



# Summary Report

## Current State of the Art of the Agroforestry Implementation in Belgium, Czechia, France, Hungary, Slovakia and Spain

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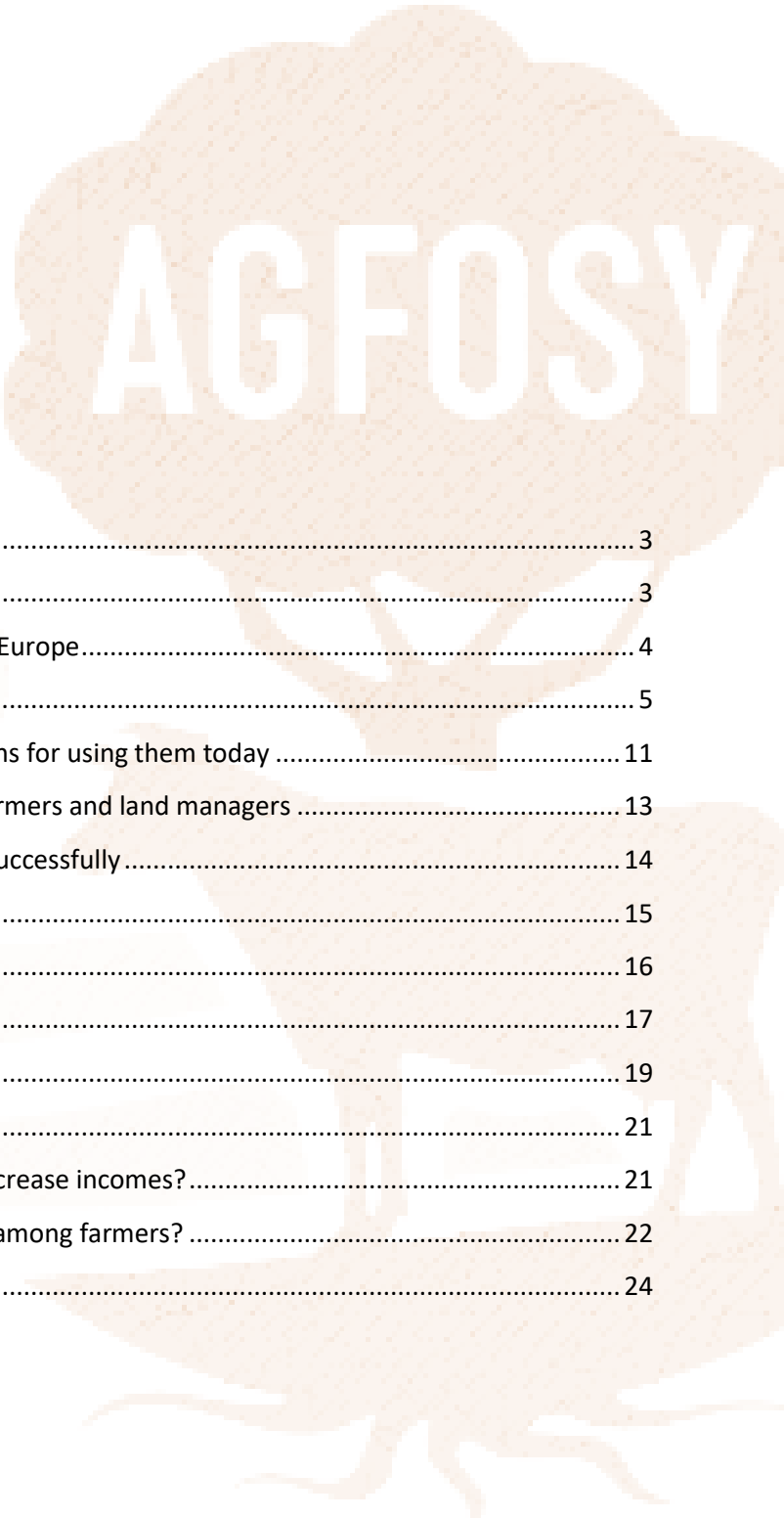
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*Motto:*

*In the same way that a higher proportion of the European population is choosing to live in towns and suburbs (in preference to cities and rural areas), agroforestry can offer a similar sweet spot between agriculture and forestry (Burgess and Rosati 2018).*

## 1. Introduction

This report was developed within WP1. The main objectives were to gather and analyse information about the current situation of agroforestry implementation both in the partners' countries<sup>1</sup> and in the rest of Europe, and to select a group of beneficiaries that will contribute to testing the training materials to be developed within the project. In this report, the authors summarised the available data included in the national reports about the current situation of agroforestry, as well as the results of surveys carried out among stakeholders in each country (farmers, researchers, advisers, multipliers etc.) which collected information on their views on the development, barriers and incentives, opportunities and expectations related to agroforestry. In order to gather all the required information and correct data from partners' countries, a questionnaire and methodology specified for the project's purposes had been developed. More than 30 interviews in six countries were prepared and carried out personally with the most relevant stakeholders during the survey. The results of the survey were integrated into the relevant sections of the report; therefore the document does not only serve as an up-to-date description of the status of agroforestry in the countries involved in the AGFOSY project, but also reflects the needs for future development from a practical approach with the contribution of the stakeholders.

## 2. Role of agroforestry

Integrating trees with crops and animals is a long-standing tradition throughout the world (Encyclopaedia Britannica, 2019). Throughout history we can observe different episodes of expansion and retreat of agroforestry coinciding with population growth and economic cycles. It can be argued that the modern concept of agroforestry emerged in the early 20<sup>th</sup> century, however, the use of woody perennials in agricultural systems is ancient, with written descriptions of the practice dating back to Roman times. As far back as the middle ages, farmers would clear trees, then plant crops alongside new trees. According to the FAO, the term agroforestry first appeared in the late 1970s, when research highlighted the role of trees within agricultural systems to respond to environmental challenges in tropical regions (FAO, 2019). In the beginning of the 20<sup>th</sup> century, awareness of the considerable damage to the environment caused by the modern industrial agriculture encouraged scientists and stakeholders to take an interest in agroforestry in temperate regions and, its potential

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<sup>1</sup> Belgium, Czech Republic, France, Hungary, Slovak Republic and Spain

to cope with such damage (Steppler and Nair, 1987). Today, agroforestry appears to be an important part of the alternatives capable of promoting the transition to a more sustainable production of food. In 2004, the World Bank estimated that 1.2 billion people practiced agroforestry. (The World Bank, 2004)

### 3. Historical types of agroforestry present in Europe



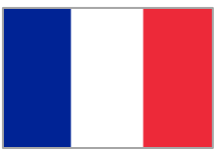
Generally speaking, two main types of agroforestry have long been developed and are still being practiced in Europe. In the first type there is a chronological relationship between annual crop harvests and tree products (sequential agroforestry), i.e. annual crops and tree plantations follow one another over time. This type of agriculture include:




- forms of shifting agriculture with fallow management i.e. combining agricultural crop cultivation with tree plantation in time;
- establishment of forest plantations in which annual crops are cultivated simultaneously, but only temporarily (for the first 1-3 years or until the foliage of the trees is fully developed).

Another type of agroforestry is the simultaneous and continuous integration of perennial or annual crops, timber trees, fruit trees or multiple use and/or livestock (e.g. alley cropping).

In the 18<sup>th</sup> and 19<sup>th</sup> centuries, there were various forms of agroforestry and they were attuned to the local natural and cultural conditions. Examples of old systems are shown in Table 1.

*Table 1: The most common historical types of agroforestry in countries involved in AGFOSY*

	<ul style="list-style-type: none"> <li>▪ Traditional agroforestry: hedges, bocage and alignment of groups of trees creating a landscape grid of good quality</li> <li>▪ Less intensive or fully extensive farming practice with combination of cattle and meat production in the central and southern part of the country</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Intercropped fruit orchards, meadows, and pastures with scattered fruit trees of different types and age or fruit tree lines (orchards with local fruit varieties), grazed by cattle or sheep or intercropped with arable crops (cereals, vegetable) , mainly located on more fertile land in lowlands</li> <li>▪ Extensively managed wood meadows and pastures where trees were probably pollarded and usually used for collecting timber, firewood, and other wood for households</li> <li>▪ Forest pastures, with acorns and other forest tree fruits for animal feeding and the collecting of forest litter for bedding practiced until World War II.</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Sylvopastoralism in open forests in the Alps, in Corsica, in Provence</li> <li>▪ Grazed orchards: cattle or sheep in orchards (Normandy)</li> <li>▪ Pré-bois (wood pastures) in the mountains</li> <li>▪ Panage (glandée), like in the Dehesa in Spain</li> <li>▪ Hedgerows, windbreaks, riparian buffers</li> <li>▪ Trees in crop fields, on plots, trees associated to cereals “alley cropping” in Dauphiné</li> <li>▪ Trees associated to vegetable cultivation</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Extensively managed wood pastures as traditional agroforestry practice used widespread in the old times (Varga and Bölöni 2009; Varga and Molnár, 2014)</li> <li>▪ Trees were common in farmsteads, planted scattered or in lines and around the buildings (fruit and forest species)</li> <li>▪ Shelterbelt systems and hedgerows in fields and farmsteads: their number increased significantly in the 1960-70s, but fell again during the following 30 years, and are currently still declining</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Various historical agricultural landscape structures i.e. vineyards, grasslands, high-trunk orchards of obsolete varieties and landraces of wild fruit tree species<sup>2</sup>, grazed by cattle or sheep or intercropped with arable crops (cereals, vegetable)</li> <li>▪ Traditional wood pastures with pollarding to support tree regeneration and fodder production</li> <li>▪ Traditional forest pastures (e.g. grazing pigs and autumn fattening on acorns/beechnut or maize grazing predominantly in coppice forests, which were cut and pruned for a larger harvest of nuts)</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Dehesa in the South-west of the Iberian Peninsula</li> <li>▪ Silvopastoral systems in the Mediterranean in coniferous and oak forests</li> </ul>

After World War II agroforestry in EU countries declined, following the intensification of agriculture, mechanisation, re-parcelling and collectivisation, and the loss of the knowledge and knowhow associated with “trees in the fields.” The common agricultural policy (CAP) which subsidises agricultural or forestry systems separately leaving little space for mixed cultures has also contributed to this tendency. In many areas, locally adapted diverse and multifunctional agroforestry was refused, ignored, or discredited – as were traditional land use practices in general – and farmers were clearing forests in order to increase the areas under cultivation.

Traditional agroforestry persisted mainly on steep terrain, less fertile soils, and in the vicinity of isolated settlements, preserving old practices and cultural heritage for the next generations.

In the 20<sup>th</sup> century, the traditional farming systems such as agroforestry, often linked to family farming, have been abandoned in many areas in the AGFOSY-countries.

#### 4. Recent state of agroforestry

Nowadays, the interest in traditional and so-called modern AF practices has revived. Among the reasons, there is the effort to mitigate the negative effects of climate change resulting e.g. in the shifting of vegetation zones, difficulties with feeding livestock and increasing risks in production. Furthermore, one of the primary goals of AF practices have been to avoid the adverse effects of modern industrial agriculture (Vityi and Marosvölgyi, 2013; Krčmářová and Jeleček 2016). Moreover, the ecological, social, and cultural values of AF systems are starting to be recognised and incentives for their protection and extension implemented.





<sup>2</sup> *Malus domestica*, *Pyrus communis*, *Prunus* spp., *Castanea sativa*, *Sorbus domestica*, *Mespilus germanica*, *Cydonia oblonga*, *Morus* spp., *Juglans regia* etc. (Lucke et al. 1992)

In most partner countries (Belgium, Czech Republic, Hungary and Slovak Republic) there is a lack of data on the total area covered by agroforestry, while in other countries, the proportion of agroforestry cannot be clearly determined in spite of the available data, due to the significant differences between the statistics such as in the case of France. Comparability is hampered by differences in the definitions of agroforestry and the statistical methods and datasets, regardless of which country it is.

Based on data obtained from the AGFORWARD website ([www.agforward.eu](http://www.agforward.eu)), the total area under agroforestry practices in the EU27 is estimated at 15.4 million ha, which is equivalent to 3.6% of the territorial area or 8.8% of the utilised agricultural area. (Herder et al., 2017). Currently, silvopastoral systems are the most widespread European agroforestry systems, representing 15.1 million ha. Wide spatial area and range of the wood pasture/meadow types suggests that they would have specific character and variability in the Central-Eastern European countries. Those systems usually occurred on less fertile lands, in hilly areas and highlands (Krčmářová and Jeleček, 2016). The area of silvoarable systems is estimated at 358 thousand ha. A particularly attractive arable agroforestry system of today is tree-cereal, a system extended from northern Italy to the rest of Europe (Eichhorn et al., 2006) where production can be increased by up to 30% compared to separate crops (Dupraz et al., 2004).

The above totals include grazing and intercropping of permanent crops (e.g., fruit trees and olives) (1.05 million ha) comprising 850 thousand ha of grazing systems and 220 thousand ha of intercropping systems.

*Table 2: Agroforestry by countries in AGFOSY (2019)*

	<p>In Wallonia, agroforestry practices are relatively limited. In Flanders, there are significantly more examples. This is partially because there has been a government subsidy for agroforestry. There are three types of agroforestry measures currently practiced in Belgium: a) “first generation agroforestry” (conservation and maintenance of hedges or isolated trees within an agricultural plot), b) “second-generation agroforestry” (implementation of woody plants in low density to a more conventional agricultural system with a view of profitability from production) and c) “third generation” or “multi-objective agroforestry” (implementation of woody plants in order to increase the resilience of the system by putting the “tree” at the centre of thinking).</p>
	
<p>Photographs of agroforestry systems from Belgium</p>	
	

ILVO estimates 2,000 ha in Flanders, and an unknown area in Wallonia (though they do note that 150 ha are in official programs). (ILVO, 2016.) In Belgium in the Wallonia region it was estimated that there was about 15,500 km of hedgerows and windbreaks (AGFORWARD). Ancestral agricultural practices, nowadays considered as agroforestry, can still be found in Belgium in the form of hedges and isolated trees. This form is probably the most common type of agroforestry. As far as second- and third-generation agroforestry is concerned, the enthusiasm remains limited and only a few farmers have implemented greater resources to achieve a more ambitious objective.



Agroforestry is nowadays a nearly forgotten phenomenon in the Czech Republic and there are no official data about the state of agroforestry. A research study calculated the total extent of agroforestry systems in the Czech Republic to be 35,750 ha in 2018, which is equivalent to 0.45 % of its territorial area and 0.8% of the utilised agricultural area (Lainka, 2018). In contrast, Herder et al. (2017) in their study found that agroforestry in the Czech Republic covered about 45,800 ha. According to Lainka (2018) the most common agroforestry practice seems to be livestock agroforestry that covers 30,031 ha, followed by grazed high value tree agroforestry which covers 5,720 ha. However, the study did not cover sequential agroforestry (rotational) systems, forest farming practices, home gardens, buffer strips, windbreaks, hedgerows, and shelterbelts that may cover thousands of hectares.



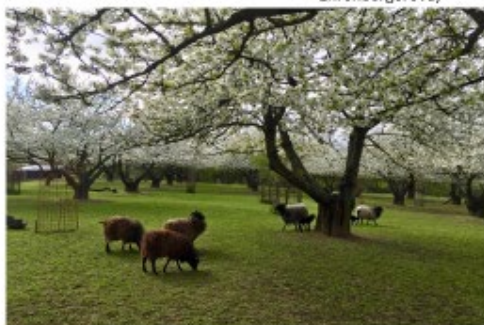
Short rotation coppice and turkeys



Example of traditional agrisilvicultural practice in Moravia (Photo by Ehrenbergerová)



Foundation of new agroforestry (silvoarable) permanent research plot "Michovka"



Agrosilvopastoral system with fruit trees near of Kutná Horaduring



Excursion to silvopastoral system near of Kutná Horaduring [ training program Establishment and management of agroforestry systems ]

Agroforestry systems in the Czech Republic are currently represented mainly as relict forms of specific farming. The most extended traditional agroforestry practice is silvopastoral form of *pasený sad* (grazing of extensive fruit orchards) remaining in sites with less favourable conditions for intensive agriculture (e.g. mountains – regions of White Carpathians and Bohemian Forest) and linear tree planting or other tree elements (buffer strips, windbreaks, hedgerows and shelterbelts, etc.) on agricultural land. There are also other agroforestry systems such as intercropping of forest trees and forest farming/gardening. On the other hand, agroforestry is commonly practiced in gardens, for example by growing crops under fruit trees or in combination with domestic animals. A specific form of agroforestry systems in the Czech Republic is the cultivation of fast-growing trees on agricultural land intended for the production of biomass for energy use in combination with plant production, as well as livestock production (poultry, pigs, sheep, etc.).



Besides the remaining traditional systems (grazed orchards in Normandy, hedgerows systems in most of the livestock regions, silvopastoral practices in the mountains, etc.) there are newer systems being developed. Over the past thirty years, innovative practices have emerged, building on traditional knowledge, research, and grassroots experiences from pioneer farmers. These evolutions have occurred mainly in arable crops, poultry, viticulture, and market gardening.



Photographs of agroforestry systems from France



Hedges and windbreaks (including riparian buffers), alley cropping associating cereals and nut trees and vegetable orchards are examples of agroforestry systems that are increasingly being rediscovered and adapted to the current constraints on the agricultural production (incl. mechanisation). Many "modern" agroforestry practices also seek to increase permanent soil coverage and encourage sustainable soil management practices. Agroforestry farmers are often engaging a more global transition towards agroecology, including conservation agriculture practices, minimum tillage, rotational grazing, and others.





Wood pastures including forest tree species and wild fruit trees are important landscape elements in Hungary. Additionally, grazed forests as part of the silvopastoral systems have always been an integral part of land use as demonstrated by a number of archived, historical sources and oral historical data. The economic and social value of such systems is hinted in the name “Glandifera Pannonia” (meaning ‘acorn bearing Pannonia’) to denominate Transdanubia in the Roman Age. The significance and operation of silvopastoral systems has reduced substantially in the past 100 years, and common ownership of pastures in forested areas has vanished almost entirely. Researchers estimate that there is currently only around 5,500 ha of used or abandoned wood pasture in Hungary, with a third in a protected area. In AGFORWARD, the coverage of woodlands and shrubland/grassland with sparse tree cover is estimated to exceed 36,000 ha. Although there is a significant interest in the benefits of agroforestry, there is a lack of basic knowledge about agroforestry practice and no information available about the number or total area of AF systems.



Agroforestry systems help to maintain traditional livestock types, eg. Hungarian Great Grey Cattle. Kőlkéd, Baranya County. (photo by Anna Varga)



Hungarian landscape with traditional wood pasture (photo by Anna Varga)

Young alley cropping system (Paulownia & lucerne) planted in 2012, Fajsz, Bács-Kiskun County (photo by Andrea Vityi)



Nowadays, arable agroforestry – excluding windbreaks and shelterbelts – have almost disappeared from the Hungarian countryside. According to Frank and Takács (2012) the total area of shelterbelts in Hungary was about 16,000 ha at the beginning of the 21<sup>st</sup> century. In the latest years, because of the reduced deterioration in the quality and yields of some crops in affected areas due to the effects of climate change several pilot projects started to investigate the possibilities for climate-adaptive arable crop production in agroforestry systems in Hungary. In addition, other agroforestry systems such as intercropping in forest plantations and short rotation coppices combined with livestock can be found sporadically.

Similarly to the northern neighbouring countries, agroforestry is commonly practiced in homegardens, in a form of mixed systems with crops, fruit trees and/or domestic animals. There is no recent data available on other arable agroforestry systems such as alley cropping, riparian buffers, or forest gardens, some of which are considered as new (atypical or not applied so far) land use technologies in Hungary. Recently these silvoarable systems have been established on a small scale mostly as pilot systems for educational and/or experimental purposes.



There are no official data about the state of agroforestry in Slovakia. Agroforestry is nowadays a “brand new” topic for both researchers and farmers. According to Špulerová et al. (2011), current area of traditional agricultural landscapes in Slovakia is less than 1 %. In AGFORWARD, the total extent of agroforestry systems in Slovakia was calculated to be about 43,900 ha (Herder et al., 2017), which is equivalent to 0.6 % of its territorial area. They also present that the most common agroforestry practice seems to be livestock agroforestry that covers 41,900 ha, followed by grazed high value tree agroforestry which covers 2,000 ha. Slovakia has a long tradition of pastoralism and sheep breeding, with favourable natural conditions for these activities. Therefore, probably the most extended traditional agroforestry practice is silvopastoral form (extensive pasture on grasslands/meadows and grazing of extensive high-trunk fruit orchards) remaining in sites with less beneficial conditions for intensive agriculture (e.g. mountains – regions of White Carpathians) and linear tree planting or other woody elements (riparian buffer strips, windbreaks, hedgerows, etc.) on agricultural land.



Former Minister of Agriculture and Rural Development of the Slovak Republic (Stanislav Bečik) is a passionate promoter of growing trees and alleys in agricultural land; Photo by Martin Domok



Active chestnut (*Castanea sativa*) wood pasture in central Slovakia grazed by sheep, Photo by Michal Pástor



Pasture of common juniper (*Juniperus communis*) in Priečhod (central Slovakia); Photo by Vladimír Čaboun

Often, agroforestry practice in Slovak rural areas is commonly practiced in gardens (kitchen gardens or homegardens), for example by growing crops under different tree species or in combination with domestic animals. In recent time, in Slovakia there has been a “big boom” of fast-growing trees (*Paulownia* spp., *Salix* spp., *Populus* spp., *Juglans nigra* etc.) on agricultural land preferentially intended for the production biomass for energy, but also for firewood and edible nuts and often in combination with plant production (vegetable, cereal etc.).



A large abundance of agroforestry areas can be found in the south-western, central and northern parts of Spain. The total estimated AF area (high value tree + livestock + arable agroforestry systems) is approximately 5,584,400 ha, which represents 23.5% of the Spanish UAA (Herder et al. 2017). According to another estimation, only about 5.2% of the cultivated land has agroforestry systems and only 4.9% of the arable crops are carried out in plots with trees (Lumbreras, 2011).



Photographs of dehesas in which agroforestry uses are observed.  
Source: Cristóbal Gómez Rubio.

One of the most representative agroforestry systems is the Dehesa with an estimated area of 3.5 million ha in the five Autonomous Communities where these formations appear<sup>3</sup>. Of this area, Extremadura has almost 1,250,000 ha (35%), Andalusia with almost 1,000,000 ha (27%), Castilla La Mancha with 750,000 ha (21%), Castilla y León with 500,000 ha (13%) and Madrid with less than 100,000 ha (3%).

## 5. The role of trees in the past and the reasons for using them today

Before the industrial revolution, huge quantities of biomass, firewood, etc. were needed to supply the population with energy. During this time, massive felling of trees was carried out for use as a source of energy or for construction. In these traditional systems, trees had multiple roles and therefore were used – depending on the species – for mainly the following purposes:

- producing food for humans and animals
- producing wood-timber for building, furniture in housing, and boats
- producing wood poles for fencing and plot limits
- source of energy (firewood, charcoal)

<sup>3</sup> Diagnosis of Mediterranean Iberian dehesas (MAPA 2008)

Today, the structure of wood utilization has changed, but its multipurpose character remains. Nowadays it is based on the principles of increasing biomass production per hectare and improving ecosystem services. By integrating trees, the functions of the production system increase significantly and the following complex roles are performed:

- a) Environmental:** integrating woody vegetation into a production system offers many benefits to the ecosystem, both for the soil and for biodiversity. The installation of woody plants in or near crops and pastures creates habitats for associated flora and fauna and thus enhances biodiversity both above and below ground, but also provides shelter for domestic animals during bad weather or extreme heat. Trees not only prevent water and wind erosion by favouring water infiltration and providing vegetation cover, but also improve soil structure by the roots and the return of organic matter to the soil (through the decomposition of leaves and roots or use of its remains for composting). The organic matter content is increased and thus soil fertility and conditions for the edaphic fauna are improved. In addition, this technique offers a partial solution to the oversupply of chemical inputs applied by the farmer through roots that draw their resources from deeper soil layers. This limits the leaching of these inputs into groundwater along with optimization of the use of nutrient resources. Finally, trees greatly contribute to balancing climatic extremes and their impacts by creating a specific microclimate (mitigation in terms of light, wind, temperature etc.), thus supporting the so-called small water cycle and increasing system resilience to climate change. These aspects are particularly relevant in areas with strong winds, as trees soften their intense drying effect. Besides this, agroforestry is considered climate regulatory service due to CO<sub>2</sub> capture into long-term carbon sink (in form of wood).
- b) Economic:** preserving or increasing total production according to the Land Equivalent Ratio (LER) principle; greater production security, multifunctional farming and distribution of risk of farming, providing pasture/fodder to animals, human food, inedible materials including firewood, sap, resins, tannins, insecticides and medicinal compounds, and high-quality products. Trees help to improve the bottom elements of the agro-ecosystem (e.g. through shading). Linear AF systems (e.g. windbreaks, hedges) protect the production systems. Beneficial effect on the population of pollinators (new habitats) play a crucial role both economically and environmentally. Economically, it can increase yields as well as provide additional revenue streams, thus increasing profits for farmers and landowners due to additional sales of crops and side commodities. Intermediate incomes can be expected if fruit species have been planted, as well as through the production of firewood, basketry etc.
- c) Social and cultural:** AF brings forth an increase of employment in the countryside (more manpower is needed per unit area), and with it the stabilization of the rural population. It supports self-sufficient family farming and intergenerational exchange in the farm management. Traditional agroforestry practices promote cultural traditions and habits, bring back local food and heritage varieties and maintain popular knowledge linked to the production system and its elements. In this way, AF improves the relationship of the population to the landscape. Furthermore, it can play an important role at territorial and landscape levels, as it also offers new landscapes, which adds value to ecosystem services for recreation but also contributes to improving health and well-being of both rural and urban communities. Agroforestry offers a positive image of agriculture, which is an asset from a societal point of view.

Trees that are planted in lines close to each other provide several advantages. They are encouraged to grow faster and taller with a straight trunk. Through trees and shrubs, it is possible to harvest elm, chestnut, hornbeam for the production of coppice or meadow poles. Densely planted trees and low growing shrubs

also act as wind-breaks and can be attractive to small game such as rabbits, hares and pheasants. Improved animal grazing, cow corridors, growing crops without compacting the soil, and bringing back local food and heritage varieties are further positive impacts of agroforestry.

The possibilities for economic utilisation of trees in European agriculture are becoming more and more widespread. In the last decades, the diversity of agroforestry tree species has been expanded to other species and genera of valuable broadleaf trees. Besides the domestic species that are suitable for agroforestry systems (eg. *Quercus rubra*, *Acer pseudoplatanus*, *Fraxinus excelsior*, *Alnus glutinosa*, *Tilia cordata*, *Prunus avium*, *Sorbus* spp., *Corylus* spp. or *Juglans regia*) the planting of *Robinia pseudoacacia* L. is also possible in the warmer and drier areas of Central-Eastern European countries. The use of fast growing tree species such as hybrids of *Salix* spp., *Populus* spp., is also typical in those regions. Non-local and hybrid species – i.e. *Juglans* spp. – are also mentioned in studies, however, for these non-native species, specific management practices must be used to minimize the risk of invasive behaviour. The selected species should be capable of providing the products and services desired by the landowner, but it is also important to match the species with the local site conditions.

## 6. Pros and cons from the point of view of farmers and land managers

The role of farmers is increasingly important in the development and practice of agroforestry measures, and can be the driving force behind its success. Despite the many benefits of agroforestry, the number of farms using agroforestry measures remain low. There are still many obstacles that seem to limit AF development:

- reluctance to switch to agroforestry for fear of reducing agronomic and financial performance of the farm and strong social pressure to continue farming as industrial agriculture sets;
- trees are perceived as an obstacle to modernization, as it is more difficult for large machines to pass through the land;
- economic and environmental benefits are perceived in long term as compared to annual cropping;
- elimination of trees, hedges and alignments structuring the landscape to expand the cultivated plots and facilitate mechanization;
- agroforestry systems are complex, labour-intensive and demand additional skills and knowledge;
- low economic interest in production of firewood, due to cheap fossil fuels;
- financial expenditure and mobilisation of human resources can be substantial, while the financial benefits will only come to the valuation of the wood products, in the medium and long term;
- planting trees out of forest is complicated due to the lack of concept of agroforestry in the national law;
- lack of information about methods of agroforestry farming (e.g. on plant combinations or protection of seedlings in combination with grazing animals) and lack of proper technical advice available to farmers (especially tree monitoring/management);
- lack of decisive support from public administrations prevents farmers to continue or start a new activity;
- lack of information on economic references;
- complexity of administration associated with the introduction of agroforestry.

## 7. Important skills to manage an AF system successfully

The results of the survey carried out within AGFOSY reflect that the stakeholders consider the followings as important skills to manage AF systems successfully:



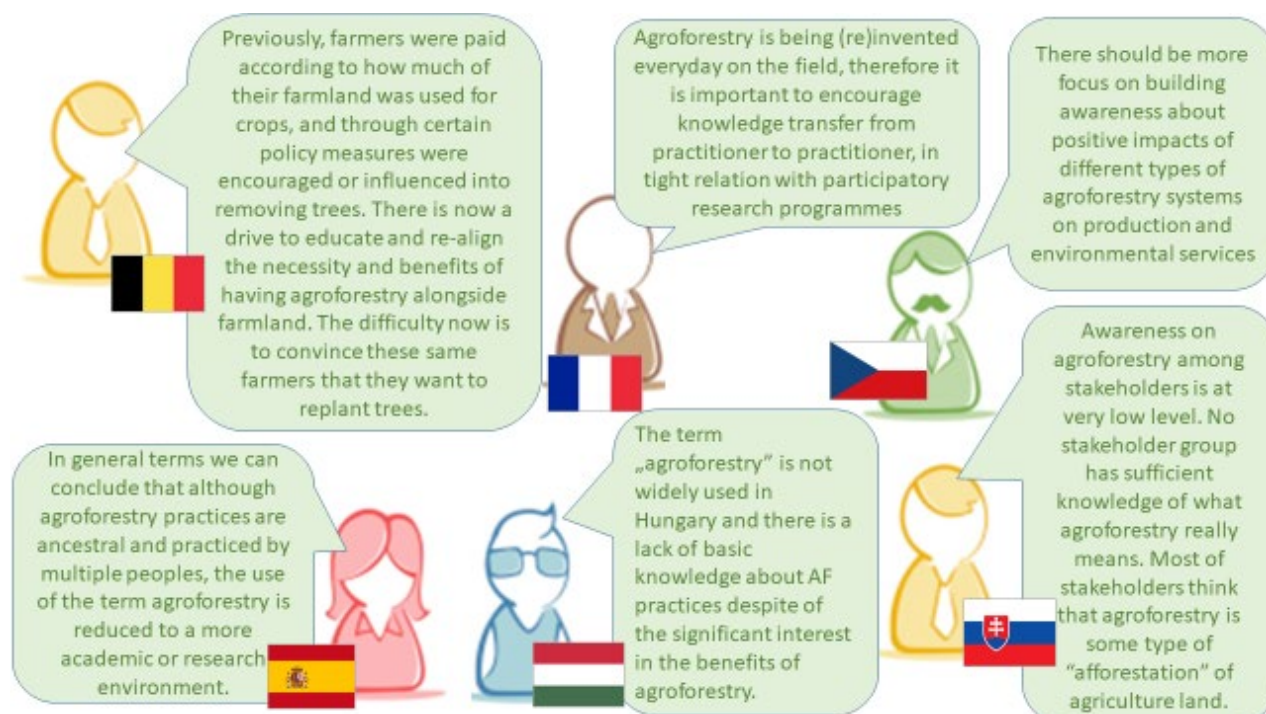
According to the interviewees, the lack of knowledge, practical examples, and the attitudinal deficiencies are the main constraints. Some of the interviewees think that the main barrier is not the lack of expertise, but of the intent and that, the support system is not capable of disrupting it.

According to the respondents, study tours, online training materials, and complex adult training programmes can help farmers the most in the first implementation and management of AF systems. The larger part of the stakeholders are aware of the training and educational programmes, but most of them are busy with their farm and cannot afford it.

## 8. Awareness

There seems to be a lack of knowledge about agroforestry throughout Europe. This is why there is a strong need for long-term interdisciplinary and trans-disciplinary research and demonstration projects as well as useful tools for planning, designing, and maintaining agroforestry projects, developed in close collaboration with different stakeholders. Promotion of agroforestry through marketing products from agroforestry systems, or organisation of promotional activities on agroforestry for diverse groups of stakeholders could also help in awareness raising.

In relation to agroforestry terminology, important confusions and multiple differences depending on the author has been recognised. There is lack of terminology mainly in the Central-Eastern European countries, but the main thing which is missing – according to French experts – is the “Ontology of Agroforestry”. However, from farmers’ perspectives, this issue has no direct practical relevance; it is essential to develop the right policy and professional communication that can help to spread agroforestry.



## 9. Agroforestry R & D & I

The countries involved in AGFOSY agroforestry research and innovation activities shown in Table 3 are currently focusing on:

- creation of scientific background for agroforestry systems (evaluation of potentials, monitoring of ecosystem services, developing decision support system);
- development of decision-support tools, models and tools focused on innovations for farmers in favour of agroforestry systems and mixed farming systems;
- encouraging exchange and transfer of knowledge between scientists and agroforestry practitioners, putting research results into practice and promoting innovative ideas to address the challenges and solve the problems of practitioners;
- expanding the current AF networks to ensure actual adoption of innovative agroforestry practices;
- evaluation of the benefits and constraints of using agroforestry systems with a focus on the socio-economic, legal and environmental context.

*Table 3: Overview of the R, D, I programmes/projects on AF in AGFOSY-countries (I: international project; N: national project. Detailed description of projects are available in the country reports)*

Country	Closed until 2019	Ongoing or planned
Belgium	<p>I: AGFORWARD (AGroFORestry that Will Advance Rural Development)</p> <p>I: AGROFE (Transfer of agroforestry knowledge by transforming research results into pedagogical material )</p>	<p>I: AFINET (AgroForestry Innovation NETworks)</p> <p>N: ‘Agroforestry Vlaanderen’ (“Agroforestry in Flanders”) (2014 – 2019)</p> <p>I: INTERREG “<a href="#">Forêt Pro Bos</a>”</p> <p>I: INTERREG “AForCLIM”</p> <p>New project specific to hedge management starting in 2019</p>
Czech Republic		<p>N: “Agroforestry - potential for regional development and sustainable rural landscape”</p> <p>N: Agroforestry systems for conservation and rejuvenation of landscape functions threatened by climate change</p>
France	<p>I: AGFORWARD (AGroFORestry that Will Advance Rural Development)</p> <p>N: Ecosfix (ecosystem services of tree roots in AF systems)</p> <p>N: Casdar Smart (veg. orchards) , Casdar Arbèle (ruminants) Casdar Vitiforest</p> <p>N: Réseau Rural Agroforestier (Rural Network)</p> <p>I: AgroFE</p> <p>I: AGROF-MM</p>	<p>I: AFINET (AgroForestry Innovation NETworks)</p> <p>N: Agr’eau Adour Garonne (regional programme supporting AF development at landscape level)</p> <p>N: Bouquet project on the AF chicken</p> <p>N: MycoAgra project (impact of AF on soil biota)</p> <p>N: RMT</p> <p>I: Poplar AF</p>



Hungary	<p>I: AGROFE (Transfer of agroforestry knowledge by transforming research results into pedagogical material)</p> <p>I: AGFORWARD (AGroFORestry that Will Advance Rural Development)</p> <p>I: AgrofMM – Training in agroforestry</p>	<p>I: AFINET (AgroForestry Innovation NETWORKs)</p> <p>N: Széchenyi 2020</p> <p>EFOP-3.6.2-16 - Grow together with nature – agroforestry as a new breakout opportunity</p> <p>N: Széchenyi 2020</p> <p>EFOP-3.6.2-16 - Sustainable raw material management thematic network development - RING 2017</p>
Slovak Republic		<p>N: "Agroforestry systems for combined production and more efficient use of agricultural land" (planned)</p> <p>I: SMARTFARM (Smart Farming: Fostering Mixed Farming) Systems and Agroforestry (planned)</p>
Spain	<p>I: AGFORWARD (AGroFORestry that Will Advance Rural Development)</p>	<p>I: AFINET (AgroForestry Innovation NETWORKs)</p> <p>N: Life11 BIO/ES/000726 Dehesa Ecosystems: development of policies and tools for the management and conservation of biodiversity</p>

Depending on the type of actions, the final outputs are dissemination and training materials (written, audio/video) and scientific publications, tools and methodologies for the application and implementation of agroforestry, inventories and models, definition and classification of agroforestry practices, knowledge reservoirs.

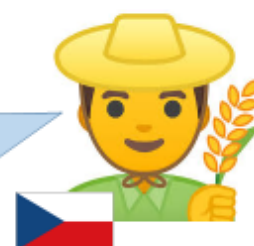
## 10. Education, training

Agroforestry has existed since ancient times, and as such, it was part of common knowledge. As the process of automatic intergenerational knowledge transfer has been interrupted in recent decades and some of



In Belgium, agroforestry education is included in some universities which participate in research, studies and projects around agroforestry. Agroforestry master classes are recently created to disseminate the information to farmers, policy makers, advisers, and other stakeholders. Also, training programs to farmers and landowners are available, supported by professional organisations.

In the Czech Republic there is a long tradition of teaching agroforestry as part of higher education in agricultural sciences. The topic of agroforestry is currently implemented into several study programmes in the agricultural universities, that are open for both MSc and BSc students. Also, several training programmes and events on agroforestry were carried out, involving a wide range of stakeholders. The number of courses and training programs focused on agroforestry is slowly increasing.



the knowledge has been lost with previous generations, the role of formal education and training has become more significant. Recently, agroforestry is present at different levels in the education of the countries involved in AGFOSY. European Agroforestry Federation (including all the countries below) is also a significant party in training programs for agroforestry.



In France, agroforestry is being increasingly integrated within the existing agricultural curricula (most often as optional modules), from the technical high schools to the agricultural and forestry colleges (future farmers and agronomists/foresters). A dedicated course (1 year) was launched in 2015, directed to future AF technicians and advisors. In addition, several lifelong learning schemes developed locally and at national level are available to farmers who wish to gain new practical skills related to an area or another of the agroforestry practice.

In Hungary, traditional agroforestry practices were always part of the higher educational programmes in agriculture, forestry and ecology, though with different nominations. Development of special classes or courses on agroforestry started in the last 4-5 years in the Hungarian universities. Today, special agroforestry training for highly trained professionals is available. There are also short duration (1 day -1 week) educational trainings that are open for all and linked to professional organization or agroforestry-related projects. The number of these activities and agroforestry-related events has been increasing significantly in the latest years.



In Slovakia, education and training is the weakest part of agroforestry. There are no practical or theoretical courses on agroforestry education and training yet. Agroforestry is not taught at any Slovak university and there are no study programs focused on it. Due to the fact that this topic is relatively new, there is lack of qualified lecturers and professionals, who are able to train and educate students and different groups of stakeholders.

In Spain, there is little or no mention of agroforestry systems in education, since for a long time the terms agriculture and forestry have been separated as two different resources, with the forest always being understood as the least profitable and the agricultural as the most profitable one. Some agroforestry systems, such as dehesa, are studied in regulated Spanish training, such as degrees in forest and agri-food engineering or in vocational education and training. There are some examples of university training related to the topic and the ERASMUS intensive courses. There seem to be few specialized training programs or courses on agroforestry.



Generally speaking, while there is a positive trend in higher education, there is hardly any information on agroforestry appearing in high or secondary schools. Thus, agroforestry training of technicians and experts close to the practice would be of high importance.

Among the improvement opportunities for the implementation of agroforestry, we can highlight the strengthening and promotion of formal and non-formal training in agroforestry, adapted to all kinds of audiences, from researchers to farmers, which would democratise knowledge. For example, by the transfer of knowledge from research centres to the field through medium and long-term programmes that guarantee its sustainability and durability. Therefore, public investment in research programmes is inevitable to achieve further progress in the field of knowledge and innovations that help decision-making.

## 11. Legislation & support

One of the main barriers for the implementation of agroforestry is the legal background. Planting and managing trees in agricultural land is a complicated issue from legislative point of view both in the Czech and the Slovak Republic. In these countries, the law does not allow tree growing on farmland (except for fast growing trees) and grazing in forest lands. Even in Hungary, forest grazing can only be carried out under tight constraints.

Agricultural policy is determined by the European Common Agricultural Policy and then implemented by the countries and regions individually. At present, the main support for agroforestry comes from the Common Agricultural Policy (CAP) measures 2.2.2 and 8.2. Recently, pillar 1 of the CAP, the basic payment of agroforestry is subject to the same eligibility conditions as agricultural parcels. If non-agricultural elements such as the number of trees per hectare or other criteria (hedges, groves) are in accordance with the general conditions of the CAP, the farmer receives basic aid. If the farmer wants to obtain the green payment (which is a complement to the basic payment if certain environmentally friendly conditions are respected) he can value some of his agricultural features as Ecological Focus Area (EFA). Agroforestry can be counted, under some conditions, as EFA that have to reach an equivalent of 5% of the arable land area for the farmer to be able to claim the green payment. It can be stated that the Common Agricultural Policy under both pillars supports and - at the same time and to some extent - restricts the planting of trees on agricultural land. Cross compliance conditions restrict tree felling (basically overlapping with general tree conservation constraints) rather than encouraging planting. Voluntary schemes (RDPs and other support programs) support the planting of trees, albeit with restrictions on stemming, in particular, from the protection of conflicting interests. In addition, to facilitate transfer of technologies known in the scientific world into practice, funds were allocated within the rural development plans for the creation of operational groups.

In most countries, the main turning point in regard to land and tree use, came in 2006 with changes to the CAP. Prior to this, farmers were penalized for having trees on their land, and as such, would cut as many of them as possible to ensure the largest subsidy. After 2006, when the CAP framework evolved, farmers began (re)planting trees, hedges and woodlots. Today, policy measures between regions within the same country often differ due to the different physical conditions, population density and historical context. In Belgium for example, whilst Flanders implement sub measure 8.2 relating to the establishment and maintenance of agroforestry systems, Wallonia does not implement this sub measure, however, there are alternative subsidies arising for supporting planting and maintenance of agroforestry systems such as alley cropping, hedges and linear short coppice systems.

There are numerous projects and strategies for promoting agroforestry (eg. AFINET Thematic Network). Word of mouth and education have caused additional agroforestry measures to be implemented however, their number is less calculable.

A legal definition of agroforestry in the Central-Eastern European countries' legislation is still missing and land-use policy does not work with the concept of agroforestry. Plots managed as a mix of agriculture and forestry are rare and remain unrecognized by the cadastral land-use categorization. In the Czech Republic

and in Slovakia, agroforestry is not supported by any specific programme, but there are initiatives in both countries aimed at collaborative agroforestry policy development. Preparation of a specific measure for implementation of AFS in the next programming period of EU CAP has already been started by the CSAL and the Czech government. There are some grants and programs that can be used to increase the ecological functions of the land (e.g. “Operational Programme Environment - Priority Axis 4 Protection and care for nature and landscape”, “Country Care Program” and “Greening” in the Czech Republic). In the Czech Republic, Ministry of Agriculture together with Ministry of Environment and CSAL are preparing a new measure for financial support of establishment and management of AFS during the first 5 years under the Pillar 2 Rural Development Program. The measure will be probably implemented during 2020-21.



*Figure 1 Panorama of a traditional agricultural landscape in Hriňová region (central Slovakia), Photo by Vladimír Čaboun*

During the 2007-2013 period, Hungary was the only country in Central Europe that implemented the EU Measure 222 (First Establishment of Agroforestry on Agricultural Land) which opened the eligibility period lasting for 6 years from 2009. For the 2014-2020 period, the conditions of support have changed, but the number of options for implementation of AFS increased by extending the support beyond the implementation of wood pastures to shelterbelts and AF innovations through the creation of operational groups.

In Spain, specific programs such as the Master Plan for the Andalusian Dehesa as well as those aimed at improving production linked to Dehesa and the processing industries for their products provide significant support for agroforestry. Further funding is available for other related activities such as diversification of uses, integrated planning or improvement of basic services, infrastructure and equipment. Moreover, national projects and materials focusing on the conservation and integral management of Dehesa as well as the development of Law 7/2010 for Dehesa through the promotion of the main management instruments provided therein. Other agroforestry systems such as family orchards or live fences lack institutional support for their survival.

The institutional support of agroforestry in France is ensured by:

- The implementation of measure 8.2 of the CAP (Pillar 2) in about 30% of the regions;
- Regional/local policies and programmes (including funding for planting and R&D activities);
- Natural resource management and landscape planning frameworks promoting agroforestry implementation and knowledge transfer;
- A national plan for agroforestry (2015-20)<sup>4</sup> set as a national strategy to enhance the visibility of agroforestry on the political agenda.

<sup>4</sup> <https://agriculture.gouv.fr/sites/minagri/files/1608-ae-synthese-agroforesterie-gb-bd.pdf>

## 12. Civil initiatives

Agroforestry civil organisations exist or are being prepared in all countries within AGFOSY (Table 4). Their main objective is the promotion of agroforestry on national level and – as member association – to contribute to the work of the European Agroforestry Federation (EURAF), the umbrella organization for promotion of agroforestry in Europe. Civil initiatives provide the core of knowledge transfer by carrying out several dissemination and communication activities such as organising seminars, workshops, excursions and field exercise for farmers and other stakeholders and thus enable the farmer-to-farmer transfer of good agroforestry practice.

*Table 4: Agroforestry civil organisations in AGFOSY-countries*

Country	English name of AF civil organisation	Year of foundation
Belgium	Association pour la Agroforesterie en Wallonie et á Bruxelles (AWAF)	2012
Czech Republic	Český spolek pro agrolesnictví/Czech Association for Agroforestry (CSAL)	2014
France	Association Française d'Agroforesterie (AFAF)	2007
	Association Française Arbres Champêtres et Agroforesteries (AFAC)	2007
Hungary	Agroerdészeti Civil Társaság/Hungarian Agroforestry Civil Association (ACT)	2014
Slovak Republic	Slovak Agroforestry Association (SALS)	under preparation
Spain	Asociación Agroforestal Espanola/Spanish Agroforestry Association (AGFE)	2016

Other social entities have been working for decades to support agroforestry systems such as Via Campesina in Spain.

## 13. Does agroforestry bring cost saving and increase incomes?

The cost savings and incomes relating to agroforestry depend on the type of AF implemented and the skills of the farmers/practitioners managing those systems. For instance, in the strategy “fruit trees associated with vegetable production or poultry production”, the farmer can expect an increase of income (diversification), with the results becoming more significant after 3-4 years. In order to build sustainable strategies, agroforestry trees have to be productive (fruits but also fuelwood, chipped wood for animal bedding etc.) and fully integrated into the economy of the farm. In addition, AF must go together with a change in agronomical strategy in between the trees. Covering soils and building integrated multi-strata systems is essential to reach a systemic approach that makes sense to farmers.

When talking about soil and plant protection strategies, the expected return of AF is a reduction of inputs (reducing chemicals and pesticide use), thus the short to mid-term objective is a reduction of costs and in longer term an improvement of soil quality and a higher quality of the final products.

The benefits of integrating trees in livestock systems include animal welfare, disease control, nutrient retention, diversification of feed sources and protection of animals, which, combined, can significantly lower animal stress and increase feeding efficiencies. Producers believe that cattle provided with protection spend more time eating and less time huddled up for warmth. Therefore, cattle can gain more weight per unit of feed.

Indeed, the limiting factor in the application of agroforestry is the reduction in the hectare yields of agricultural production. Timber production can be a component that improves yields per land unit. However, this will happen in a longer term than is common in intensive farming. Planting of fast-growing trees is a way to shorten the return time and integrate agroforestry in farmers' short-term strategies, or at least bring the concept closer to them.

On the other hand, there is a need for economic valorisation of the ecosystem services provided by agrosystems, which are currently neglected in terms of the conventional economy despite their singular relevance. Once these systems are valued, agroforestry will be profitable in all its extremes.

The revenue within high value tree systems can be increased by introducing intercropping or grazing while the shading by trees can also provide yield benefits in some arable systems. For this reason, AF should be used more widely in agricultural areas where large blocks of arable land are very common or on sloping land, for example in South Morava, or in the plains of Hungary. Computer modelling of agroforestry, using validated models, can provide guidance on the short- and long-term benefits of different agroforestry designs in terms of yields and financial impacts (Burgess and Rosati, 2018).

As described in chapter 3, the re-introduction of trees into the landscape represents the potential for improving the productivity and ecosystem services of land use systems. In the CE-European countries there are several hundreds of thousands of hectares of unregistered, abandoned areas that are not used for various reasons. These plots can represent the potential for agroforestry.

AF farmers often sell their high quality domestic products on local markets, in local shops or shared shops. Some farmers even deliver their produce straight to restaurants that focus on healthy and sustainable products. Products sold in this way gain a higher added value. However, there is a relatively large difference in short-chain market possibilities between the investigated countries (e.g. much less in the Czech and Slovak Republic compared to western countries). In case of lower volume, high quality AF food products are easily sold on local market, therefore farmers who produce relatively small quantities of products do not feel the need for extra market opportunities.

## 14. What could further enhance agroforestry among farmers?

The most important issue to enhance agroforestry among farmers is to break the barriers that prevent them from planting trees on agricultural land (see chapters 4 and 9). To this end, beside the development of a supportive legislative background and redesign of European policies (i.e. coherent development of conditionality, eco-schemes and rural development measures), the enhancement of the level of AF-knowledge among farmers is crucial. Although educational programs inside and outside the school system contribute substantially, the most effective way to achieve this goal is delivering professional information to farmers, *by advisors and by farmers*. Transfer of knowledge *between farmers* in field training-visits, farmers' trainings including practical and on plot activities, and a strong network of counsellors to advice and support farmers need to be encouraged. Furthermore, to reduce the administrative burden on the farmers, the development of advisory services as well as special forums for farmers to meet relevant

stakeholders are of high importance. In addition to this, the network of advisors is lagging behind (especially the CE-European countries).



Due to economic realities, farmers tend to focus on short term solutions. This is often due to the farmer not being the owner of the land they are farming. As a result, they do not consider agroforestry economically viable because the long-term advantages of agroforestry does not have such a big impact for them. Farmers are often concerned about losing cropland to trees however, proper selection of tree species and careful planning, planting and management can significantly

increase the total productivity of the entire production system. In addition, ecosystem services are important components of return, but mostly they are not valuable in the short term. Thus, more information should be provided to practitioners about the financial benefits of agroforestry.

In order to strengthen the marketing of AF products and running profitable farms, the creation of public product processing centres (coordinating logistics, marketing and distribution channels) should be supported to obtain greater added value and encouragement for producers to sell their products through short channels.

Agroforestry does not work without long-term land availability, therefore, facilitating access to land is crucial, for example by the creation of "land banks" aimed especially at rural women and young people. In this way, strengthening the transfer of agroforestry traditions and knowledge between generations could also be promoted.

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