municipal levels). Generally, the legal frame for NWFPs is regulated by national laws, such as National Forest Acts, Wildlife and National Hunting Laws, Environmental Protection Laws and Nature Conservation Laws. Most legal acts make direct references to: NWFPs in the context of forest management; and the access to the forests and harvesting rights of NWFPs or specific rules to be applied in the context of nature conservation (e.g. usually stricter rules for the collection of specified NWFPs).

In the past, there used to be dedicated policies and legislation for specific NWFPs (such as foliage and resins) in several European countries. However, with the decreased importance of these products for the local economies, and their replacement by substitutes, these policies have tended to disappear. In recent decades, NWFP were re-incorporated into forestry policies and laws mainly as a response to the international policy discourse recognizing the importance of these products and as a significant component of the modern conceptualization of the multi-functional use of forests. The majority of the national forest policies of the EU Member States from the 1990s, and especially after 1998 (the year of implementation of the first European Forest Strategy) incorporate the promotion of NWFP production and use in their texts.<sup>23</sup> However, in many cases it is not clear whether such statements are linked to effective implementation measures, or that these policies are coherent with co-existing legislation.

The implementation of NWFP policies requires institutional support structures with adequate capacity and resources to address the different aspects of the multi-faceted NWFP sector (e.g. inventory, land management, harvesting, transportation, processing, trade, etc.). However, in most European countries such institutional structures either do not exist, or lack the authority, resources and capacity to adequately deal with the issue. For example, a study of expert opinions in 14 European regions revealed that in 10 of the regions the differences between the legal rules and actual practices on the ground were attributed mostly to failures in the implementation of legal rules. Overlapping laws and institutional mandates can sometimes result in confusion as to which procedures should be followed by NWFP entrepreneurs (e.g. as reported in Serbia).

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<sup>23</sup> The terminology used in policy documents to refer to NWFPs differs across countries, and may include terms such as: wild products; wild forest products; non-wood forest products; non-wood goods and services; non-timber forest products; secondary forest products; minor forest products; and other forest products.

In countries with dedicated resources for NWFP initiatives, the resources are typically allocated to a few species that are traded in significant quantities with the highest potential in national and international markets – e.g. cork in Portugal, resin in Spain, nuts in Spain and Turkey, berries in Finland, and mushrooms and truffles in Italy and Spain.

Although most Member States include reference to NWFPs in their national forest policies, the Scottish Government is the exception rather than the rule in having a dedicated policy on NWFPs.<sup>24</sup> Policies addressing specific NWFPs are more common. The existence of policies or provisions on specific NWFPs reflects the ecological feature of the forest ecosystems, traditions, practices and the history of use of specific NWFPs in the area (e.g. mushroom regulations in Italy, cork regulations in Spain and Portugal), as well as the value of NWFPs in national and international markets (e.g. truffle regulations in Italy, Spain and Turkey). High-value products aside, most NWFPs used for subsistence or traded locally are regulated by customary law and informal rules.

However, national support for NWFP use transcends the realm of NWFP sectoral policies. As NWFPs encompass different dimensions of local livelihoods, their importance needs to be recognized also in other policy fields such as food, health, recreation, industry, etc. (Box 8). Supporting existing policies with consistent implementation measures and removal of policy barriers that hinder NWFP use by communities or enterprises is equally important. For example, tax structures can be used to provide incentives to the NWFP sector (e.g. tax exemptions for mushroom and berry harvesters in Finland, or truffle harvesters in Italy).

#### **Box 8. Strategic design of policies for berries and mushrooms in Finland.**

The most iconic case of coherent policies addressing NWFPs is probably represented by Finland. Under the concept of “everyman’s rights” everyone can pick and collect NWFPs in forests, as long as what is picked is not a protected species and the habitat is left undamaged. Recognizing the traditional and economic importance of some NWFPs, such as berries and mushrooms, the Finnish Government has for a long time supported scientific studies to assess their biological productivity. It also has encouraged harvesting and fostered supply chain development by financing the preparation of models for forecasting production of these species. Moreover, economic incentives are also in place: harvesters are tax-exempted and berries and mushrooms can be sold tax-free on a marketplace and to restaurants or wholesale buyers. There are also associations and thematic groups, sponsored by the Finnish Government, directly focusing on berries and mushrooms (and broadly on NWFPs), which provide support for business development.

<sup>24</sup> Forestry Commission Scotland. 2009. The Scottish Government’s Policy on Non-Timber Forest Products. <http://scotland.forestry.gov.uk/images/corporate/pdf/NTFPpolicypublic.pdf>

#### 4.2.2 Stakeholder involvement in the policy-making processes

In some cases, one of the factors that can explain insufficient attention by policy-makers to NWFPs is the lack of advocacy organizations or stakeholders willing and able to participate in the policy-making process. The situation is different for different NWFPs. Some NWFPs (e.g. cork or truffles) are well represented by numerous advocacy organizations, both at national and European levels, that represent the interests of producers and processors and bring visibility to these products. For other NWFPs (e.g. berries, moss) the advocacy groups, if any, are only starting to emerge (e.g. Arctic Flavours in Finland, The Association of Foragers in UK, Scottish Wild Harvests Association). Frequently, NWFP pickers and producers cannot (or choose not to) participate in organized political action, due to the lack of the organizational capacity to do so, or the lack of institutional vehicles through which their opinions and views can be shared, consolidated and expressed. However, involving a wide range of affected stakeholders in policy-making processes is key for developing more informed, effective and widely accepted policies that reflect real needs and priorities, and are tailored to local circumstances (Box 9). This is particularly important for products with significant market value and importance for local livelihoods as well as to safeguard personal use rights.

##### Box 9. The policy-making process for regulating mushroom picking in Catalonia (Spain).

Mushroom picking in Catalonia is a popular activity and nearly 23% of the Catalan population pick mushrooms at least once a year. Most of picking happens in private forest lands. Legally the mushrooms belong to landowners, who have traditionally kept forest property open to the public. However, due to the increasing pressure on the resource, forest owners are concerned about the damage that harvesting poses to their properties. Therefore, landowners are requesting a regulation that would address the pressure on the resource and practices of mushroom pickers. Still, forest owners' diverse conceptions of picking rights result in heterogeneity of their policy preferences.

From dispersed voices, landowners are progressively forming a clearer position on the need for an umbrella regulation in the region – a position, which has been backed by scientific research on mushroom productivity, forest management, and institutional aspects. However, after a series of legal drafts, the administration has yet to approve a specific regulation which satisfies all stakeholders. Similar problems were faced in other Spanish regions, which have approved specific NWFP rules in recent years (i.e. Galicia and Aragón in 2014, La Rioja in 2015).

Pilot cases of picking permits have opened the possibility to test their acceptability in public and private lands, with positive, but so far, limited results. A grassroots initiative has followed in a Pyrenean county, while opposition of some local stakeholders blocked the extension of pilots proposed for other areas. Further surveys and interviews with stakeholders are providing insights into the economic effects of the introduction of permits in recreational picking and associated mycotourism, as well as on the preferences of forest owners and general acceptance of a new norm. The policy making process in Catalonia is evolving slowly but steadily, backed up by solid ecological and socio-economic research.

## Management for and commercial exploitation of NWFPs by landowners

The issues related to production of NWFP are typically addressed in legal acts at national and sub-national levels, and the detail of these regulations depends on the overall national policy towards NWFPs.

### 4.3.1 Legal constraints on management goals

The ability of forest owners to determine the management goals of forests in their property is crucial for encouraging the production of NWFPs and promoting product domestication and innovation. Research conducted by the StarTree project demonstrates that in general forest owners are legally allowed to transform a forest stand to favour NWFP production for commercial use, with the prior approval of the appropriate authorities, based on a management plan, or on a felling license (Table 11). Only in three countries out of twelve, are there clear constraints placed on a shift from timber production to NWFP production. In the remaining nine countries, prioritizing NWFP production over timber production is possible as long as the land is not deforested, or the stand clear-felled, or the site otherwise 'devastated'. The authorities generally reserve the right to permit felling to prevent this happening, and some also require any activities to be included in management plans (e.g. Slovenia). In practice, however, very few owners actually prioritize the production of NWFPs over timber (examples of the few exceptions include cork or chestnut producers), which suggests that NWFP production is still considered of secondary importance for most forest owners. The ability (or inability) of forest owners to benefit from the value of the NWFPs produced on their land plays a role in the decision about whether or not to change the forest management to increase NWFP production.

### 4.3.2 Forest owner's use of NWFPs from their land

In general, forest owners are entitled to use NWFPs on their property both for self-consumption and for commercial exploitation. However, commercial use is sometimes subject to additional procedures. For example, commercial exploitation of a certain species may require a plan for resource management or extraction. The regulations vary across European countries. For example, management plans that incorporate commercial exploitation of NWFPs are required for the exploitation of: cork in Portugal; pine nuts in Spain, Turkey and Portugal; and mushrooms in Turkey, Serbia and some Spanish regions. A conventional timber-oriented management plan without specific mention of

**Table 11.** The legal possibility to transform the forest resource to enhance NWFP production.

Country	Stand transformation for commercial production of NWFPs	Maximizing NWFP production at the expense of timber production
Portugal	Not allowed in cork stands, possible in other stands for pine nuts and mushrooms	Yes, for cork and pine nuts
Turkey	In general no. Some forest restoration, e.g. for bees	No
Spain*	Specific forest management plan or management plan approved by authorities	Yes
UK*	Constraints may be imposed by any nature protection designations. Deforestation is not permitted.	Yes
Latvia	In certain conditions, e.g. game farming	Yes
Finland	In certain conditions. Semi-cultivated berries might be. Birch sap- cultivation	Yes, in principle, probably not in practice. Metsäkeskus (Finnish Forest Centre) must be notified if a special cutting type is intended.
Slovenia	Yes, but included in the forest management plan	Yes, but included in the forest management plan
Austria	In certain conditions (not clear-cut, not devastating)	Not allowed if considered as clearing or devastation.
Romania	No	No, except hunting
Serbia	No	Yes
Italy*	Yes (only from coppice to high forest)	Yes
Germany	In certain conditions, needs approval if land use change, clear cut, or reduced growing stock under 25% of the total	In certain conditions in the frame of legal boundaries, but hardly common

Note: \*Regional differences may exist.

NWFPs suffices for the commercial exploitation of most NWFPs in Slovenia and some regions of Italy. In Romania, where the NWFP production system is highly regulated, the commercial use of NWFPs by a forest owner requires a scientific study that assesses the level of the resource and the limits to its sustainable harvesting.

Other restrictions imposed on forest landowners by the authorities include harvesting permits and authorization for commercial harvesting of NWFPs from their own forests including the imposition of harvest quotas. Again, there are some major differences between countries. Some countries seem to be rather restrictive with regard to the commercial use of all resources (e.g. in Turkey harvesting permits are required for the commercial collection of all NWFPs regardless of the forest ownership form); in other countries, restrictions concern certain products only (e.g. game in Finland); while in other countries, most NWFPs can be commercially exploited by the forest owner without any limitation (e.g. UK). The degree of regulation of commercial use by forest owners seem to be aligned with the general regulation of NWFP harvesting in the country, and is frequently driven by concerns over overharvesting or damage to populations or habitats – whether the concerns are about actual, perceived, or potential damage.

## Access to forests and NWFP harvesting rights

### 4.4.1 Public access to forests

Public access to forests in Europe is typically regulated by national or regional level legislation, with a few exceptions where such regulations are delegated to lower administrative levels (e.g. Italy, Spain). Most countries guarantee free access to forests by the general public, but access is usually subject to specified conditions (e.g. limited to day time), restrictions (e.g. allowed only on foot, only on paths, or not during forestry operations) and prohibitions (e.g. no access with vehicles). The general rule is that people must avoid harm to the forest owner, and damage to the property and environment. In some countries, access to private forests can be restricted either by the landowners (e.g. Portugal, Spain, Latvia), or by law (e.g. Romania). However, restrictions of public access to private forests are rarely effective, because forest owners are frequently unable to enforce access control. Such restrictions are mainly operational in countries or regions, where forest is fenced and gated to restrict access by livestock (such as in Wales), and so the necessary infrastructure is already in place, and access restrictions are generally accepted as the norm.

### 4.4.2 Mapping harvesting regulations in Europe

In Europe, laws and provisions concerning NWFP harvesting rights differ substantially from country to country and are linked to the historic use of a specific NWFP in the area (Figure 10).

According to these differences, several groups of countries can be distinguished:

- countries where harvesting of most common NWFPs is generally *allowed both for private and commercial collection* (e.g. Finland);
- countries where the public has general rights to gather NWFPs, but *landowners may either restrict or prohibit* the use of certain products (e.g. Serbia, Romania) or may charge fees for their collection (e.g. Italy, Spain);
- countries where *restrictions are only imposed on commercial production and collection* (e.g. Scotland), or when collection by the public can be forbidden if the forest owner holds a permit for commercial harvesting of NWFPs (e.g. Slovenia).

### 4.4.3 Harvesting of NWFPs for personal and commercial use

Personal consumption of most NWFPs is generally permitted in the majority of European countries, although in some countries forest owners or commercial harvesting right holders have the legal right to forbid (e.g. Austria, Romania, UK, Spain) or restrict collection of species for which they hold a permit (e.g. Italy – Box 10). In some other countries,

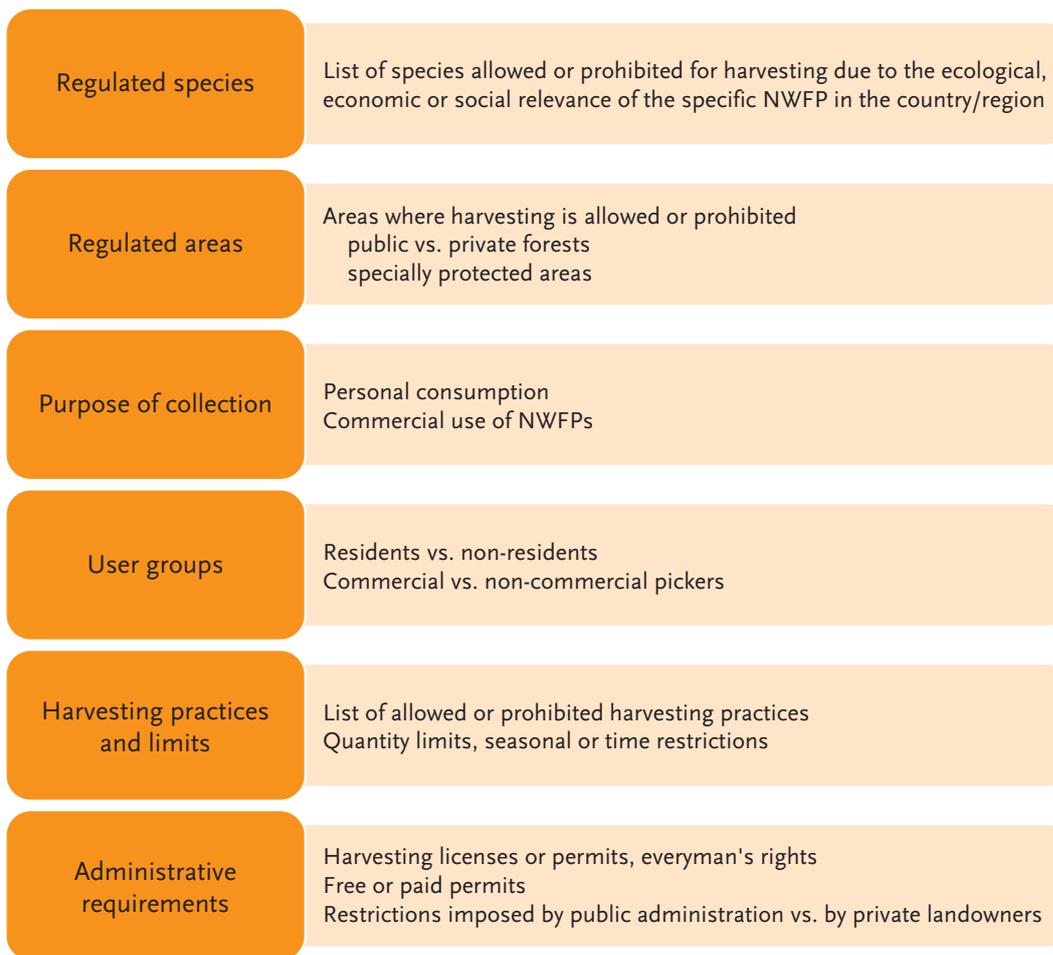


Figure 10. Different components of harvesting regulations in Europe.

personal use is limited to “levels commensurate with household consumption” (e.g. Turkey), while in other countries these levels are clearly defined (e.g. in Austria and Slovenia personal consumption of mushrooms is limited to 2 kg per person per day).

The key issue associated with harvesting regulations is their implementation – in order for these regulations to be effective, implementation needs to be controlled either by public administration (e.g. forest guards, forest police) or by private bodies to make sure that harvesters comply with the rules. The local socio-economic and cultural context in which harvesting occurs also has an impact on how well formal harvesting rules and norms are followed.

In practice, however, forest owners are seldom able to prevent the public from harvesting NWFPs for personal consumption on their land, even when they legally have the right to do so; game being the notable exception. Moreover, customary rights and traditions can sometimes overrule even very clearly defined property rights over NWFPs. This is the case, for example, in Scotland, where NWFPs legally belong to forest owners, but are largely considered common goods for commercial use by pickers. Such discrepancies between formal and informal rights may create tensions between landowners and foragers, especially in areas where pressure on the resource is high and may lead to the propagation of illegal harvesting activities.

### Box 10. Mushroom picking permits in the Autonomous Province of Trento (Italy).

In the 1970s in Italy, high harvesting pressure on mushroom resources in some regions and autonomous provinces led to the introduction of restrictions on mushroom collection. In 1993, the national framework law on the collection and marketing of fresh and preserved wild mushrooms was introduced (L. n. 352/1993)<sup>25</sup>. This law gave all regions and autonomous provinces the right to establish harvesting limits in accordance with the traditions, customs and local needs, as well as the areas of wild mushroom collection and collection periods. The sale of wild mushrooms requires the authorization of the municipality. The majority of Italian regions adopted the use of picking permits for mushroom collection, with specifications that differ between regions. Other national laws<sup>26</sup> define which species can be traded, regulate the trade of mushrooms, and establish the qualitative standards under which mushrooms have to be traded (e.g. only after a mycological inspection).

In the Autonomous Province of Trento, in northern Italy, a regular harvesting permit allows collection of up to 2 kg of mushrooms per day. The permit is free for residents in the province, while all other pickers need to pay a fee. Every municipality has the authority to issue permits on its own territory, set the fee and receive proceeds from the sale of the permits. A special permit that allows pickers to exceed the 2 kg daily maximum can be granted to persons whose livelihood depends on selling collected mushrooms. Commercial mushroom sellers need to have two additional certificates which accredit commercial production.

Research shows that there is a multitude of local informal institutional arrangements governing different aspects of NWFP harvesting. These informal arrangements frequently have a greater impact on the value chain than the formal rules. For example, many rules for NWFP extraction and exclusion are not contained within the law, and customary rights and local practices may allow certain NWFPs (e.g. mushrooms, berries, forest fruits) to be collected by local people, regardless of the directives contained within the formal rules.

Formal and informal norms often coexist, especially in cases where the implementation of formal norms on the ground is not effective; in some cases, the informal norms complement the formal rules, and in some cases they contradict each other. Informal norms typically precede formal regulations, which sometimes incorporate elements of pre-existing informal rules (e.g. hunting regulations in Germany). Given that local customs and traditions governing access and use of NWFPs tend to evolve more slowly than the formal regulations and laws, the local customs and traditions need to be identified and recognized in order to avoid the disengagement of local communities and to ensure consistent and harmonious policy outcomes.

The exclusion of commercial users is less affected by informal norms compared to the case of harvesting for personal consumption, even though such cases still exist. Commercial harvesting typically requires an acquisition of a specific collection permit

<sup>25</sup> Legge 23 agosto 1993, n. 352 (*Norme quadro in materia di raccolta e commercializzazione dei funghi epigei freschi e conservati*)

<sup>26</sup> Such as the law on the gathering and commercialization of fresh and preserved mushrooms (D.P.R. 14 luglio 1995, n. 376 [*Regolamento concernente la disciplina della raccolta e della commercializzazione dei funghi epigei freschi e conservati*]). The law regulates the mycological inspectorate (criteria for the issuance of mycological certificates, etc.). The sale of fresh mushrooms is subject to authorization by the municipality, and only those sellers recognized as adequate in identifying mushroom species can sell the product. Moreover, in order to sell mushrooms a sanitary authorization is needed. Another law states that the dried mushrooms on sale must be labelled according to the characteristics of the product (extra; special; commercial; crumbs; powdered) (D.M. 9 ottobre 1998 [*Menzioni qualificative che accompagnano la denominazione di vendita dei funghi secchi*]).

usually requiring payment of a fee (e.g. Turkey, Italy), specific training (e.g. Serbia), or being registered as an enterprise (e.g. Latvia). Only in a few countries (e.g. Finland) do everyman's rights extend also to the commercial use of most NWFPs – e.g. mushrooms and berries, and cones and fruits lying on the ground. The leasing of forest land for the purposes of exclusive access to NWFPs is also allowed in most European countries, but in practice this seldom happens.

The establishment of contractual arrangements and their enforcement for products that are attached to a tree (e.g. cork, birch sap, nuts, pine cones, etc.) is somewhat easier than for those attached to the land (e.g. mushroom, berries, herbs), partially due to their dispersion, as well as the lack of information about the main NWFP characteristics (e.g. abundance, quality). Even under 'everyman's rights', harvesting of products from a tree is not allowed without the consent of the owner, independently of the purpose. For example, in Portugal and Spain cork can only be collected by an authorized harvester.

#### 4.4.4 Development of harvesting regulations

Policies and regulations addressing harvesting of NWFPs are the cornerstone for successful enterprise development based on NWFP exploitation, and are key for improving the livelihood of rural communities whose well-being depends on NWFP resources (e.g. Latvia, Serbia, Italy). Ideally, policies take into account different uses of NWFPs and rely on a coherent and proactive approach to NWFP harvesting, management, trade and use so as to foster the sector and contribute to rural development. Deliberate design of harvesting regulations requires the consideration of the problem or issue the regulation is intended to address. Is the intention of regulation to protect the resource from over-harvesting, limit the pressure on areas where massive harvesting takes place, obtain income for public administration or private forest owners, or acknowledge private property rights? Ideally, the type of regulation applied in each case is tailored to the problem at hand, and considers implications for household consumption as well as recreational and commercial activities.

However, NWFP harvesting measures are frequently adopted in the absence of a strategic policy with a long-term vision, but are rather developed in a reactive or opportunistic way. Regulations are frequently set in response to a real or perceived risk of overexploitation of a particular species. For example, research shows that a rapid increase in the marketability of a particular NWFP often triggers a shift in the property regime under which that NWFP is managed – either towards privatization, or towards domestication. Likewise, when governments perceive that the harvesting dynamic of a species is changing in intensity, extent, or frequency, they typically react by setting up laws and provisions with the primary aim of conserving ecological sustainability in line with the precautionary principle articulated in the Convention on Biological Diversity. Emblematic examples are the *maximum harvesting limits* or *quotas* set for many NWFPs in several European countries and *restrictions of harvesting season*.

Harvesting regulations may also be devised to provide a source of income either to forest owners/managers or to public administrations (e.g. harvesting licenses, concessions). When properly designed, such mechanisms can generate considerable income, which may subsequently be reinvested in improving NWFP production (e.g. by implementing specific silvicultural measures), or in incentives for building business capacity, so as to contribute to rural development.

Harvesting regulations are independently devised by the countries. However, evidence suggests that differences in harvesting regulations among countries may have considerable effects on NWFP markets: if collection of a certain NWFP in a country is restricted, a displacement of the supply chain may occur as economic actors will seek supply from another country with less stringent regulations. Products that cross national borders may require common policies, especially for strategically important resources. So far, however, the complexity and diversity of legal and institutional mechanisms across countries, and the multiple jurisdictions and cross-cutting nature of conservation, trade, intellectual property and benefit sharing, have prevented the development of common policies.

### Key messages

- NWFPs are a central element of sustainable development and sustainable forest management, and their promotion is highlighted in international and EU processes and agreements. However, the lack of political and economic organization of NWFP actors is a key challenge to generating long-term and large-scale support for collection and production of NWFPs.
- The fragmented policy framework, along with a plethora of sectoral and non-sectoral regulations, both at the EU level and at the national level, pose major challenges for the development of NWFP-related activities. Overlapping regulations, insufficient advocacy, and confusing responsibilities undermine the production, harvesting and marketing of NWFPs.
- The ability of forest owners to determine the management goals of forests in their property and their knowledge about NWFP-enhancing management is crucial for encouraging production of NWFPs and promoting product domestication and innovation.
- The possibility of exclusive commercial use and its transfer is a precondition for NWFP-related entrepreneurship. However, research findings indicate that the distinction between the commercial and personal use of NWFPs does not always operate or is not properly enforced in practice.
- The separation of the forest ownership attributes (e.g. ownership on land and ownership on NWFPs) through contractual arrangements could facilitate the development of economic activities. However, the selling and leasing of the right to collect are, with a few exceptions, seldom practiced in private forests.
- Evidence suggests that differences in harvesting regulations among countries may have considerable effects on NWFP markets: if collection of a certain NWFP in a country is restricted, a displacement of the supply chain may occur as economic actors will seek supply from another country with less stringent regulations. Products that cross national borders may require common policies, especially for strategically important resources.

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# Rendering NWFPs innovative

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## 5.1 The role of innovation – trends and needs

### 5.1.1 Why is innovation in the NWFP sector important?

Innovation is one of the five objectives of the EU's Horizon 2020 strategy for a “smart, sustainable and inclusive growth”. Innovation is inevitable in adapting to changing environments – and our ecological, social and economic environments are constantly changing: climate change, information society and globalization are some of the buzzwords. Innovation is necessary if we want to achieve the ambitious goals of making the EU an economic world leader.

Earlier chapters argue and illustrate that NWFPs have much greater economic potential than is currently utilized. NWFPs are often regarded as ‘non-market’ goods and services, and it is assumed they cannot be marketed, or are only for subsistence uses. Forest policies generally do not include NWFPs as a business field. When policy documents do refer to NWFPs, it is usually in the context of praising the multiple benefits of the forest, multi-functional forest management, or the valuation of forest ecosystem services, and quite rarely about the management and production of NWFPs. When assessing the ‘full value’ of the forest, NWFPs are often viewed as part of welfare economics and less often as part of real market values. With regard to their role in improving or maintaining quality of life or well-being, the delivery of these goods and services is rarely seen as a business opportunity (see Chapter 3).

These views are partly justified because NWFPs often have the characteristics of public goods (see Chapter 4). Furthermore, a reliable supply of, for instance, mushrooms or berries is difficult to provide from small fragments of forest land, but rather needs coordinated production from a larger area with stands in different stages of growth. Since the right of the public to use those products is often seen as a traditional use right by local populations, it is difficult for the landowners to focus forest management and innovation.



**Figure 11.** Making business with mushrooms may work in different legal frameworks, e.g. with private property rights (Italy) or every persons' rights (Finland) (photo: Merca Setas Soria).

As a consequence, some of the NWFPs are in fact difficult to market although – as this book is arguing – there is much untapped potential.

A more focused management of NWFPs may in many situations increase their provision – be it through a directed forest management system, or improved harvesting, processing or marketing. In view of the increased importance given to the bioeconomy in contributing to “smart, sustainable and inclusive growth” in the EU, NWFPs could make an important contribution. A harvest of the unused treasures would require innovations along the whole production chains and also in policy.

Innovation is necessary in any sector to keep up with societal and economic changes, but in the field of NWFPs this is even more so as there is currently a profound lack of attention by innovation system actors. Innovative products or processes in the NWFP field would support rural economies, provide jobs and income and bring valuable and competitive products on the market.

### 5.1.2 How should innovation be understood?

Very different kinds of measures are needed in order to mobilize the unused potentials, ranging from research, technological development and advisory measures to new institutional frameworks.

There are two aspects to ‘innovation’ that are important in our context: (i) the innovative outcome; and (ii) the process of innovating. Therefore, we should ask two questions: (i) What are the goals for innovations in NWFPs? and (ii) How do we get there? The latter question is of specific importance in any attempt to foster innovations – be it in a business or in a policy context.

There is a new understanding of innovation in both research and policy spheres, according to which innovation is considered as not just ‘research and technological development (RTD)’, but the whole process of putting new knowledge and new ideas into practice. To address this, policies now talk about research, development and innovation (RDI). Furthermore, innovation is not just technology or new products, it is found everywhere, i.e. in business, policy and social life, and in all stages of production and business, including in products, processes, organization and marketing (innovation types according to OECD classification). In addition, policy, institutional and social innovations are often necessary in order to make business innovations possible, or, they provide the stimulus for new business opportunities.

### Box 11. Institutional innovation – the example of Nature Park Specialities (Austria).

“Nature Park Specialities” is a cross-regional marketing label used by small producers of jams, liqueurs, etc. from nature parks all across Austria. It was developed under the framework of the Austrian Nature Park Association. NWFPs often need institutional innovations such as the creation of a new label or organization and often also depend on institutional support such as through interest groups, regional development agencies or policies. In this case, the range of products was enlarged into forest products through the support of the Austrian Nature Park Association, a regional development consultant and the European research project StarTree through a bottom-up process.



A range of Nature Park Specialities – NWFPs through institutional innovation (photo: Marelli Asamer-Handler).

Innovations are not only to be understood as the absolute new (disruptive or radical innovations), but also the further process of adapting innovations to new situations and applications (adaptation, adoption of innovations), take-up of ideas from other countries, sectors or companies (diffusion of innovations), and any small improvements of existing products or processes (incremental innovations). Taken together, these forms or phases of innovation would help to unlock the full innovation potential of NWFPs.

### 5.1.3 What are the innovation trends for NWFPs?

Current innovation trends for NWFPs cover all types of innovation:

- **Product innovations:** NWFPs are often traditional but they can be profoundly improved or new uses found for them. Cork is an example of a traditional material for which – through regular RTD investments – new uses are constantly developed by the industry, for instance, clothing. A huge silent potential for medicinal or pharmaceutical products may be hidden in the wood, bark, fruits, leaves or in the broad range of forest plants. Pilot studies on Swiss stone pine (*Pinus cembra*), black cherry (*Prunus serotina*) or mushrooms prove this, but also show that RTD investments would be needed to transform this potential into reality.
- **Process innovations:** Process-related improvements include those related to forest management, product harvesting and the processing of products. The specific management of forests for NWFP may range from small interventions (such as increasing the amount of light reaching the forest floor through thinning to enhance production of mushrooms or berries) to the selection of specific tree species (such as cherries, nuts or other fruit trees), agroforestry systems (such as the Portuguese montado system with cork production and grazing), or even the planting of wild or grafted fruit trees or shrubs such as chestnuts (*Castanea sativa*), hazelnuts (*Corylus avellana*), elder (*Sambucus nigra*), sea buckthorn (*Hippophae rhamnoides*). Innovations in harvesting or processing may reduce the costs or improve the product quality – for instance, the natural ingredients or the shelf-life of the products.
- **Organizational innovations:** Many examples exist for horizontal or vertical cooperations which can make NWFP businesses more profitable. Horizontal cooperation of small producers under a common brand allows for joint marketing (e.g. to enable year-round supply and sales through supermarket chains or in the shops of the producers. Vertical integration or cooperation may secure a higher value added for the primary producer (farmers' direct marketing of processed products) or may allow for a traceability of the product chain (e.g. high quality game meat or other products from natural production).
- **Marketing innovations:** Marketing of NWFPs may be improved in numerous ways – new packaging, design, advertising, or labelling. New marketing may address new customer groups through different design or new advertising or distribution channels. Internet platforms and social media networks are examples of how even small producers may reach distant clients. Regional or quality certification schemes (e.g. local, natural, organic or 'from the wild') testify to the qualities of specific products.
- **Policy innovations:** Innovations may require new or adapted regulatory frameworks, either in the field of the products (e.g. official recognition as a forest or agricultural product; license systems for collection) or in innovation support (e.g. the European Union LEADER instrument).
- **Institutional innovations:** New institutions may be new certification schemes, regional marketing approaches or new lobbying organizations for NWFPs. Institutional level organizations provide important services for the sector through awareness raising activities for the economic importance of the products or through lobbying for their recognition as agricultural or forestry crops, for research funds, education and training programmes, or other political-institutional support. There are examples of successful activities from the past for cork in Spain and Portugal, or for chestnuts in Italy and Austria.



**Figure 12.** Chestnuts as a social innovation – formerly a poor man’s food transformed into a stylish trendy food (photo: Ivana Živojinovic).

- **Social innovations:** Social innovations are those that originate from civil society rather than companies, and/or have a specific impact on society. They are often not as visible because it might not be possible to trace innovations that correspond to modern societal trends to the origin, or entrepreneurs may simply pick up new lifestyle trends such as the love for nature, the wild or tradition. Examples include foraging and bushcraft activities, survival training or the rediscovery of old skills and traditions. A social innovation is certainly also the redefinition of traditional wild food products – such as chestnuts, mushrooms, forest herbs and juices – from being seen as a poor people’s food to a healthy and stylish gourmet food served in the finest restaurants.

#### 5.1.4 NWFPs to contribute to important social megatrends

Opportunities for NWFPs today differ profoundly from earlier times. While in the past, NWFPs were connected to the basic needs of rural populations (chestnuts as staple food, grazing of livestock, herbs, pitch and resin for medical uses, etc.), they are today rather modern lifestyle or luxury goods (see also Chapter 2.4). Societal megatrends with a specific importance for NWFP include the following:

- **Lifestyle of health and sustainability (LOHAS):** LOHAS has been described as a growing market segment in wealthier societies, focused on health and fitness, the environment, personal development, sustainable living, and social justice, and including diverse sectors that are highly relevant for wood and non-wood products – such as green building, alternative energy, eco-tourism, and natural, healthy personal care and food products. Important concepts closely connected to this trend include: green marketing, back-to-nature trends, natural, environmentally friendly, eco-, organic, wild, fair trade, and local or regional products.



**Figure 13.** Birch sap sparkling wine (photo: Birzi- Dzirkstoša Bērzu Sula)

Forest products are increasingly used for making natural soap, healthy foods, green products, but often only by small-scale businesses. Behind those small initiatives, there is a huge potential.

- **Back-to-nature and old traditions:** Lifestyle trends sometimes go against the major trends of societal transformation. As a reaction to the industrial society and urban lifestyles there is a growing desire for the unspoiled nature assumed to be preserved in rural areas and assumed to be found in natural or wild products. Similarly, there is a growing appreciation of the 'good old' cultural traditions. Back-to-nature or retro products may have raw, non-refined or retro style designs as a contrast to industrial mass production; they may be from home-made production or may be hand-made, self-made or one-of-a-kind artisanal products as opposed to the non-personal, modern production methods; and they may be from local or regional sources, an antithesis to our globalized economy. Slow-food, organic products or local specialties are good examples of this trend, for which there is a price premium (e.g. for specialty liqueurs, chocolates, jams, honey). Non-food examples are the 'good old' long-lasting quality products from small producers that incorporate the use of traditional methods, traditional materials and aim at a high-quality, unique, handmade or one-of-a-kind item available through a small production line (clothing, soap, shampoo, ointment, wooden-handled knives, artistry, etc.).
- **Experience economy:** There is a trend in all business fields for a growing importance of providing experiences for the customers, not just the product. The ex-



Figure 14. Soap with wild ingredients (photo: Ivana Živojinovic).

perience economy is described as the next development stage after the agrarian economy, the industrial economy, and the recent service economy. Businesses must more and more create memorable events for their customers, and that increasingly this memory itself becomes the product – the ‘experience’. The experiential aspects of any consumption are assigned to the customers’ fantasies, feelings, and fun. According to this far-reaching concept, it is then not simply the offer of experiential services from the forest but any forest product: conventionally, forest experiential services are guided tours, eco-tourism, cultural or sports events, or survival training courses (the 4Es of experiential services – educational, (a)esthetic, entertainment and escapist, Pine and Gilmore 1999). Under the broader concept, all products that convey strong emotional ideas are included – such as nature and environment, old cultures and traditions, the wild and original, peace and harmony, or other emotions connected with the forest or woodlands. NWFPs are now often marketed together with or rather through services. These services are then not only added on so as to make the product more attractive (e.g. by providing a cooking recipe with a food product), but the products are embedded in service offers. The experience of the product is then the core of the offer. These are often experiential services such as foraging or mushroom collection tours, wild fruit cooking courses or a broad range of production workshops (e.g. ‘weave your own basketry’, ‘make your own wild herbal salt’, ‘cut your own Christmas tree’, or any ‘learn to ...’ course).

- **Countryside renewal/resettlement:** In the past, in many European countries there have been strong trends of rural depopulation and land abandonment. Today, there seems to be a counter trend in which the countryside is highly valued as a place to live, in particular in peri-urban areas. New possibilities to work from home, together with broad internet coverage allow more and more people to re-settle rural areas. The new populations – often modern, highly educated, urban

people, sometimes from the creative industries – are a resource to renew rural regions. They are not only new customers for NWFPs (LOHAS or back-to-nature costumers as described above), they are also often the new producers, being new landowners themselves, or perhaps just processors of NWFPs. This migration provides an opportunity to connect old and new values, or rural and urban knowledge and skills. The new populations may provide an injection of new ideas, creating new products or finding new production technologies or marketing channels.



**Figure 15.** Willow weaving. (photos: Ivana Živojinovic).



**Figure 16.** Wild boar bristle brushes by WildGood, LV (photo: WildGood, LV).

## Innovation processes – innovation is learning

Learning is crucial for innovation because innovations always imply the development of new knowledge. Therefore, in innovation processes, two aspects are important: (i) the availability of relevant knowledge; and (ii) the management of learning processes. In both aspects, the innovating companies may be supported by institutional actors such as: research, education and training organizations, advisory services, interest groups, innovation and development agencies, etc. Those actors are all part of what we understand by ‘innovation systems’.

### 5.2.1 Knowledge and information provision

With regard to the first aspect – the availability of knowledge – the role of the entrepreneurs vs. institutional actors may differ with respect to the innovation field. The more innovative the product or technology is and the more it is in the sole interest of the company, the stronger will be the role of the company in the acquisition of relevant knowledge which they will gather from available sources or generate themselves. In contrast, the more a new product or technology is already established, the more institutional actors – such as training institutes or advisory services – may support its further development and/or diffusion in the sector and the country. Further, the more public interest there is in a new product – such as for environmental and social benefits or for rural development – the stronger the role of public institutions should be. Public institutions may therefore engage in the provision of knowledge for groups of companies (which is itself an important driver for organizational innovations). As this support with specific information is usually organized according to sectors, and (as described above) NWFPS often fall between established sectors, there is often a lack of support information.

The way that information is provided for innovating companies differs according to the phase of the respective innovation. In early phases of innovations (development phase), the companies are front-runners and have strong entrepreneurial attributes. In later phases (diffusion phase), it may be more the initiative of institutional actors that promote established innovations and provide relevant information to companies or landowners who might be interested in adopting the innovation. In both phases, the characteristics of the companies, their information requirements and the possibilities to provide support differ:

1. **Development phase:** Front-runner companies typically set out to search for information on their own initiative. As the innovations are new, it is these innovators who drive the idea forward and organize all information and secure other support which is necessary. For such projects, institutional actors do not have ready-made information. So how can companies still be supported? The organizations’ necessary characteristics would include openness and flexibility and set to offer customer-oriented service. Advisory services would have to accompany the innova-

tors in their search for relevant information sources, respective authorities, legal regulations, etc. (see Box 15). For training organizations or programmes it would mean offering process-oriented training such as on entrepreneurship, innovation or project management or founding a business, as well as content-oriented courses.

2. **Diffusion phase:** Companies that pick up innovations that they see somewhere else (adopters) may be not as persistent willing to take risks as those who develop innovations for the first time. For promoting promising innovations, institutional actors build up a knowledge base and expertise in the innovation field in the form of databases, information brochures or packages and trained experts. They may also organize seminars, events or excursions for information exchange among companies. Peer-to-peer learning is one of the most effective tools for diffusion of innovations.

### 5.2.2 Management of learning processes

The other important aspect of the innovation process is the management of learning processes. This is a generic process provided by sectoral actors (such as the agricultural or forestry advisory service) or by regional development and innovation agencies. NWFPs may especially benefit from the non-sectoral or cross-sectoral orientation and experience of the various regional and rural development agencies in different countries. The LEADER programme is of particular relevance because of its bottom-up, cross-sectoral and innovation orientation. In the following text, the specific roles of statistical information, research, information provision and urban-rural interaction for innovations in NWFPs are discussed.

### 5.2.3 The role of research

NWFP innovations are, in the majority of cases, not research driven and are often not technological but other types of innovations – for instance, new organizational solutions or new ways of marketing. Nevertheless, research can still play an important role. There are cases where research institutes or universities have had a central role, such as in the discovery and the development of truffle production on the Swedish island of Gotland. When taking a closer look, it becomes clear that some research activities are often part of NWFP success stories, but in many cases indirectly or not in the form of formal scientific research, but rather as informal and self-organized research by the entrepreneurs themselves. There are three possible roles of research:

1. **Applied RTD activities for NWFP development:** The explicit use of research and development is costly and cannot be easily afforded by small companies. Furthermore, entrepreneurs without academic background generally do not have the capacity to develop research applications. Therefore, not only the availability of public funds for applied research is necessary, but also support services for entrepreneurs to get connected to research institutes and/or to develop research proposals. Examples: (i) the Welsh KESS scheme which is intended to enable SMEs to access university research has been used in forestry and a few NWFP cases; (ii) in the frame of the LEADER region Zirbenland (Austria), a study on the extraction of the pine needle oil was done together with the University of Graz.
2. **Indirect role of scientific knowledge:** The availability of research results may be of importance in many ways. Scientific knowledge is a basis for education and

training, but it should also be easily accessible for entrepreneurs in their own information gathering activities, such as through research institutes, information platforms, training organizations, extension services, or other public or semi-public technical institutes. Interest groups may play an important role in connecting to relevant organizations, but also as information brokers: scientific studies are often crucial in marketing or awareness raising. Examples: (i) vocational schools, such as the Forestry Training Centre Pichl in Austria, are more flexible than formal education programmes and frequently take up new interest in NWFP; (ii) scientific studies are used by interest groups such as the Arctic Flavour Association from Finland in the marketing of wild berries.

3. **Informal research activities:** When developing new products, entrepreneurs often conduct their own experiments, commission private research providers or find suitable solutions through trial-and-error. Examples: (i) a new method for making birch sap durable without chemical substances was developed by a small Finnish company; (ii) how to make “wine” from oak leaves was developed by a small Scottish company.

Examples of where research is particularly relevant include:

- To analyze active substances in trees or other forest plants for medicinal, pharmaceutical or cosmetic uses. Examples: (i) active ingredients of Edelweiss (*Leontopodium nivale*), used in many cosmetic products, e.g. anti-aging products by the Austrian start-up company siin-life (Swiss and Austrian research); (ii) several products with active ingredients of conifer needles researched by a state research institute (Latvia); (iii) amygdalin from black cherry (*Prunus serotina*) (Hamburg, Germany); (iv) cultivation of medicinal bog-myrtle (*Myrica gale*) was researched in Scotland.
- Breeding of suitable plant varieties for cultivation. Examples: (i) varieties and cultivation techniques are developed for pine nut (*Pinus pinea*) plantations (Portugal); (ii) local chestnut (*Castanea sativa*) varieties developed by a Styrian nursery (Austria); (iii) ongoing research on the domestication of forest mushrooms by a private company (Italy); (iv) oak (*Quercus* spp.) seedlings for establishing truffle plantations for potential truffle growers (Spain); (v) method for propagating the medicinal pakuri or chaga mushroom (*Inonotus obliquus*) in standing birch (*Betula* spp.) trees (Finland) (see also case study 2 in Chapter 6.2).
- To develop processing methods for durable or marketable products. Examples: improved shelf-life of birch sap (Finland); (ii) heat treatment for wooden climbing holds for climbing walls made from tree burrs in Slovenia.
- To study health effects of food, cosmetic or pharmaceutical applications. Examples: (i) the health effects of using scented Swiss stone pine (*Pinus cembra*) in interior furnishings was studied in Austria and caused a boom in the use of such pine products; (ii) berries are marketed with reference to their health benefits by the Finnish Arctic Flavours association.
- To study pests and plant diseases and to develop pest control methods or agents. Examples: (i) a remedy for chestnut bark canker was developed by public means in Austria; (ii) a natural antagonist was developed in a research project focusing on the chestnut gall wasp in Italy.
- To study consumer trends and public opinion. Examples: (i) the consumption and picking behaviour of private households across Europe were studied in the course of the European StarTree research project.

## The innovation system – innovation needs support

From the viewpoint of the innovation system approach, a crucial condition for an innovative sector is a strong institutional framework such as supportive policies and public and private actors. However, a major challenge for innovations in NWFPs is the fragmented institutional and business structure, which means the system to support innovation is also fragmented. NWFPs do not belong to a uniform sector, nor is there a bundled institutional system; this situation results in a lack of support measures. The lack of institutional attention towards NWFPs is illustrated by the limited statistical data that are currently available (Box 12). Basic data is a crucial part of the knowledge and innovation system. Lack of data collection efforts results from a lack of political interest and the lack of data reinforces this unfavourable situation through reduced visibility of the sector.

### Box 12. Limited statistics illustrate the lack of political attention and hinder innovation support

Official statistics that are relevant for NWFPs such as FAO's Forest Resource Assessment (FRA) or the State of Europe's Forests (by FAO/UNECE and FOREST EUROPE) mostly include "marketed" NWFPs because they rely on national market statistics. Furthermore, data about NWFPs are often included in larger categories and are not given separately. Statistical data on honey, berries, herbs, nuts, etc. are given in total sums, not distinguishing whether the products come from agricultural or from forest land, or in other words, from cultivation or from the wild. As a consequence, the value of NWFPs is significantly underestimated.

In a study the total value of NWFPs and forest services in Austria was estimated at approximately €220 million<sup>27</sup>, which was almost the double the amount reported in national statistics. For the year 2005, NWFPs accounted for about 43% (almost €95 million) with the remaining 57% contributed by forest services. Among the tree products, Christmas tree production (16.8%) was the most significant. Forest honey, game and forest reproductive material have a high relevance as well. In the category 'services', the revenues from hunting licenses accounted for the largest share of the total value (21.8%), followed by tourism (10.8%).

The actual difficulties for a systematic inclusion of NWFPs in official statistics also include the fact that most NWFPs are site specific and may be of only local importance (FOREST EUROPE, 2015). According to FOREST EUROPE, those marketed NWFPs with the highest values are: Christmas trees, fruits/berries/nuts, and cork. The value of reported NWFPs has tripled since the 2007 FOREST EUROPE report. The increase is not due to increased marketing, but rather reflects a growing political importance and increased assessment of NWFP activities.

In summary, the incomplete statistical data mirrors a lack of political interest in NWFPs in recent history of forest management. It is a drawback for innovations in the sector since the lack of accurate statistical accounts decrease its visibility for decision makers and relevant agencies.

<sup>27</sup> Wolfslehner B. and Vacik H. 2009. Potenzialabschätzung von Nichtholzprodukten und forstlichen Dienstleistungen in Österreich. [http://www.netzwerk-land.at/lum/veranstaltungen/download-2010/endbericht\\_nichtholzprodukte\\_forst](http://www.netzwerk-land.at/lum/veranstaltungen/download-2010/endbericht_nichtholzprodukte_forst)

Innovation systems are, in short, defined as the innovation relevant policies and actors and their interrelations. Public policies should contribute to frame conditions which are conducive for innovations and offer specific support through research, advice, networking, financial grants, etc. Besides entrepreneurs and innovators, the relevant actors from the public or private spheres include authorities, advisory services, research and education organizations, customers and suppliers, and many more.

### 5.3.1 The role of policies

The policy areas relevant for NWFPs are manifold. They include, on the one hand, various policies aimed at generic innovation support and rural and regional development, and on the other hand, they may also be defined by sector, such as in the fields of forestry, forest industries, food, health and agriculture, etc. (cp. Chapters 4, 6.1) It is not only the multitude of relevant policies areas that is a problem, but also the fact that innovation support for NWFPs is rarely a focus for any of these policy areas. When looking at (national or regional) innovation policies, the forest sector, and specifically NWFPs, are hardly recognized in most countries (one of the few exceptions being Finland with a nationally significant forest sector). National innovation policies are mostly focused on high-tech sectors such as with so-called national High-Tech Platforms, Science-Industry Platforms or nationwide Innovation Projects and clusters.

With regard to the support for innovation within forest policy, innovation is usually mentioned only in general terms, and specific support measures for innovation are not common. Within forestry policies, there is a ‘double blindness’ for innovation in NWFPs in the institutional system as both aspects – NWFPs and innovation – are much neglected. Not only is innovation a secondary goal of forest policies, also NWFPs are often seen only as secondary products of forestry. Some of the better examples when looking at how innovation in NWFPs is promoted include the following forestry policies: Austria promotes measures for “ensuring employment and innovation”; Finland aims at “innovative and eco-effective use of natural resources”; and Italy states the “diversification of goods and services” explicitly as a policy aim.

Specific national policy programmes that explicitly integrate both spheres through policy programmes aiming at innovation in forestry are found in the UK in the forestry strategies of Scotland and Wales, and also in the natural resource strategies of Finland.

When looking at the administrative levels of the policies, we see that specific support comes more from local or regional levels, i.e. from local/regional policies, or when European or national policies provide for flexibility in the local implementation – such as in the case of the European LEADER instrument. This is because many NWFPs have great importance in specific regions within a country, and less importance in other regions. At the national or European levels, policies offer only very restricted frameworks under which NWFPs may be allocated. LEADER is suitable because of its innovation and regional development orientation. It is, therefore, open to any product or activity, and it specifically offers the type of support which is needed when new initiatives should be fostered. LEADER supports regional strategies, participatory processes, capacity building, information services, networking support and seed money for feasibility studies or pilot projects. An important feature is that not only grants that are offered, but also support structures are installed in each LEADER region that may pick up local resources, interests and capacities (see Box 13).

Recent studies have shown that the positive effects of thorough bottom-up initiatives (such as the LEADER instrument) are becoming less significant and less used by entrepreneurs, as access to the funds has become subject to more and more bureaucratic procedures. As a result, they lose attractiveness and effectiveness in marginalized rural areas. In the NWFP sector, even more so than in the forestry sector, entrepreneurship is undertaken by very small forest holdings, or even only by individual farmers, who generally do not have the administrative resources or the skills to apply for funding under the LEADER instrument. It is recommended to reconsider the strategies for fostering innovation in such contexts. This means, for example, enabling funding for small sums, or special grants for risky start-up phases, and lessening the bureaucracy associated with such funding.

**Box 13. The role of the EU LEADER funding instrument for the region “Zirbenland” (Austria).**

The LEADER region “Zirbenland” (Land of the Stone Pine) in Austria is an example where the EU LEADER instrument supported the development of new products from Swiss stone pine (*Pinus cembra*) such as liqueurs, chocolate, furniture, health and tourism. In this example, the instrument’s potential to act as a cross-sectoral innovation tool to support bottom-up initiatives was successfully utilized by the regional management structure, institutional actors and companies by a range of activities: a participatory strategy process, research cooperation, product development, tourism campaign, etc.



“Zirbenkugel” – a chocolate treat filled with pine liqueur (Photo: Konfiserie Kern).

### 5.3.2 The role of actors

In a survey of 53 key actors supporting innovation of wild products from forests in 14 EU regions, slightly more than half of the relevant actors are active in sectors other than the forest sector (Table 13).

When taking a closer look at the innovation processes we see that the innovating firms are the central actors, often operating in a small cross-sectoral network of supporting actors. It seems that, more than in other business fields, NWFP innovations are done by small or micro companies who largely act on their own and without much direct support from institutional level actors. There are several reasons for this on the side of the companies and the institutional system: (i) innovations in the field are often incremental improvements of products or processes that occur without the need for extensive research or big investments, or they are new forms of marketing or business organization that can be done within smaller networks; (ii) in practice, companies pragmatically find their cooperation partners or advisory agencies (furthermore, small companies often do not have the capacity to engage in research co-operations or to apply for large-scale research or development projects); (iii) relevant institutional support is often not specifically directed towards the NWFP field, and therefore it is not easy to find and get access to the support (sometimes, even the direct advice contacts of landowners – such as agricultural or forestry advisory services – do not know about relevant funding sources or other offers of support, if that support does not come from their own sector); and (iv) funding procedures tend to become more and more bureaucratic, even for relatively small sums of money, making applications prohibitive for small companies.

Even though small companies may shy away from bureaucratic procedures and too large co-operations, institutional support could be offered in more easily accessible ways. Even though many innovations do not require extensive research and development or high-tech solutions, a result is that many opportunities for potential investments, expansion of production and more radical innovations are currently missed because procedures are too bureaucratic.

**Table 13.** Innovation actors and sectors.

Type of Actor	Forest sector	Other sectors*
Interest group (20)	9	11
Authority (19)	7	12
Advisory (5)	1	4
RTD (5)	3	2
Education & training (4)	2	2
TOTAL (53)	22	31

\*Other sectors include: food, tourism, chemicals and pharmaceuticals, rural development, regional development, environment, innovation and start-up support. Source: Ludvig et al., 2015.

### 5.3.3 Crossing sectors

Fostering innovation for NWFPs has good potential for more involvement from actors from the forestry sector, such as forest owner associations, forestry departments, firms and industry, research and consultancies. With the exception of activities amongst private and public actors in Finland, there still seems to be an indication that NWFPs and non-wood forest services are not seen as an important business opportunity. Especially the actors at institutional levels (forestry and industry associations as well as forest owners' associations) would have to engage more in the promotion of entrepreneurship, the provision of market information and the support of interactions amongst landowners, with relevant entrepreneurs, and across the different sectors mentioned above.

The new uses of forests for purposes other than timber production in many of the examples given in this publication, have been introduced from outside sectors such as energy, biodiversity conservation, recreation or tourism or as social innovations through non-market actors. There are interesting cases, where artists (e.g. by a film-maker in the promotion of truffles in Catalonia) or haute cuisine chefs (e.g. the renowned Noma restaurant in Copenhagen) have played a crucial role. It seems that urban–rural interactions can be particularly relevant: of 20 innovation cases that were studied in the course of the StarTree project, one third of the relevant ideas and knowledge came from the rural sphere, one third from the urban sphere, and one third from both. In all cases, some urban–rural interaction was an important success factor. Through the interaction between rural and urban actors, social trends (see Chapter 5.1) are transmitted to the rural areas.

## Diversify forestry – future innovation strategies

Possible measures for supporting innovation in NWFPs are manifold. This section describes where there is potential for innovation and where there are gaps in innovation support. The potentials are seen in any interaction between different actors, particularly across sectors, and most of all between urban and rural spheres. The major gaps are seen in the ‘double blindness’ of forestry actors and policies towards innovation, and also towards NWFPs. Three major strategies for fostering innovation in NWFPs are proposed.

### 5.4.1 Foster the urban–rural interaction

Case studies of NWFP innovations indicate that innovative ideas often come from a new combination of traditional and new knowledge, or from a combination of rural and urban values and experiences.

1. **Traditional and new knowledge:** It is often traditional products that are revived through new ways of processing, packaging, or marketing channels. In the case of the Finnish birch sap drinks, a new technology has improved the shelf life and allowed the product to be marketed in other countries. New forms of trading may open up new markets or customer groups, such as through online trading platforms. There are numerous examples where a modern design has opened up new urban markets for traditional products.



**Figure 17.** Cut your own Christmas tree – an experience offered by some Austrian forest owners (photo: Gerhard Weiss).

2. **Rural and urban values:** In order to take advantage of new markets, rural producers need to understand urban values and preferences. A whole range of experiential services in forests answers new urban demands for experiences in nature – such experiences may be related to education (guided tours or educational trails), aesthetics (experiencing landscape beauty or art events), entertainment (ranging from sports to cultural events), or escapism (simple hiking, survival training, self-awareness, etc.). Such services may add value to many forest products such as Christmas trees, berries, mushrooms, herbs or wildlife, and may provide new customer groups.

#### Box 14. Add-on services – gastro.

In the provinces of Burgos and Soria Spain mycological tourism has expanded to the gastronomic sector with restaurants and bars offering mushroom tapas to promote awareness and appreciation of mushrooms and provide a platform for outstanding chefs. This gives incentives to the restaurant sector and provides income through increased clientele. End-users can be involved by allowing them to vote for their favourite “tapa”. Social and gastronomic benefits are encouraged through the organization of these events in autumn.



Truffle tapas at Merca Setas (photo Merca Setas Soria).

#### 5.4.2 Support bottom-up innovations

We have seen that innovative NWFP-related projects have difficulties to get relevant information and financial support because they often do not fit into established sector programmes – for instance, if they do not easily fit into agricultural or forestry programmes. In order to provide support for innovative companies, it is therefore necessary that the institutional system offers support structures that are not strictly bound to sectoral rules or products. This service would best be provided by regional or rural development agencies that are not organized by sector, and that provide help to innovative companies in their search for information, financing and partners. Several models exist for such support agencies in different countries. Within European policies, the LEADER structure is a good model because of its bottom-up innovation orientation (Box 13) although the

LEADER instrument has lost much of its innovation orientation over time. Successful cases often combine a structured and expert-led process with an active involvement of local actors. In that way, external support offers connections to local resources, creativity and capacities, such as in the case described in Box 15.

#### Box 15. Bottom-up support in an action research approach in Wales.

Llais y Goedwig is the Welsh Community Woodland Association. It has two aims: (i) to promote and represent community woodland groups; and (ii) to provide assistance and support to local community woodland groups and initiatives. In an action research approach as part of the European research project StarTree, they supported four existing and aspiring enterprises to develop small-scale NWFP oriented income streams to discover the challenges and solutions involved. In their successful bottom-up approach, they started from the premise that:

- innovative ideas and products often develop out of a specific need or set of circumstances and do not follow conventional business models;
- even a small amount of well targeted funding can have a big impact on a business or organization looking to develop a new product or process;
- funding streams have to have a structure, but careful designing of that structure with enough flexibility can allow innovation to grow organically and expand to fill gaps in the market.

Each group or business was given a small amount of funding that was tailored to their specific project and encompassed: training, research and development time, materials, consultancy and marketing. Plans and outcomes were broadly defined but not prescriptive, and a series of reporting and feedback mechanisms was incorporated into each project in order to enable changes in direction in response to interim results.

The resulting reports and case studies along with recommendations will be used in Wales to inform policy and help shape future funding streams.

Zena Wilmot, whose Dyfi Woodlands 'Wild Useful Fungi' project had been supported, says: *"It was really useful to get support to cover research and experimentation time to flexibly develop ideas. The process was not prescriptive and allowed for adaptation along the way and as my ideas developed. In this way, a small amount of funding has made a change in our organizational direction and opened up opportunities for additional income. Reflecting on the process was not onerous and gave the opportunity to regularly think about what I've been doing, how things have developed, why decisions were made and what the next steps should be."*

### 5.4.3 Establish systemic NWFP development support

A systemic support for innovations in NWFP needs to start with raising awareness for these products and to provide relevant information. A fully-fledged innovation support system would provide various information and financing measures and would ideally contain a specific support organization. The following elements of a systemic innovation support system would be desirable:

- **NWFP information collection:** Efforts to launch an awareness raising campaign would first of all need to collect the relevant information on the sector. As mentioned, the statistical systems do not often provide comprehensive data about NWFPs, which is why studies to assess the characteristics and significance of NWFPs are necessary. An exception to this lack of comprehensive data is the "Potential study on NWFPs in Austria" (2009).

- **NWFP information campaigns:** Raising awareness of NWFPs may be directed towards forest owners (to make aware of the potential economic profits) and towards the public (as potential customers). Information for the landowners may contain statistical information, production and marketing methods, relevant legislation and networks, as well as show case examples of successful businesses. Campaigns may include initiatives such as prizes or awards for the best projects or companies.
- **NWFP research, development, education and training programmes:** Research and development aims for NWFPs may be included in many existing programmes on EU, national or regional levels, and in agriculture, forestry and rural/regional development. NWFP management and opportunities may be included in forestry education and training programmes.
- **NWFP clusters, platforms or innovation hubs:** Specific clusters or innovation centres in regions with a specifically high importance for certain NWFPs may be formed such as in Mediterranean or Scandinavian countries. Alternatively, the topic may be included in existing forest-related or rural development initiatives and programmes.

#### **Box 16. Successful Awareness Raising of the Economic and Cultural Benefits of NWFPs – Promoting Mushrooms in the MercaSetas project (Spain).**

The idea for MercaSetas originated in the cooperative project “Micosylva” dedicated to the valuation of wild mushroom resources in European rural areas.

Inspired by the success of mushroom markets in the Perigord region of France, a group of stakeholders from Soria, Spain (one of the most mycologically rich forested regions of Spain) decided to invest in and promote a series of mushroom markets in three villages of the province, choosing the name “MercaSetas”.

The objectives of the MercaSetas project were to: (i) promote mycological tourism; (ii) educate consumers and mushroom collectors regarding the quality and traceability of the mushroom resource; (iii) promote the cultural and gastronomic values of mushrooms; and (iv) generate income for rural communities and forest landowners to better manage their land.

The annual cost to the organizers representatives of the group of Owners of Public Forestlands (micocyl) is approximately €12 000 for each market. This covers the costs for infrastructure for these events (tents, exhibition facilities) and advertising. Each market is organized to serve the public for three days on different weekends throughout the autumn mushroom season, providing local bars, restaurants and hotels with tourism opportunities while offering expert speakers forums, educational displays and activities for children, and an excellent setting for buying and selling quality regional fresh mushrooms.

In the first year there were 23 000 visitors (to the nine market days) of which 10 000 came from outside the province. That year MercaSetas generated more than €210 000 in tourism, four times the amount that was initially invested. The success of the MercaSetas project ([www.mercasetas.es](http://www.mercasetas.es)) has extended to five local villages/year, rotating through different rural villages, which belong to the group of municipalities associated for managing the mycological resource ([www.micocyl.es](http://www.micocyl.es)). The interest in and appreciation of forest mushrooms from this region is expanding with support from the public, business and private sectors.

### Key messages

- The issue of NWFPs should systematically be made visible in policy documents, information/statistics, budget lines, education and training, research, development and innovation, as well as in all relevant political communication activities.
- Innovation support for NWFPs needs to overcome traditional sectoral and institutional boundaries, actively led by committed, public and private forestry actors. Special attention should be paid to interaction between rural and urban actors, and to support structures for better communication across the highly diverse, but fragmented, NWFP sector.
- Innovation support for NWFPs would have to cover a broad range of fields including the collection and provision of data, integration into existing education and training programmes, the funding of research, development and innovation support measures, as well as active networking and interaction across sectoral boundaries of agriculture, forestry and rural development.
- Respective budget lines need to be dedicated in the field of forestry, agriculture and rural development, as well as in research, development and innovation programmes. There is a special need for supporting bottom-up initiatives, radical and risky innovations, and cross-sectoral co-operation.

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# 6.

## NWFP implications in a bioeconomy

As demonstrated in this volume, NWFPs show a variety of connections to the concept of smart, inclusive development in a bioeconomy. However, there is no substantial body of evidence that comprehensively considers NWFPs in the context of a bioeconomy. Based on the knowledge collected in this report, this chapter describes a few examples of the contribution of NWFPs as a basis for more in-depth perception of NWFPs as a central natural resource of European forests.

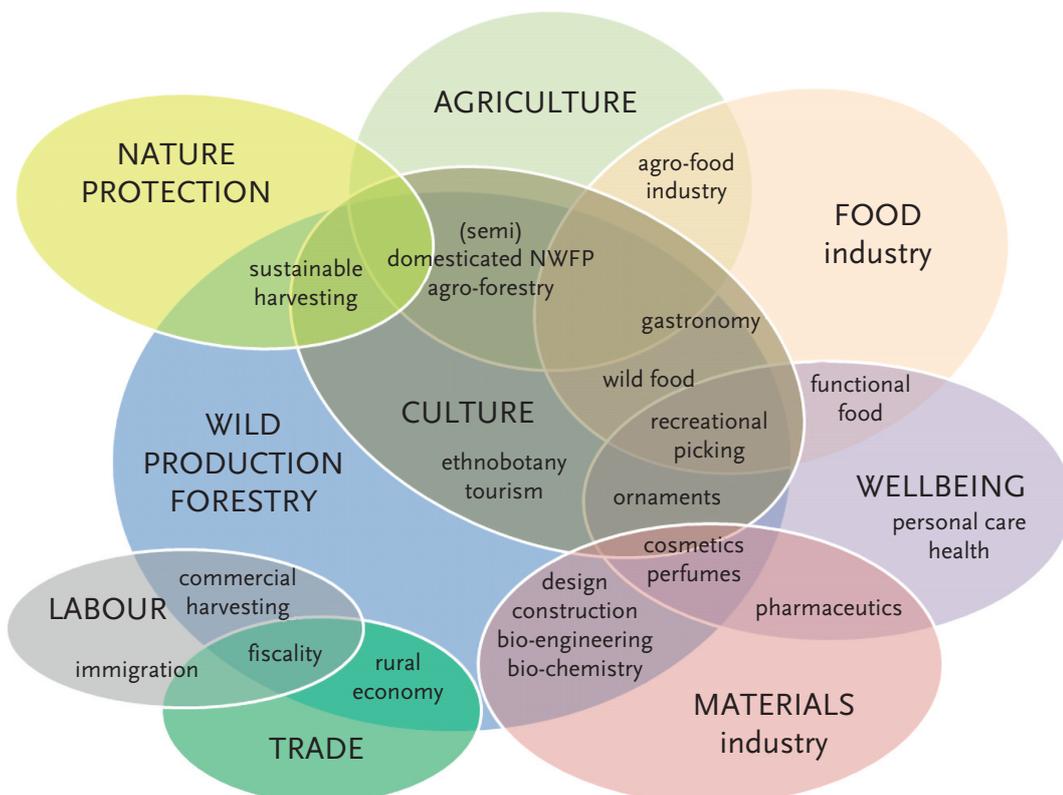
This section: (i) briefly summarizes some principle linkages of NWFPs that bear opportunities in a cross-sectoral bioeconomy; and (ii) highlights the importance of modern, adapted management concepts.

## NWFPs in a bioeconomy spectrum: opening opportunities for cross-sectoral links

Elena Górriz

A wide social understanding of the bioeconomy approach aims at a comprehensive inclusion of bio-products into national welfare systems, i.e., conceptualizing the economies as broader than the registered and formal trade.

NWFPs and related services offer opportunities for the forest domain to interact with other sectors and disciplines. Some of these interactions already take place in a more-or-less structured manner, opening chances for joint value chain development (Figure 18).



**Figure 18.** Cross-sectoral linkages of NWFPs. Circles represent sectors; lower case text represents products and processes connecting sectors.

### 6.1.1 Agriculture

In some cases, agriculture and production of NWFPs are intimately linked, e.g. in some agroforestry systems. NWFP cultivation in such systems reduces uncertainty by smoothing out natural irregularities in wild production and securing tenure which helps to modulate/regulate the amounts produced for the market. For example, the cultivation of cork, chestnut or black truffle has developed specialized management techniques. Alliances with agriculture also rely on the structuring of NWFPs within agricultural policies. Agricultural production policies to bolster the NWFP sector could consolidate the offer; however, producers also fear market saturation with consequent price reduction. This can be overcome with actions towards expanding the NWFP demand, e.g. becoming a mass product (i.e. strong marketing and distribution) or searching for new uses (substitute of more polluting products/services or complementing others). Treated cork layers substituting plastic textiles, or oils or pasta flavoured with black truffle illustrate these options. Still, uncertainties remain over the productivity over the long-term growing periods with consequent risks of wildfire, pest attacks, or market changes.

### 6.1.2 Food industry

Edible NWFPs constitute an increasingly important raw material for the food industry. Often gastronomes are the main ally for bolstering use and production of NWFPs, with chefs offering sophisticated and traditional dishes with chestnuts, berries or pine seeds. Food regulation generally restricts the tradable species and their processing. Instead of synthetics, more or less domesticated yields of spice plants (e.g. wild garlic, saffron) and teas (e.g. verbena, valerian, mint) help to maintain the cultural pool of herb use. NWFPs can also be served as special drinks (e.g. birch sap, elderberry juice, berry juice), sometimes as alcoholic drinks (e.g. *patxaran* in northern Spain, *retsina* in Greece, or berry wines). The agro-processing and commercialization sectors play a role in this value chain development.



Figure 19. Examples of different brands birch water. (Photo: Elena Górriz)

### 6.1.3 Raw material for industry

NWFPs provide raw material for several industries, for example: resin for turpentine (used industrially as a solvent and for synthesis of other compounds), cork for insulation in construction, or tannins for dyeing, treatment of leather, and adhesives. This field shows opportunities for bio-substitution either of polluting materials – e.g. tanning of leather using tannins of vegetable origin is less polluting than using alternatives such as chrome tanning restricted by EU directives – or those with worse-ranked life-cycle due to harmful extraction or residues – e.g. cork stoppers for bottles have a better carbon efficiency than synthetic alternatives. Furthermore, bio-engineering solutions are applying the mineral absorption properties of fungi in polluted areas to soil restoration techniques. Strong alliances are required with industrial engineers and product designers to make the best use of the natural properties of NWFPs, and with biochemists to even improve the properties of NWFPs.

### 6.1.4 NWFPs and recreation

NWFPs constitute a component of forests that attracts recreational users to woodlands. Picking NWFPs is an important leisure activity for many Europeans, but they also contribute to the tourism industry when pickers travel and make use of rural accommodation, food or guided tour services. In Castille and León (central Spain), mycotourism generates around €4.5 million annually creating an equivalent of 46 full-time jobs. Wild foraging constitutes a cultural ecosystem service; for example, 70% of rural Finns collect berries. This activity is becoming more popular in industrialized societies as a way to reconnect with nature. Whether this benefit is completely captured by the tourism provider or is also shared with forest owners depends on the property rights and possible picking permit systems. A dialogue and collaboration between both sectors could help enhance the long-term sustainability of NWFP activities. Moreover, traditional use by local pickers maintains a pool of ecological knowledge in rural communities, which is a source of adaptation strategies with potential relevance to global change. These traditional uses may also legitimize (or not) the social license to commercialize those products, i.e. ‘commoditization of tradition’. In addition, NWFP harvesting might have consequences for species ecology and ecosystem integrity. Working together with nature conservationists and rural development on studying harvesting evolution will help to ensure that development pathways are sustainable.

Finally, NWFPs are also used for crafts and decorative ornaments: floral greens, wicker handicrafts, moss, ferns, mastic or conifer cones for wreaths, and Christmas decorations such as Christmas trees, holly and mistletoe.

### 6.1.5 Health and personal care

NWFPs provide essential oils and bio-molecules for health and personal care. In order to be considered within the current parameters of conventional medicines, strict tests are required; the costs of the testing can be beyond the financial capacity of small rural companies. However, there are interesting scientific studies on the therapeutic uses of some NWFP components: Chaga (or pakuri) is reputed to have a variety of health

benefits (including anti-cancer properties and as an immune-stimulant for post chemotherapy and radiotherapy) (see case 2 in Chapter 6.2 for report of experimental cultivation of pakuri in Finland), preparations of arnica can be applied as a poultice to reduce inflammation and increase blood circulation to the area where it is applied, and therapeutic mushrooms (e.g. shiitake in Japan, *Pleurotus* in Mexico).

The use of NWFPs can also fall within the personal care sector, given their potential as functional food (nutraceuticals), cosmetics, perfumes or ornaments. The nutritional properties of mushrooms are being studied and are beginning to be exploited: mushrooms can be used as a substitute for other carbohydrates in weight-loss diets, and also can have high concentrations of quinine, which can help in absorbing LDL (low-density lipoproteins) cholesterol. Dog roses or cloudberry have a high vitamin C content and liquorice is used as a blood-pressure regulator. Pine resin creams, sweetbriar rose balsams and argan oil are used in cosmetics. Additionally, essential oils are used for their perfume properties in, for example, soaps.

### 6.1.6 Labour and trade sectors

Finally, it is worth mentioning that NWFP harvests can be strongly correlated to employment and fiscal policies. While not being entirely considered as 'sectors', they constitute relevant governmental policy fields indirectly affecting NWFP development and consolidation. In many cases in higher wage economies there are not sufficient local harvesters to cover the NWFP demand, so migrant labour – for whom picking is a complementary livelihood strategy – is used to fill the gap. This raises concerns related to salary ranges, traditional harvest rights and behaviour, security and sustainability. Seasonal and variable climate-dependent yields call for a special fiscal treatment to align rural livelihood strategies with clear market traceability. Economic and social integration policies, especially in rural areas, should tackle these challenges.

## Resource and management – Novel management concepts to boost product diversity and secure higher product flows

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Forest management reflects people's interaction with the forest under the objective of optimizing the production of goods and/or services, usually reflected in higher returns on initial investment. People have the ability to strongly control forest structure, and therefore, long-term forest development. Increasing knowledge concerning forest ecology and forest processes has made the prediction of the consequences of human intervention more reliable and realistic. To a certain extent, it is now possible to anticipate the impact of forest management actions on forest structure and production, to monitor forest evolution under the prescribed forest management and the changing environment, and to adapt forest management towards pre-defined and/or adapted objectives.

The needs of society are changing at an unprecedented rate, and forestry must adapt to the changing demands. Recently, the emphasis has been placed upon multi-functional sustainable forest management, and nowadays forest managers are faced with both, objectives towards the sustainable intensification under an integrated bioeconomy, and a diversification of products and services. The NWFP portfolio is part of this process, and has been recognized for its potential in this quest for diversification of products and services from ecosystems. As a consequence, the aim of forest management has broadened to include an increase in NWFP production as an objective, and this has led to development of novel management concepts. With a few exceptions, forest production has been largely focused on production of wood, while NWFPs have often been a minor product or coincidental good, produced in an informal manner. Such ad-hoc management occurs despite there being a long tradition of harvesting of NWFPs in Europe. The silvicultural system that optimizes NWFP production strongly depends on the product and the best management ranges from passive systems such as unmanaged forest or nature reserves, to combined objective agroforestry systems, and towards intensively managed systems where the primary or secondary objective of management is the production of a particular NWFP. The optimum solution will commonly imply a compromise with wood production. Socio-economic issues, such as property rights and marketing, are often an important part of the solution.

Novel management concepts towards the increase of NWFPs, preferably as part of a basket of products and services, are discussed through the presentation of four case studies selected from different parts of Europe: (i) Optimization of cork extraction in Portugal and Spain; (ii) Cultivation of pakuri (*Inonotus obliquus*) in birch stands in Finland; (iii) Co-production of wood with nuts or fruit; and (iv) Effect of forest management on edible mushroom production.

### Case 1. Optimization of cork extraction rotation based on field sampling of cork quality and prediction of short-term evolution of cork value.

Cork is a particular NWFP that makes an important economic contribution for a large number of landowners in the Mediterranean regions (especially in Portugal and Spain, but also in other countries around the Mediterranean). The cork oak (*Quercus suber*) ecosystem and the cork product are so important that thinning and felling of trees is prohibited by national legislation, except in very specific conditions and even then only after the authorization by the forest services. The area of cork oak occurring in the Mediterranean natural ecosystems has been artificially enlarged, and most present-day mature stands are a product of broadcast seeding treatments. Most cork oak stands have historically been managed as agroforestry systems, either combining trees with annual crops such as wheat, or silvopastoral systems that combine the trees with pastures and grazing of animals under the trees. However, several management systems can still be found and the landowners are quite dynamic, and always prepared to adapt management to new market opportunities and changing edaphoclimatic conditions.

Cork oak management involves three main decisions: (i) tree density; (ii) how often cork must be extracted (cork debarking rotation); and (iii) stand regeneration method (silvicultural system). The first decision implies the selection of the type of system, from a sparse stand compatible with agriculture, pasture or game, to a denser forest that aims at producing cork as the main product. The decisions are not straightforward, and, in a changing world, management must be adaptive. It is difficult to provide 'fixed' silvicultural guidelines. Instead, adaptive management based on the monitoring and revision of the objectives, combined with the use of decision support tools is suggested. Such an approach will help landowners analyze the best way to change management to face new challenges (climate change, new markets, etc.). The aims of decision support tools can range from long-term optimization of the system (strategic planning) to short-term adaptation to optimize decisions for changing conditions. The impact of alternative stand densities combined with different cork rotations can be analyzed using tools based on growth and yield models, such as SUBER<sup>28</sup> or ALCORNOQUE<sup>29</sup>. These tools use several indicators (economic, ecological and social) in order to optimize the outcomes according to the owner's objectives.

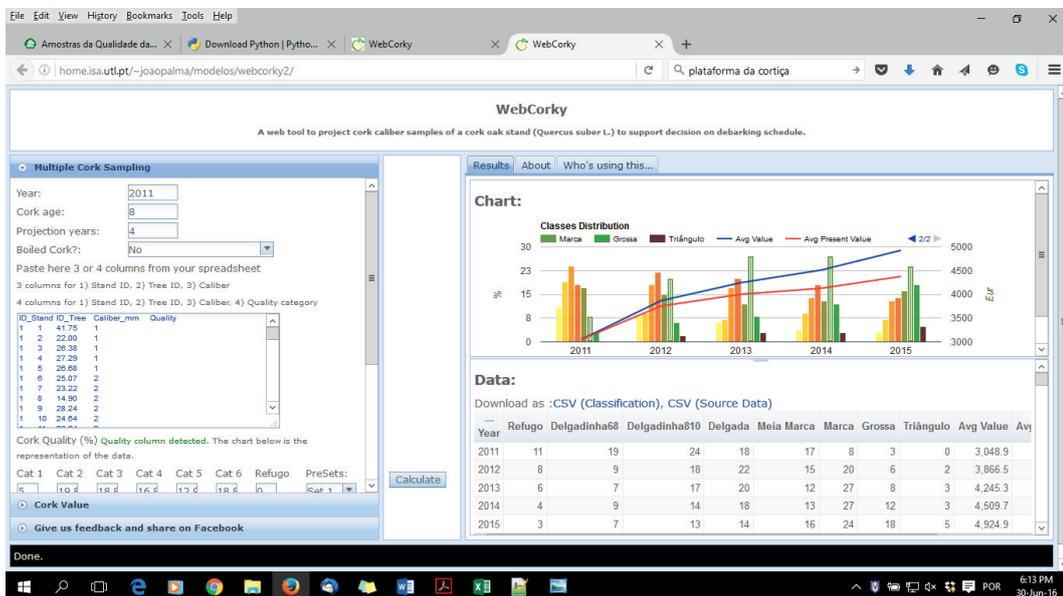
Once the long-term management has been determined (decisions about stand density and cork extraction rotation over time) the landowner can use other tools to more precisely determine their short-term options according to a more detailed appraisal, namely related to cork prices structure and climate impacts on cork growth. One example of

<sup>28</sup> <http://www.isa.ulisboa.pt/cef/forchange/fctools>

<sup>29</sup> <http://wwwx.inia.es/alcornoqueWeb>



**Figure 20.** Field sampling of cork quality. After boiling the cork samples, cork thickness is measured and cork quality visually evaluated, allowing the estimation of cork value (price).



**Figure 21.** webCorky tool to predict short-term development of cork value. Cork growth is estimated for the next years and the respective cork value (price) is estimated to landowners decide when to harvest the cork. The graph shows the evolution of the distribution of cork thickness and of cork value (blue line) and present cork value (red line).

such a tool is webCorky,<sup>30</sup> a web-based tool that allows the user to refine the near future decision with regard to the optimum time to extract the cork based on measurements of actual cork growth. A pre-harvest sampling is used to estimate the distributions of cork thickness and quality, used as input for a cork growth model that, along with a user defined cork price and interest rate, allows the prediction of cork price. Rather than using fixed silvicultural guidelines, cork oak landowners now have the possibility to use flexible tools that help them to adapt management to changing conditions leading to an optimization of benefits.

<sup>30</sup> <http://home.isa.utl.pt/~joaopalma/modelos/webcorky/>

## Case 2. Cultivation of pakuri (*Inonotus obliquus*) changes forest management and offers new business opportunities for forest owners

Pakuri (*Inonotus obliquus*) is a pathogen of broadleaved trees. In Finland, it occurs mainly on birch (*Betula* spp.), infecting trees that have been damaged by frost or by machine. Pakuri is used as tea made from a sterile conk which forms on the tree. The use of pakuri as a product that has several different health effects is growing in Finland, but it has a well-established market in Asia. The value of pakuri may exceed the value of timber ten-fold if sold as a raw material for health remedies and as nutraceuticals. Thus, pakuri production could be a new business opportunity for forest owners.

So far, pakuri collection has been based on naturally developed conks. However, more raw material is needed. Thus (semi-)cultivation of pakuri becomes a very interesting option. For cultivation, strains of *I. obliquus* were collected, pure cultures were prepared in the laboratory and their performance was studied in field trials (Figure 22). On average, the rate of successful inoculation was 75%, and the early signs of conks are already appearing on about 65% of inoculated trees.

Throughout Finland, birch trees in several privately owned forest holdings have been inoculated using plugs containing pakuri mycelia during the last few years. An interesting aspect of these operations is that pakuri can be cultivated in birch stands that have little or no value for timber production. At the same time, the emerging business opportunity indicates the need to change the prevailing forest management so that instead of aiming to produce as much high value timber as possible, there would be a need to select trees that would produce high numbers of conks.

At this point, the field trials indicate that pakuri can be successfully cultivated, but the yield cannot be assessed yet. Preliminary calculations show that the profitability of the first commercial thinning can be increased by growing pakuri on birch trees to be removed in thinning. At least for forest owners that have birch stands that are otherwise of little commercial value, pakuri can be a great opportunity.



**Figure 22.** Inoculation of birch trees with plugs containing pakuri mycelia in privately owned forest located in North Karelia.

### Case 3. The co-production of wood with nuts or fruits

The production of NWFPs often directly competes with an established and economically proven system for producing timber. The production of timber (especially high value timber) together with production of nuts or fruits is sometimes impractical since the trade-offs between the two production systems can be significant. However, co-production preferring a defined target, while proposing a secondary production objective is a potential alternative and can be optimized if provenances that are site specific and produce large and desirable fruits or nuts are planted. Alternatively, fruit production can also be promoted within specific orchards, using established domestication techniques, while orientating natural forests towards timber production. Selection of either co-production in a single stand or separated oriented production will depend on the main objective defined by the forest manager. For those species showing a high quality, high return, veneer-oriented timber product, such as wild cherry (*Prunus spp.*) or the wild service or checker tree (*Sorbus torminalis*) – fruit from managed forests could be considered as a secondary objective, and specific orchards for fruit production could also be promoted. For species with highly desired fruits or nuts, such as chestnut (*Castanea sativa*), co-production of timber and fruits/nuts could be considered as a management option. Finally, for species with very low timber value, such as stone pine (*Pinus cembra*), production of pine nuts could be the main objective in natural forests as well as in plantations oriented towards production of pine nuts.

For a more targeted commercial production of fruits or nuts with an additional timber product goal, a modification of an orchard system may be considered. If fruit or nut production is of particular interest, a wider spacing between trees is important. For example, chestnuts can be established at a wide spacing with the goal of producing a tree stem with a ‘clean’ (i.e. free from branches and knots) timber length of 2 m (approximate minimum sawmill requirements for veneer production). As a result of wide spacing of trees, additional livestock farming can also be carried out between the trees. In order to achieve nut production with large high quality relatively soon after establishment (as opposed to waiting until individual trees mature and reach fruiting age), grafting of selected cultivars is advocated. The grafting scions of known cultivars onto established rootstock at a minimum height of 2 m can achieve this goal. To increase the production of nuts, a strong well-spaced scaffold of branches must be created. Pruning can be used to shape the crown with the aim of creating strong, well-spaced branches that will provide sufficient support for nut production and allow sufficiently high levels of light to penetrate the crown.

A further example of compromise within a co-production system is the distribution of timber and NWFP production between trees within a stand. For example, in wild cherry stands it is possible to identify primary grade trees with high potential value for timber and secondary grade trees (i.e. those displaying poor form and below optimal diameter growth) which can be used for production of cherries. Thinning should remove weak trees to allow full crown development of those trees designated for the production of cherry fruits. The total tree height of fruit trees should be limited by the removal of dominant shoots to create an open and spreading crown to facilitate annual cropping. This dual system (high quality trees for wood production and medium quality trees for fruit production plus lower quality wood at the end of the rotation) leads to less compromise required from individual crop trees that show superior stem form and diameter growth. Thus, the landowner obtains a regular income from fruit production, as well as producing a high value timber crop at the end of the rotation.



**Figure 23.** Edible mushrooms (*Tricholoma terreum*) growing in a forest (left), and an artistic paint representing a valuable edible mushroom (*Amanita caesarea*) in a tourism-oriented mycological hiking trail.

#### Case 4. Forest management can improve edible mushroom production.

Edible mushrooms represent one of the most valuable categories of NWFPs in Europe. They can contribute to creating important value chains within the food and tourism sectors. Furthermore, mushroom picking is a key traditional outdoor leisure activity in many European regions. Mushrooms like ceps/porcini (*Boletus* group *edulis*), chanterelles (*Cantharellus cibarius*) and saffron milk-cap (*Lactarius* group *deliciosus*) and many others are picked and traded every year all over Europe and beyond. The value of marketed mushrooms may even exceed the income obtained from timber harvesting in many areas where traditional forest management is no longer very profitable.

Although wild mushroom production is largely driven by climatic and weather conditions, production also depends on other factors related to site and forest stand characteristics. Thus, since stand structure can be modified by means of silvicultural operations, forest management can contribute to enhancing mushroom yields. The optimal stand basal area that maximizes mushroom productivity may differ among forest types and ecosystems, ranging from approximately 15–20 m<sup>2</sup>ha<sup>-1</sup> to 40 m<sup>2</sup>ha<sup>-1</sup>. Moreover, light thinning may also boost the production of edible marketed fungi, mainly if thinning operations are conducted using low-impact techniques that minimize soil disturbance. Since most wild edible fungi form ectomycorrhizal associations with forest trees and shrubs, continuous cover forestry may allow the production of edible mushrooms for longer periods in a given stand.

Results of studies indicate that forest management schemes need to be adapted and improved with the aim to consider highly valuable forest products and ecosystem services other than wood and timber, including mushrooms but also other NWFPs and ecosystem services. The diversification of forest management objectives to explicitly consider mushroom production may entail trade-offs between different management options aiming at providing alternative forest ecosystem services and products. These trade-offs need to be further assessed in order to improve the science-base upon which decisions and policies concerning European forests are made.

### Key messages

- Besides the traditional synergies with agriculture and food industries, bolstering the NWFP economy requires coordination of policy issues as varied as production of raw materials; health and well-being; art and tourism; nature protection; labour, and trade.
- Biochemistry and bio-engineering can help to unlock the potential of NWFP properties to launch bio-based solutions tackling pollution, life-cycle assessment, or global change adaptation.
- Non-tangible values of NWFPs should not be neglected in the discussion of their optimized marketing. NWFPs relate to green space, regional identity, and are linked to the well-being of individuals and society as a whole. These aspects are not sufficiently quantified, and consequently their effects addressed discussions about policy.
- Responding to a diversification of demands of forests, forest management planning needs to entail co-production and combined objectives. NWFPs can be more than just a by-product of wood production, if objectives are adequately harmonized, and if multi-functional synergies in forest management are properly understood and utilized.

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## Policy implications

**Bernhard Wolfslehner**

### **NWFPs are more than a by-product of wood production; they are an essential natural resource in Europe**

NWFPs contribute more than the official statistics reveal. Informal and non-market activities substantially contribute to livelihoods and well-being, as well as to maintaining local and regional identities, which is an important carrier of rural development in a European Union of the regions. Multi-purpose use of forests is an important feature for securing traditional life-styles and subsistence economies. Currently, these are documented as rather marginal phenomena in rural areas across Europe.

NWFPs are systematically undervalued because statistics are incomplete or completely lacking. This is due to fragmented value chains, complex trade-patterns across Europe, and the high importance of individual, non-marketed use of NWFPs.

More effort is needed to more fully comprehend, monitor and document the NWFP resources and their current and potential contribution to rural development and a bioeconomy of natural resources. In this respect, cross-sectoral boundaries in statistics and market analysis have to be overcome and monitoring instruments harmonized.

### **NWFP trade and consumption patterns reveal new dimensions of marketed and non-marketed NWFPs**

Current NWFP monitoring is inadequate with regard to production, trade, and consumption of NWFPs in Europe as well as their imports and exports. A new product classification scheme for NWFPs would increase transparency to the product diversity, and be responsive to the new raw and processed product groups.

The extent of private gathering and consumption of NWFP is chronically underestimated, and it appears to be substantial in the light of a recent household survey undertaken within the StarTree project. NWFPs contribute substantially to the economy of peri-urban and rural areas. Consumption patterns of NWFPs should be assessed, and NWFP resources need to be governed taking into account limits to potential and sustainable production.

The international trade of NWFPs is increasing, both as intra-trade flows within Europe and as imports from non-European countries, due to an increasing global demand for these products. A key question is how European NWFP production can be increased to meet the rising demand within the frames of sustainability. Currently NWFP

consumers and producers are to some degree isolated from each other. NWFP consumers (often located in urban areas) need to be re-connected with the NWFP producers located in remote rural areas.

There are many opportunities for increased value generation along NWFP production and processing chains. This will stimulate the economy in rural areas, and can be particularly successful if the actors are well organized along value chains. Public policies should provide incentives to: (i) foster regional horizontal and vertical cooperation and business opportunities; and (ii) develop from low value exports of unprocessed raw materials towards high value products of distinct origin.

The introduction of standards and certification schemes can help overcome perceptions that NWFPs lack, compared to cultivated plantation sources, quality, supply stability, and traceability of origin.

### **Institutional and regulatory fragmentation of NWFP governance needs to be overcome to make progress towards sustainable and potentially high-value chains**

The variety of NWFPs and the diversity of production systems makes for a complex institutional and policy framework. This framework involves multiple policy domains and multiple stakeholders at different spatial scales. Hence, policies addressing NWFPs require a comprehensive and coordinated vision, both at the EU level and, in particular, at the national level.

The implementation of NWFP policies requires institutional support structures with adequate capacity and resources to address the different aspects of the multi-faceted NWFP sector (e.g. inventory, land management, harvesting, transportation, processing, trade). In most European countries such institutional structures either do not exist, or lack power, resources and capacity to adequately deal with the issue. There should be stronger coordination of the regulatory instruments required to govern sustainable NWFP harvest, and incentives and informational instruments to promote the benefits of producing and marketing NWFPs.

Sustainable use of NWFP resources is strongly linked to a clear definition of ownership, access, and NWFP use rights. In general, exclusion and restriction are not successful ways to control access to and use of NWFPs. Information means, education and awareness-raising campaigns, and developing pathways for responsible and sustainable handling of natural resources leads to less conflict between users and owners, and prevents negative effects on the forest ecosystem.

### **Innovation in the NWFP sector should look beyond sectoral boundaries**

Production of NWFPs is deeply rooted in traditions and life-styles of the different regions. On the other hand, there is enormous potential for innovative production and marketing of NWFPs if the policy environment and economic system provides incentives for business generation and entrepreneurship.

In the light of an observed fragmentation of the NWFP sector, it is important to generate a cross-sectoral view, where cooperation (e.g. among actors, among business branches, between primary production and industries) along the value chains and the generation of cross-sectoral links are strengthened.

In a complex network of private, public and corporate stakeholders, special attention should be paid to the interaction between rural and urban stakeholders, and on support structures for better facilitation communication across the highly diverse NWFP sector.

A sectoral approach would also imply innovation support that ranges from product and process innovation to more integrated value chain cooperation. Sectoral fragmentation is a major reason why NWFPs receive less attention than they deserve in the discussion about the bioeconomy. This requires targeted RTD calls, innovation partnerships, and new initiatives to stimulate innovation and new business start-ups, that go beyond the traditional NWFP activities.

### **NWFPs have many connections to a bioeconomy; they provide both natural resource and social services**

The bioeconomy in a forest context has to go beyond a purely technological, biomass-driven concept; the concept should take into account a broad range of ecosystem services and their social effects. The contributions of NWFPs to a socially inclusive bioeconomy have to be fully recognized and brought into the political debate, including a bio-society as pronounced in Winkel (2017).

This requires a new viewpoint on NWFPs that responds to a holistic picture of a bioeconomy, providing support and policy instruments that do not exclude certain types of natural resource use, but promote an inclusive utilization and development of European forest resources.

There is an opportunity to link NWFPs more strongly to current trends of organic products and nature-based solutions for basic materials. Lifestyle changes might link to traditional products and render them progressive in light of a bio-based economy. In the context of a multi-lateral bioeconomy, the social benefits of NWFPs for human well-being need to be accounted for. Green infrastructure and green health are important lead topics that need to more strongly recognize the role of NWFPs, be it as asset for outdoor activities, nature-based food and medicine, or social and educational purpose to maintain strong links between different parts of society and nature. This includes maintaining a broad portfolio of current and future options – from recreational services to medicinal reserves – that are high on the agenda in a global perspective.

The ability of forest owners to determine the management goals of forests on their property is crucial for encouraging production of NWFPs and promoting product domestication and innovation. In order to tap into the potential of NWFPs, optimized forest management concepts are needed to balance multiple claims on forests and forest resources. This requires fostering the development of new management tools, and new approaches of participatory forest management. This is particularly applicable when focusing on co-production of NWFPs and wood, where synergies between product groups can be achieved. The concept of optimized forest management should also ensure that forest resources are managed sustainably.

Mobilizing synergies in NWFP resource use requires coordination with other sectors (e.g. agriculture, food, tourism). Rural development programmes should focus on value chains that entail multiple benefits from small, local producers towards multi-sectoral and industrial cooperation.





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