E·L·N F·A·B

Functional AgroBiodiversity

for a more sustainable agriculture and countryside in Europe

In short

EU farmers and policymakers increasingly acknowledge that biodiversity and agricultural production need not necessarily be in conflict, but can potentially strengthen each other, as experience has already shown. Understanding the relations between biodiversity and sustainable agricultural production, and translating such knowledge into management practices that can be applied at the scale of farms and landscapes, is of key importance for a robust and environmentally friendly agriculture in Europe. In this context, the concept of Functional AgroBiodiversity (FAB) has recently been introduced.

This folder describes the concept of Functional AgroBiodiversity (FAB) and the benefits it can provide for a more sustainable agriculture. FAB has been defined as 'those elements of biodiversity at the scale of agricultural fields or landscapes, which provide ecosystem services that support sustainable agricultural production and can also deliver benefits to the regional and global environment and the public at large'.

There is a need to develop and share knowledge and practical experiences among relevant stakeholders, in order to strengthen the informed use of agrobiodiversity to the benefit of agricultural production and environmental quality in Europe. Examples of effective practices and potential benefits are given.

The European Learning Network on Functional AgroBiodiversity (ELN-FAB) provides a platform for exchange of knowledge and practical experiences between farmers, policymakers and scientists to enable fast and effective implementation of best practices, and to promote sustainable agriculture in the EU Member States, Norway and Switzerland.

Introduction

Interdependence of agricultural production and biodiversity

In recent years there has been growing awareness and recognition in different sectors of society that the conservation and sustainable use of biodiversity is key to human well-being. Biodiversity plays a pertinent role in the provision of ecosystem services, including those that are essential to sustainable agricultural production. Wild plants and animals, the cornerstones of biodiversity, are the origin of all crops and domestic livestock and the variety within them. In addition, components of biodiversity in agricultural landscapes maintain ecosystem services such as pollination, biological pest control, soil and water conservation, nutrient cycling, and climate regulation.

Modified landscape management and alternative farming practices can contribute to biodiversity conservation in various ways. However, biodiversity in and of itself does not automatically translate into ecosystem services such as enhanced pollination or natural pest control. To optimize these benefits, we need to understand which biodiversity elements drive these ecosystem services. Based on this information, benefits to farm productivity can be

EXAMPLE OF FAB-BASED PRACTICE
Provide habitat and resources to pollinators on farmland, through implementation or conservation of semi-natural landscape elements

TYPES OF ECOSYSTEM SERVICES PROVIDED
Pollination

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Increased yields and quality of farm crops that require pollination; landscape aesthetics

generated through a rational design and management of agro-ecosystems and landscape structures. Such management strategies can range from informed choice of non-crop vegetation such as field margins, forests, hedgerows, and other non-crop elements, to conservation tillage, crop diversification or crop rotation.

Agriculture is undoubtedly one of the main driving forces which influence biodiversity in Europe, as about half of the EU territory is under agricultural use. Recognition of the strong links between biodiversity and agriculture is reflected in policy frameworks at the EU and national levels. So far, environmental policies in the EU have primarily focused on negative impacts of agriculture on biodiversity and ways to alleviate these. More recently, European farmers and policymakers have increasingly recognized that agricultural production and biodiversity need not necessarily be in conflict, but are interdependent and can strengthen each other. In response to these changing perspectives policymakers have started to integrate ecosystem health into some sectoral policies with a focus on harnessing synergies between biodiversity conservation and sustainable production.

EXAMPLE OF FAB-BASED PRACTICE
Hedgerows

TYPES OF ECOSYSTEM SERVICES PROVIDED
Soil and water conservation

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Reduced soil erosion and water loss; less damage to infrastructure; landscape aesthetics

Biodiversity plays a pertinent role in the provision of ecosystem services, including those that are essential to sustainable agricultural production.

EXAMPLE OF FAB-BASED PRACTICE
Use of green manure cover crops, including legumes

TYPES OF ECOSYSTEM SERVICES PROVIDED
Maintenance of good soil structure and nutrient cycling by a diverse community of soil organisms; retention of nutrients

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Reduced dependence on external inputs; reduced environmental impacts

Challenges to the EU agricultural sector

Major challenges to the EU agricultural sector are, among others, related to the negative impacts of intensive agriculture on environmental quality and its high dependence on non-renewable resources. Other urgent issues are the negative impacts of land-use intensification and land abandonment on biodiversity. In addition, the direct and indirect impacts of climate change on agroecosystems and their productivity are becoming more apparent. The interactions between land use, biodiversity and climate change are of fundamental importance, as the agricultural sector is viewed as being part of the problem and part of the solution.

These challenges call for new approaches to agricultural management that reconcile food, fibre and fuel production with the conservation and sustainable use of biodiversity in order to strengthen the delivery of ecosystem services to the benefit of the agricultural sector and society as a whole. Benefits to agricultural productivity can include improved pollination, natural pest control, nutrient cycling, and water conservation, and as a consequence a decreased demand for external inputs and the production of higher quality and value added products as well as increased resilience and adaptive capacity of agricultural production systems against disturbances or climate change. Benefits to society as a whole include reduced environmental impacts, conservation of wild biodiversity, landscape aesthetics and mitigation of greenhouse gas emissions.

Understanding interactions between biodiversity and agricultural production, and translating this knowledge into management practices that can be applied at the farm and landscape levels is therefore of key importance for a robust and environmentally friendly agriculture in Europe.

EXAMPLE OF FAB-BASED PRACTICE
Field margin management to provide alternative food sources and overwintering sites for pest natural enemies

TYPES OF ECOSYSTEM SERVICES PROVIDED
Biological pest control

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Reduced costs of external inputs; reduced environmental impacts; reduced pesticide residues landscape aesthetics

EXAMPLE OF FAB-BASED PRACTICE
Reduced tillage for enhancing earthworm numbers and diversity

TYPES OF ECOSYSTEM SERVICES PROVIDED
Maintenance of good soil structure; nutrient cycling

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Improved water infiltration; less waterlogging; reduced soil erosion

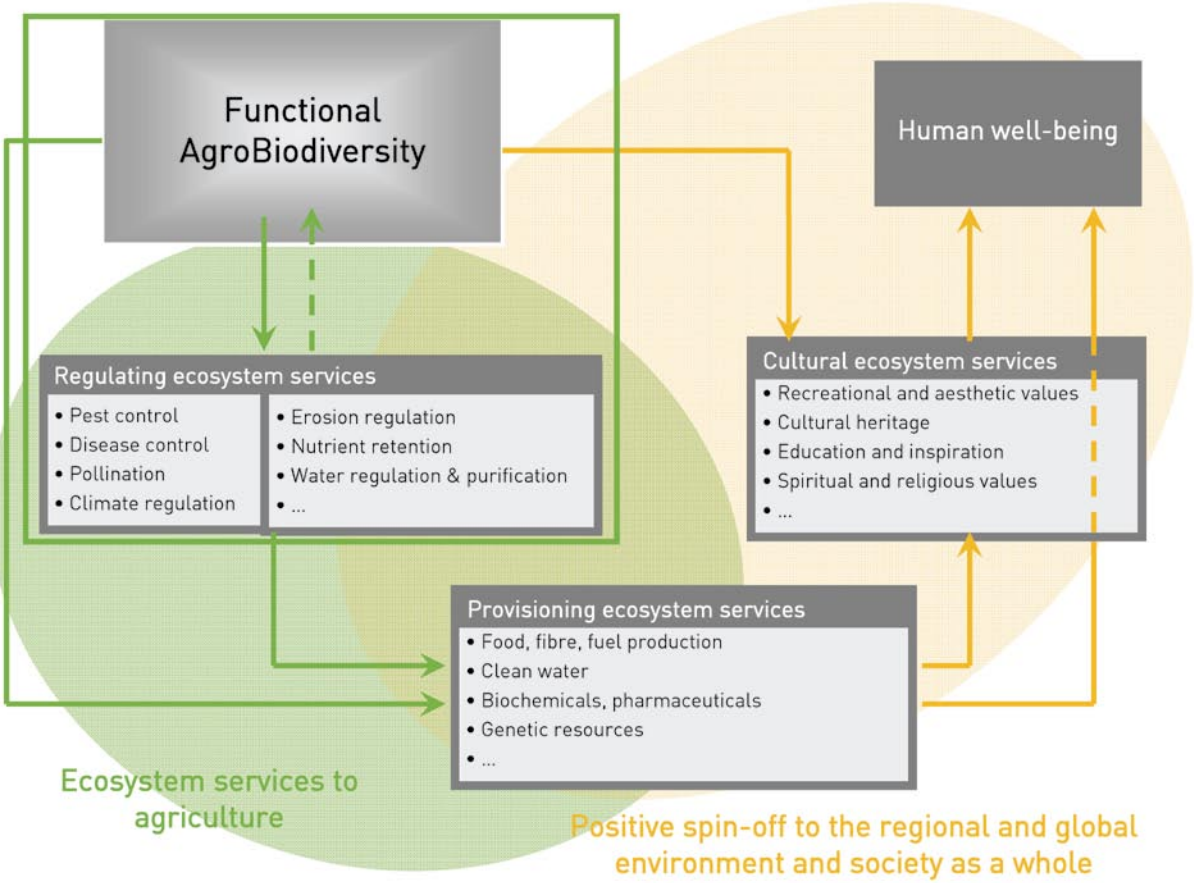
Functional AgroBiodiversity

The concept
The concept of Functional AgroBiodiversity has recently been introduced and is increasingly being used as a framework in scientific research, policymaking and on-farm implementation.

Functional AgroBiodiversity (FAB) has been defined as: 'those elements of biodiversity on the scale of agricultural fields or landscapes, which provide ecosystem services that support sustainable agricultural production and can also deliver benefits to the regional and global environment and the public at large' (ELN-FAB, 2009; www.eln-fab.eu).

Functional AgroBiodiversity uses science-based strategies to optimize regulating, provisioning and cultural ecosystem services (Figure 1). Positive synergies often exist among regulating, provisioning and cultural services and with biodiversity conservation.

Figure 1. Conceptual diagram showing the relationships between Functional AgroBiodiversity and ecosystem services with benefits to agriculture and society as a whole (adapted from the Millennium Ecosystem Assessment, 2005).



The concept of FAB is therefore not synonymous with farming systems or broad agricultural concepts such as 'environmentally friendly agriculture', 'sustainable agriculture', 'organic farming', or 'multifunctional agriculture'. However, FAB can certainly be an element of such systems, in the same way it can be an element of conventional farming systems or integrated landscape management. The difference lies in that FAB emphasizes the application and development of informed management practices that specifically enhance and exploit elements of agrobiodiversity for their role in providing ecosystem services, irrespective of the type of farming system(s) they are being applied to. Examples of such biodiversity-based practices and their connection to ecosystem services are given in the text boxes.

The interactions between land use, biodiversity and climate change are of fundamental importance, as the agricultural sector is viewed as being part of the problem and part of the solution.

EXAMPLE OF FAB-BASED PRACTICE
Production of rare, traditional crops, cultivars or animal breeds

TYPES OF ECOSYSTEM SERVICES PROVIDED
Conservation of plant or animal genetic resources

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Improved income from value added specialty products; future adaptive capacity and resilience to disturbances

The benefits

In an increasing number of European countries targeted agrobiodiversity schemes are used as a functional tool for achieving the sustained delivery of ecosystem services such as natural pest control, pollination, nutrient cycling and water retention. Recent projects in a range of European countries have delivered promising results, including a clear reduction in pest pressure as well as pesticide use on farms. This, together with other examples of benefits as presented above, illustrates that introducing and maintaining the right biodiversity elements is essential for sustaining the ecological functions that ensure agricultural productivity and the sustainable use of natural resources. By recognizing biodiversity as a key element of agricultural production, and by understanding which biodiversity elements generate ecosystem services, we can generate tools for farmers to make their production systems more robust to disturbances and less dependent on external inputs. This will be essential to ensure the delivery of safe and sufficient food, fibre and fuel, as well as public environmental services that all Europeans benefit from.

EXAMPLE OF FAB-BASED PRACTICE
Mixed rotations

TYPES OF ECOSYSTEM SERVICES PROVIDED
Biological pest and disease control; increased soil fertility

BENEFITS FOR FARMERS OR SOCIETY AS A WHOLE
Reduced costs of external inputs; reduced environmental impacts; reduced pesticide residues landscape aesthetics

Future perspectives

The effective application of FAB-based practices at the farm and landscape levels requires the development of interdisciplinary knowledge and translation of knowledge into policies and practices that create synergies between different components of biodiversity and the provision of ecosystem services. The study of the synergies and trade-offs between multiple ecosystem services and the underlying biodiversity is therefore a priority research area for science to respond to societal questions. At the same time, sharing of knowledge and experiences among the relevant stakeholders is essential to its practical application at farm and landscape levels and across geographical boundaries.

The European Learning Network on Functional AgroBiodiversity

The European Learning Network on Functional AgroBiodiversity (ELN-FAB) has been established with the mission to accumulate, document and share knowledge on how biodiversity can be mobilized to the benefit of sustainable agricultural production. The ELN-FAB provides a platform for exchange of knowledge and practical experiences between farmers, policymakers and scientists to enable fast and effective implementation of best practices, and to promote sustainable agriculture in the EU Member States, Norway and Switzerland.

To learn more about it and share your experiences visit www.eln-fab.eu

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Colophon

Design: ECNC
Printing: Drukkerij Groels, Tilburg, the Netherlands
Photos: Clouded yellow (*Colias croceus*), Dutch Butterfly Foundation-Henk Bosma (Cover page); Steenhommel (*Bombus lapidarius*), Saxifraga-Ab Baas (p.2); Clover flowers, Luigi FDV (p.3); Liège (Belgium), Saxifraga-Jan van der Straaten (p.3); Field margin management, Bas van Andel (p.4); South Downs (UK), Peter von Meijenfeldt (p.4); Earthworm (*Lumbricus terrestris*), Ron de Goede (p.5); Hungarian Grey Cattle, Ecotours Hungary Ltd. (p.6); Isère (France), Saxifraga-Jan van der Straaten (p.6); Cornfield, Jorn Boon (p.7); Gerona (Spain), Saxifraga-Jan van der Straaten (p.7); Lapwing (*Vanellus vanellus*), Saxifraga-Luc Hoogenstein (p.7); Farmland flowers, Brabants Landschap-Huub Smeding (p.8)