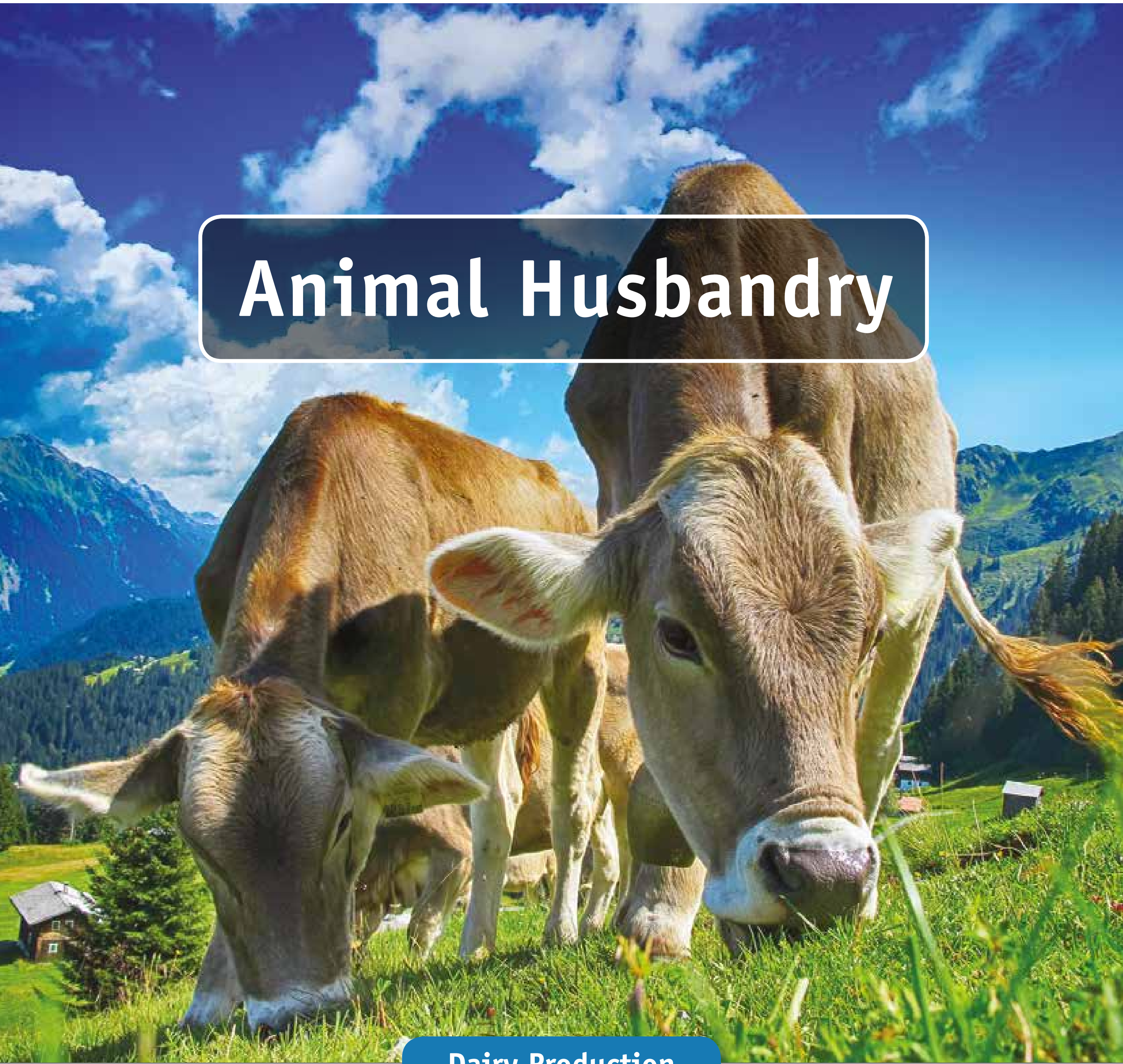
BIODIVERSITY FACT SHEET

FOOD & BIODIVERSITY



Animal Husbandry

Dairy Production

CONTENT

1. INTRODUCTION

The LIFE Food & Biodiversity project supports food standards and food companies to develop efficient biodiversity measures and to include these measures in their pool of criteria or sourcing guidelines.

In this Biodiversity Fact Sheet, we provide information on the impacts of dairy production on biodiversity in temperate climate regions of the EU, as well as ways to very good practices and biodiversity management. Biodiversity-friendly agriculture is based on two main pillars, shown in the graph below. Within this paper, the aspects of "very good agricultural practices" are discussed in each chapter. The aspect of biodiversity management, including biodiversity action plans, is described in more detail in the fifth chapter.

BIODIVERSITY FRIENDLY AGRICULTURE

Reduction of negative impacts on biodiversity and ecosystems (e.g. reduction of pesticides) **VERY GOOD AGRICULTURAL PRACTICES for MORE BIODIVERSITY**	Creation, protection or enhancement of habitats (e.g. creation of semi-natural habitats and biotope corridors) **BIODIVERSITY MANAGEMENT**

The Fact Sheet is aimed at everyone who takes decisions on product design and development, supply chain management, product quality, and sustainability aspects in food processing companies and food retailers in the EU. We wish to raise awareness on the importance of biodiversity in the field of providing key ecosystem services as the fundamental basis for agricultural production.

2. AGRICULTURE AND BIODIVERSITY

Biodiversity loss: time for action

The loss of biodiversity is one of the biggest challenges of our time. Species loss driven by human intervention occurs around 1,000 times faster than under natural circumstances. Many ecosystems that provide us with essential resources are at risk of collapsing.

Conservation and the sustainable use of biodiversity is an environmental issue and, at the same time, a key requirement for nutrition, production processes, ecosystem services and the overall good quality of life for mankind.

Biodiversity is defined as the diversity within species (genetic diversity), between species and of ecosystems.

The main drivers of biodiversity loss are:

- **Habitat loss due to land use changes and fragmentation.** The conversion of grassland into arable land, land abandonment, urban sprawl, and rapidly expanding transport infrastructure and energy networks are causing large habitat losses. 70 % of species are threatened by the loss of their habitats. In particular, farmland flora and fauna has declined by up to 90 % due to more intensive land use, the high use of pesticides and over-fertilisation.
- **Pollution.** 26 % of species are threatened by pollution from pesticides and fertilisers containing nitrates and phosphates.
- **Overexploitation of forests, oceans, rivers and soils.** 30 % of species are threatened by overexploitation of habitats and resources.
- **Invasive alien species.** 22 % of species are threatened by invasive alien species. The introduction of alien species has led to the extinction of several species.
- **Climate change.** Shifts in habitats and species distribution due to climate change can be observed. Climate change interacts with and often exacerbates other threats.

Animal husbandry and biodiversity – a symbiosis

The main task of animal husbandry is to provide a secure protein supply for a fast-growing world population in order to ensure stable livelihoods. Consumption patterns in industrialised and emerging economies have led to an intensification of animal husbandry and a more globalised food market, resulting in enormous changes in the use of agricultural land, grassland and pastures, highly intensive production systems, and worldwide traffic of animal food and animal products.

The production of animal food – thus animal husbandry in general – depends on biodiversity while also playing an important role in shaping biodiversity. Since the Neolithic age, agriculture and animal husbandry have significantly increased the diversity of landscapes and species within Europe. The European continent used to be covered with forests; new landscape features emerged with the expansion of agriculture, including fields, pastures, orchards and cultivated landscapes (such as meadows). The conservation of biodiversity and habitats has been closely linked to agro-systems ever since. Currently, European farmers use more than 47 % or 210 million hectares of arable and grassland areas, which equates to almost half of the surface in Europe (EU-27) for agriculture. Consequently, 50 % of European species depend on agricultural habitats. This symbiotic and beneficial relationship between agriculture and biodiversity has altered fundamentally since the 1950s.

The food sector can substantially contribute to biodiversity conservation. The appropriate integration of biodiversity as a factor into sourcing strategies allows the evaluation of risks for internal operations, brand management or legal and policy changes, improves product quality, and helps to ensure a secure supply to retailers and end customers. A good strategy for biodiversity conservation, i.e. a positive biodiversity performance, opens up opportunities in terms of differentiation in the market, value proposition, meeting consumers' demands and more efficient sourcing strategies.

Legal Framework for Agriculture in Europe – Common Agricultural Policy (CAP)

Since 1962, the EU-Common Agricultural Policy (CAP, Directive 1782/2003/EG and the 2013 amendments) has presented the legal framework for agriculture in the European Union. It was based on the experience of hunger and starvation in Europe and targets on securing the supply of food for the population and the independence of European food supply from international markets. The CAP regulates subsidies to farmers, the market protection of agricultural goods and the development of rural regions in Europe. Farmers receive payments per hectare of cultivated land as well as additional subsidies related to production and farm management.

The EU CAP refers to a set of EU directives, which must be respected by farmers:

- **Directive 91/676/EEC –** "Nitrates Directive" regulates best practices for the fertilisation of crops.
- **Directive 2009/128/EC –** "Pesticides Directive" regulates best practices for the use of insecticides, herbicides and fungicides.
- **Directives 92/43/EEC –** "Flora-Fauna-Habitats Directive" and 79/409/EEC – "Birds Directive" provide the legal framework for biodiversity conservation in Europe, which has been ratified by all member states and directly transferred into national conservation laws.
- **Directive 2000/60/EC –** "Water Framework Directive" aims to improve the state of water bodies in Europe and relates closely to biodiversity.

Since 2003, cross-compliance (CC) regulations address any shortcomings in relation to environmental issues of the CAP philosophy described above. CC represents a first step towards environmentally-friendly farming, forming a principle for linking the receipt of CAP support by farmers with basic rules related to the protection of the environment (besides others). These regulations target general measures to reduce the severe impacts of agriculture on the environment such as erosion, nitrification, pollution of water bodies, landscape change and others. Conservationists only see a small improvement, if any, to biodiversity protection by the cross compliance regulations.

Since 2012, the CAP has promoted the implementation of voluntary agro-environment measures supported by payments per hectare that depend on the efforts and losses in yield due to the implementation of these measures. Member states, federal states and provinces define regionally adopted agro-environmental measure, encompassing actions, which directly focus on the protection and conservation of agro-biodiversity. Farmers can sow flowering strips, set aside fields temporarily or permanently, organise buffer strips along open waters, plant hedgerows and others. Studies show positive effects of such measures on biodiversity (What Works in Conservation 2017).

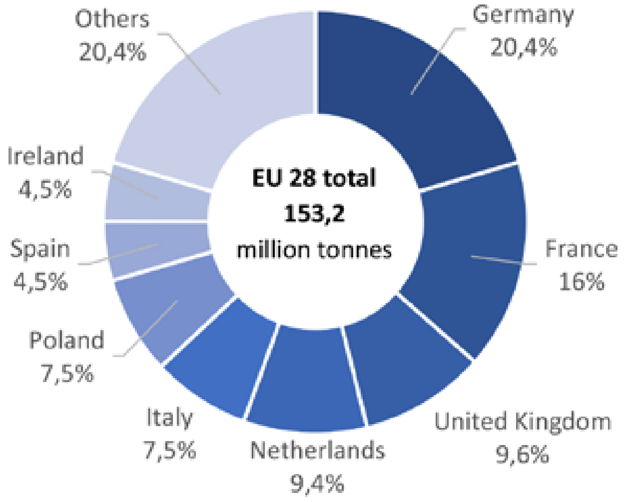
The most recent CAP "REGULATIONS OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" (No. 1305/2013 - on support for rural development; No. 1306/2013 - on the financing, management and monitoring of the common agricultural policy; No. 1307/2013 - establishing rules for direct payments to farmers; No. 1308/2013 - establishing a common organisation of the markets for agricultural products), introduced in 2014, oblige farmers to implement "greening measures" when applying for direct payments. Hereby, biodiversity and clean water are explicitly targeted. Farmers have to fulfil criteria to diversify crops, maintain permanent pastures and preserve environmental reservoirs and landscapes. 30 % of direct payments are tied to strengthening the environmental sustainability of agriculture and enhancing the efforts of farmers, especially to improve the use of natural resources. First assessments after two years indicate the necessity to adjust the current set of greening measures, as the effect on biodiversity is not apparent.

3. DAIRY PRODUCTION IN EUROPE

Dairy production is very important within the European Union from an economical point of view: milk accounts for 14 % of the EU agricultural output, more than any other single product. Every single member state produces milk. Particularly for Germany, France, the United Kingdom, Poland, the Netherlands and Italy, dairy production plays a significant role in the agricultural economy. These countries account for around 70 % of the EU dairy production (see graph on the right). Europe contributes to one third of the world milk production, with 165 million tons per year. Until 2015, the production of milk in the EU was a matter of quota and complex regulations, including pricing.

While the number of cows has decreased to 23 million over the last few decades, the average milk production per cow increased to 6,700 kg annually. The most important dairy cow breed is Friesian-Holstein with a yearly production of up to 10,000 kg.

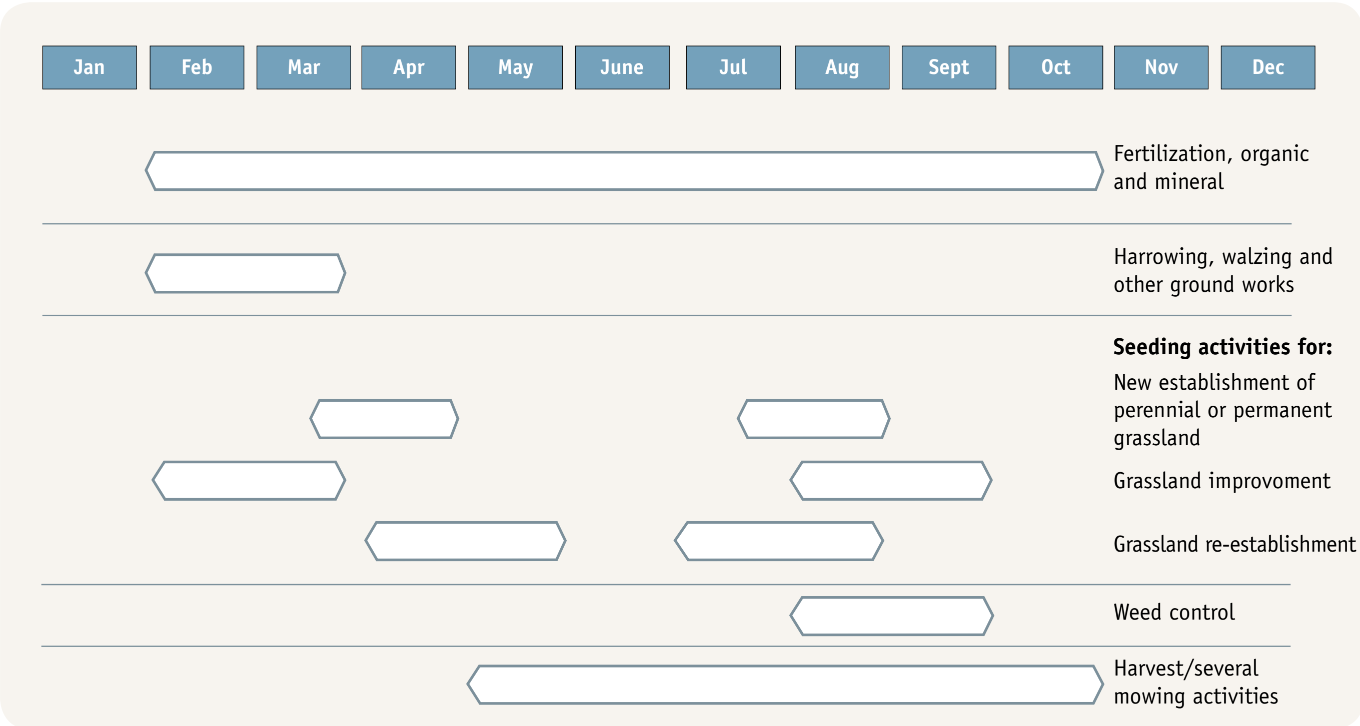
According to Eurostat, 33 % of arable land worldwide is used for the production of animal fodder, 60 % within the European Union. Of this area, some 50 % is grassland (33 % permanent grasslands and pastures), while the other part is arable land. The surface area required to feed all animals has steadily increased over the last few decades following higher demands for dairy produce and meat on the world market. Nowadays, many of the crops produced in intensive agricultural systems is assigned to be used as fodder.



Collection of cows' milk by dairies, 2016 Source: Eurostat

The same applies to the extension of arable land, often into pristine ecosystems, which is regularly related to fodder production, e.g. soy in Brazil. This development can be seen in the US, Brazil and Argentina.

4. PRODUCTION OF ANIMAL FOOD AND IMPACTS ON BIODIVERSITY



Chronogram detailing the usual application of major cultivation treatments in permanent or perennial grasslands.

Permanent and perennial grassland is usually fertilised with manure from February to the end of October. Other fertilisers can be applied from mid-January to mid-December. If permanent grassland needs to be improved, the related mechanical groundwork, such as harrowing, rolling, etc. take place in February and March; if new seeds need applying to keep up high value grassland or to improve it, grass seeds are sown from February to March or from August to September. Fragmented grasslands are re-established either in April/May or July/August. Grass is mainly harvested from May to October. If necessary, actions to combat problematic weeds are taken in August/September. Weeds are mostly supressed by frequent cutting.

4.1 Soil preparation and seeding

The seeding of permanent or perennial grasslands may take place for three main purposes:

1. Establishing new grasslands. These are frequently the perennial components of crop rotations and rarely truly permanent grasslands. Seeding may take place in spring (March/April) or summer (August). A conventional seeding approach is usually applied, using a plough and further soil preparation steps in order to arrange the seedbed.

2. Re-establishing permanent grasslands after weeds or other undesired grass species have freely developed and covered more than 50 % of the area. This operation is usually performed when mechanical weeding strategies or herbicides are not acceptable options. This is generally done during summer and may or may not include soil preparation measures. If a farmer chooses to prepare the seedbed mechanically, the grassland is tilled, harrowed and seeded. There are strict regulations regarding when and where he is allowed to till permanent grasslands. Alternatively, this may be done through direct seeding. This approach goes hand in hand with the use of total herbicides to devitalise the old grass community.

3. Improving existing permanent grasslands in order to amend fragmented pastures or meadows. This is carried out early in spring or in late summer, depending on the local weather conditions and water availability. The established permanent grassland can be improved by applying seeds using a fertiliser sprayer or with a direct-seeding drill, which places the seeds in the soil.

EFFECTS ON BIODIVERSITY

According to the German Federal Environment Agency, one gram of soil contains billions of microorganisms: bacteria, fungi, algae and protozoans. A mere one square metre of soil is home to anywhere from hundreds of thousands to millions of soil fauna such as nematodes, earthworms, mites, woodlice, springtail, and insect larvae. A hectare of soil rooting layers contains around 15 tons of live weight – the equivalent of around 20 cows. In other words, immeasurably more organisms live in the soil than on it.

Soil ecology plays a key role in natural soil functions. The biological processes in soil ecosystems include integrating plant residues into the soil, shredding them, breaking them down and releasing fixed nutrients as minerals for plant growth. Soil organisms create favourable physical conditions in the soil: by storing and mixing soil materials (bioturbation) together with the cementing of soil particles through mucus secretion (revegetation), making soil organisms instrumental for the formation of soil pore systems. Soil organisms form stable clay-humus complexes with high water and nutrient storage capacity, and create a fine-grained, quasi erosion-resistant crumb structure. These organisms can, to some extent, mitigate the harmful effects of organic substances on soil, groundwater, and the food chain.

In general, soil treatments have an adverse effect on biodiversity, as the natural processes described above are interrupted. Oxygen, UV radiation and heat will come in contact with the soil, particularly when turning the soil by ploughing the resulting furrows lead to severe adverse effects for life in the soil. Humification processes, which take place under the exclusion of oxygen, are hindered and the natural soil pore system is disrupted. Each treatment affects biological diversity within the soil and the flora and fauna above ground to a different extent.

The use of glyphosate in order to devitalise permanent grassland prior to its re-establishment via direct seeding has catastrophic effects on biodiversity. Any total herbicide targets all plants on the field non-specifically, washing away the established flora and with that destroying the overall food supply for a great number of insects and animal, which can result in the breakdown of complete food chains.

4.1

Very good agricultural practices to ensure more biodiversity

Superficial treatments are usually less harmful than ploughing. Earthworms, spiders and ground beetles are less affected by mulch seeding and direct seeding compared to conventional ploughing.

Small invertebrates, which form the basis for soil food chains, are supported by conservation-oriented soil preparation, resulting in increasing species and population sizes and increasing the self-regulation of the soil ecosystem.

Mulch seeding with its mechanical soil preparation is an environmentally-friendly option to reduce wild flora competing with crops in early stages. This helps to reduce the intake of herbicides and negative environmental consequences of agrochemicals.

4.2 Nutrient management and fertilisation in grassland

The yield and the quality (protein content) of the grass determines the application of nitrogen (N) fertilisers on grasslands. If grassland is used as pasture, the maximum amount of N is around 130 kg/ha as the nutrient input through the manure of the grazing animals contributes significantly to the total N supply. Meadows on the other hand, depending on the production intensity, may need up to 300 kg N/ha, if they are managed to the greatest intensity possible. On such meadows, it is permitted to apply 170 kg/N in the form of organic substances. Both pastures and meadows also need a reasonable supply of phosphorus, sulphur, magnesium and potassium. The complementary use of mineral fertilisers is advisable.

The most important source of nutrients in grassland is organic fertiliser in the form of manure. The optimal time of application is defined by the growth habits of the grass as well as pasture management. Generally, manure should be applied in cold, moist and cloudy weather. This reduces the evaporation of ammonia and is beneficial for high utilisation of the manure-N by the grass. Starting in February, manure can be applied on soils that are free of snow, not saturated by moisture or deeply frozen.

EFFECTS ON BIODIVERSITY

There are at least two main types of effects, driven by fertilisation practices, on biodiversity. The first refers to changes in the trophic state of plant and animal communities and the second refers to changes in global nutrient cycles, mostly due to nutrient run-offs into the surrounding environment and the diffuse pollution, caused by nitrogen and phosphorous, that follows.

In integrated farming, the crop will consume all fertilisers for its growth; some remnants might be absorbed by the soil and are available later. The application of fertilisers will favour fodder plants and disadvantage natural vegetation, which often benefit from poor soils. Plant communities are composed of biotic and abiotic factors, such as soil, precipitation, competition with other vegetation, etc. Grassland as such is very diverse in plant and animal species. Around one third of fern species and flowering plants mainly occur in grasslands. These represent about one third of the endangered fern species and flower plants in general. In healthy native systems, the competition for limited resources is relatively high and thus plants fill ecological niches, leading to great plant diversity across a pasture. Plants compete for soil type, soil nutrients, light, water, and space. By increasing the availability of a limited resource, such as nitrogen, through artificial fertilisation, this competitive factor is reduced, as the nutrient is easier to acquire. This supports plants with high demands of nutrients. Often, species that benefit from nitrogen fertilisation tend to be the non-native cool season grasses.

Pollution caused by organic fertiliser on arable land and adjacent habitats and its severe impacts on soils and water bodies is an issue of areal disposal of organic matter, not of fertilising. One example is the application of manure outside the growing season as well as the distribution of greater amounts of manure than necessary. The introduction of nitrogen in waterbodies can destroy the entire life in it and it will take a long time to re-establish natural conditions. The steady impact of moderate manure disposals lead to significant changes in limnic organisms, leading to a small set of species tolerant to water pollution. Water bodies in regions with intensive dairy and meat production suffer from this effect. Algae blooms and fish die-offs occur regularly in such waters, which are far from complying with the EU Water Framework Directive.

More nutrients lead to higher biomass production and therefore to a higher food supply for herbivorous arthropods. Generalist species can benefit from this increase in biomass and show increasing populations. Biodiversity on the other hand is not driven by generalists, but by specialised species occupying a huge number of ecological niches. Long-term studies show a significant and strong decrease of species typical for agricultural landscapes and ecological niches within landscapes, suffering from too much nitrogen being available.

4.2

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Very good agricultural practices to ensure more biodiversity

Due to the complexity of organic fertilisers and their multiple benefits for the environment, mineral fertiliser should be avoided as much as possible. This may mean that different kinds of organic matter have to be used. It is important that these fertilisers are applied according to some basic rules, which aim at prohibiting the nutrient run-off into existing water bodies. Manure must not be applied on:

- water-saturated or flooded soils;
- deeply frozen soils; and
- soils covered with snow.

A minimum distance of 1 metre (using precision application machinery) or 4 metres (using common application machinery) to water bodies must be ensured in order to further decrease the possibility of run-off. Furthermore, farmers should be able to store the manure produced in their farms for at least 9 months in order to avoid the application of manure when facing sudden events and due to a lack of storage facilities. In 2017, such a situation arose in Northern Germany after enduring rainfalls made it impossible to apply manure for over six months.

Finally, the criteria for optimal soil fertility and fertilisation should be based on standards that require nutrient balances and provide proven methods to apply. Such standards should define grassland-specific nutrient limits, combined with tolerance thresholds and time references. The fertilisers used should be documented in detail and according to legal regulations. Currently, the EU Nitrates Directive (Directive 91/676/EEC) sets a limit of 170 kg of organic N/ha and all member states have adopted action programmes that include this limit. Redelivery of the organic N fractions must be respected in the following years and the ammonium amounts must be accounted for since the moment of fertilisation for each crop. Standards and companies may define retention periods for the application of organic fertilisers in order to reduce the likelihood of run-off into water bodies.

Generally, extensively managed grasslands are highly diverse in flora and fauna. Whenever possible, grasslands should be managed extensively. A reduction in fertilisation and plant protection substances results in a greater abundance of species such as birds that also use grasslands as foraging habitats.

4.3 Wild flora management

From an ecologist's point of view, grassland, especially extensively managed grassland is a diversified polyculture, including many different grasses, herbs, legumes and flowers. Even intensively managed meadows consist of a plant community made up of grasses and herbs, although the diversity of different species is strongly reduced by the related management. In intensive meadows, grasses are clustered according to their dietary value for the cows. Plants not regarded as valuable such as (canes, sorrels, nettles, thistles) as well as plants, toxic for cows (marsh horsetail, common buttercup, benweed) are combated. Farmers commonly do that with mechanical methods as a first step. These measures include levelling, harrowing, rolling, mowing and mulching. Since herbicides have a negative side effect on the established grasses, the chemical combating of wild flora occurs infrequently and mainly if wild flora cannot be controlled by mechanical measures or if highly problematic plants have established. Often a fragmented sod is the reason for unwanted plants spreading, therefore, sustainable grassland management and control of wild flora includes reseeding.

Two types of herbicides can be considered: residual and contact. Residual herbicides seal the ground and inhibit the development of wild plant species. Contact herbicides disrupt the metabolism of emerging plants. Herbicides may also be regarded as total or specific. Total herbicides target any plant species (note that monocotyledonous species, such as grass species or maize, and dicotyledonous species have slightly different metabolisms). Specific herbicides target only particular plant species. Herbicides are very effective and glyphosate is an example of total herbicide working as contact toxin. The application of just 0.1 ml/m² of active matter is usually enough to obtain the desired effect. In grasslands, total herbicides are applied to devitalise a bigger grass community prior to reseeding. Specific herbicides are used as a mean to counteract weeds.

EFFECTS ON BIODIVERSITY

Due to their high impact on biodiversity, the use of pesticides is generally criticised by NGOs and regulating authorities. Water legislation restricts the application of some extensively used herbicides, as well as those with high risks of leaching due to their application times. A careful application of pesticides is essential to minimise collateral damages.

With regard to the use of herbicides, it is important to note that floral diversity forms the basis for food webs associated to grasslands. Consequently, if such diversity is reduced, then less food will be available for many animal species, such as arthropods and birds, which are dependent on that food source. In grasslands, plants with a low nutrition value are generally decreasing in their population size. Many typical farmland species are almost extinct in numerous agricultural landscapes.

The use of mechanical treatments to fight undesired wild flora also generates strong negative impacts. These treatments are usually applied over the whole field, leaving only a few places untreated and therefore virtually all animal species inhabiting the grassland are affected. The nests of early breeding birds, such as the skylark (*Alauda arvensis*) are often destroyed by these measures. The negative impact on amphibians, insects and arthropods, and the resulting decline in population, ultimately reduces the availability of food for other vertebrate species.

4.3

Very good agricultural practices to ensure more biodiversity

Many agricultural activities today directly impact biodiversity negatively. Mechanical measures to reduce wild flora have less negative effects on the environment compared to the use of herbicides, as no active matter remains in the soil, in the plant and can leak out to other habitats.

4.4 Mowing

Farmers mow intensively used permanent grassland and alternating grassland up to seven times a year, depending on the speed of growth and length of the growing season. Starting from the first cut, which in temperate climate regions of Central Europe takes place in May, such grasslands are cut every four to six weeks. Vegetation period and mowing time vary considerably with the geographical latitude. Mowing of fodder as a catch crop, e.g. clover grass, is done after flowering; clover can flower several times a year. Besides this crop is fed fresh, dried as hay or preserved as silage for the winter. The preservation of fresh grass as silage has seen an increase since the 1950s. Extensive grassland is usually mowed twice and only once in short summers.

EFFECTS ON BIODIVERSITY

Grasslands provide habitat, breeding ground and protection to many animal species. Therefore, the intensive use of grasslands strongly impact biodiversity. Some plant species are unable to flower in such grasslands due to frequent mowing. This drastically reduces the value for insects. Furthermore, ground insects are regularly eliminated and cannot reproduce sufficiently. Finally, mowing frequencies of four to six weeks are critical for ground breeding birds, since this does not allow enough time for the breeding and raising young.

Mowing is usually carried out with large rotary mowers, or alternatively with bar mowers. Rotary mowers are very efficient and create suction to the rotating blades, which is deadly for insects and small animals up to deer fawns. The number of deaths caused by mowing is hardly documented, but in Germany it is estimated that at least 500 thousand animals die every year. About 90 thousand of these are deer fawns.

Some extensively used grassland types are protected under European nature conservation law because of their important function for biological diversity (e.g. Macaronesian mesophile grasslands, lowland hay meadows, or mountain hay meadows, among others). The extensive cultivation with little or no fertilisation leads to a high species richness in herbaceous plants. Double mowing simultaneously pushes back grasses and favours the growth of such plants.

4.4

Very good agricultural practices to ensure more biodiversity

A series of measures can help to reduce the impact of mowing on biodiversity. In general, bar mowers cause much less damage to animals than rotary mowers. That's why bar mowers are used on most protected grassland. If there is no alternative to rotary mowers, timing, pattern and cutting height can help to reduce the severe impact of mowing on biodiversity:

1. Strategically delaying the mowing season. If the first mowing is delayed by some weeks (e.g. until mid-July), then the breeding season of many wild animal species, such as birds that breed in meadows or insects, is avoided. Where birds are concerned, this measure will mostly benefit the first brood, as chicks usually start fledging in May. Insects benefit mostly from plant species that have an opportunity to flower before the first mowing.

2. Establishing a minimum mowing height of at least 7 cm. Generally, the higher the cut, the lower the loss of animals seeking protection by lying flat on the ground, and the lower the loss of nesting sites. For example, Eurasian skylarks (*Alauda arvensis*) have a higher productivity on sites with raised cutting height.

3. Reducing the mowing frequency. Increasing the interval, mainly between the first and the second cuts, gives soil breeding birds the possibility to lay a second clutch of eggs and to breed successfully. Bar mowers cause less damage to animals than rotary mowers.

Furthermore, the mowing regime can be changed into a more biodiversity-friendly practice, by:

1. Mowing when insects and other arthropods are less active. Mowing should preferably take place under damp, cold weather conditions. Furthermore, insects visiting flowers, such as bees and butterflies, hardly fly during cloudy weather. The same applies to the early morning and evening. Therefore, mowing should preferably be carried out at such times or under such weather conditions. For silage, cloudy weather is not an issue, but for haying it may be.

2. Mowing different areas at different moments. If all meadows get mowed at the same time, huge areas are no longer available as habitats. For surviving insects, this means that they no longer find food and their life cycle is disturbed. Birds and other small animals no longer find cover and are exposed to predators. Therefore, mowing larger areas, section by section, has proved successful. Alternatively, leaving strips (e.g. 20 metres wide) may allow animals to retreat to those areas, which can be set up temporarily or permanently.

3. Adopting an adequate mowing pattern. In the past, pastures were often mowed in concentric circles inwards (Figure a), which drove fleeing animals into the inner circle, where they eventually became victims. Alternatively, the following mowing regimes must be selected:

A. In order to prevent animal death, mowing should start from the middle of the field and continue towards the sides (Figure b). This pattern drives animals away from the danger and has proved to be highly effective;

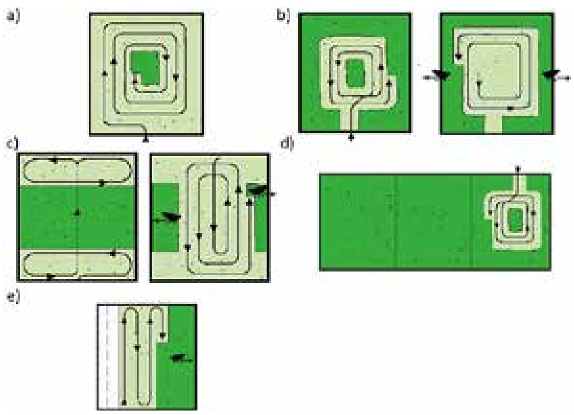
B. If a field is very wide, but long, the best mowing regime starts with cutting the field extremes (Figure c). Animals withdraw towards the middle of the field, which afterwards is mown from the inside to the outside;

C. Very large grasslands can be split into several parcels and each of these should be mown from inside to outside (Figure d);

D. Finally, if a field lies next to a road or any other infrastructure that constitutes a boundary or holds danger for fleeing animals, it should be mown in a way that drives animals away from it (Figure e).

After mowing, many grassland animals seek protection and hide in the cut grass. It is recommended to leave the grass for some days on the field in order to provide temporary shelter for these animals. The strips of uncut grass at the margins of the field also serve as a withdrawal area for animals, during and after the mowing, and are an important overwintering habitat. Such strips should be at least 6 metres wide and should be implemented on fields larger than 0.5 ha.

Close collaboration between farmers and hunters have also become more frequent. If a hunter comes to the grassland prior to the mowing and chases the animals away, this can be very effective. Dummies may be strategically placed on the field for the same purpose, but this has proved to be less effective.



In the past, pastures were often mowed in concentric circles inwards, causing considerable animal deaths. In order to prevent this, the mowing regime can be changed into a more biodiversity-friendly practice by adopting adequate mowing patterns that allow shelter for fleeing animals. Source: Landesjagdverband NRW

4.5 Grazing

While granivores (e.g. pigs and poultry) are usually fed specific feedstuffs and do not necessarily, require significant agricultural land, herbivores (e.g. cattle, sheep, goats and horses) may be raised indoors, and fed with harvested fodder, or outdoors – grazing directly on pastures and grasslands. Some basic grazing systems are:

A. continuous (the pasture is not divided into sub-pastures or paddocks and livestock is allowed to graze all the pasture area at any given time);

B. rotational (the pasture is divided into sub-pastures or paddocks, using appropriate mobile and wildlife-friendly fences, and cattle is allowed to graze each paddock for an adequate time period before being moved);

and **C.** ultra-high density, mob grazing and flash-grazing (usually in the morning, high livestock densities are allowed in a pasture for invasive species control but may also later be moved according to a rotation system).

EFFECTS ON BIODIVERSITY

Grazing, by either wild herbivores or domestic species, can have positve and negative impact on biodiversity.

Domestic herbivory in the past allowed unique biodiversity to evolve, take shape and adapt in grassland-related habitats where, historically, grazing has been present for a long time. Therefore, maintaining the high levels of biodiversity observable in European natural and semi-natural grasslands requires well-managed grazing to continue.

On the negative side, high grazing livestock densities increase the risk of overgrazing and have highly negative impacts, leading to soil compaction, erosion and degradation (causing desertification in arid regions). Such high densities may also increase the likelihood of excessive nutrient run-offs, and the diffuse pollution that follows, affecting the soil and water bodies, due to high levels of manure production. Grazing may also lead to a direct loss of biodiversity through the intensification of grasslands, driving the decline of native plant species, which are poorly adapted to herbivory (or to higher levels of herbivory), and of wild animal species that made use of that vegetation.

4.5

Very good agricultural practices to ensure more biodiversity

Taking these aspects into consideration, grazing livestock densities should respect a maximum of 1.4 LU/ha of fodder surface. Farms with higher stocking densities must work towards reducing density values in order to match this limit, within a given period. Farms with lower stocking densities should keep to these lower densities. Overall, livestock density values should be subject to a continuous reduction over time, until the optimum level is reached.

A grazing strategy that reduces the impact on the grassland and on biodiversity should be adopted. When invasive and undesired grassland species are to be controlled, applying flash-grazing is preferred (instead of mechanical or chemical control methods). If a reduction in the overall livestock density is not viable, the application of rotational grazing is recommended.

4.6 Fodder production overseas: soy

The EU imports around 35 million tons of soy, mainly from South America, which accounts for 35 % of worldwide soy trade. Brazil, Argentina, Paraguay, Uruguay and Bolivia produce over 50 % of the world soy on around 55 to 60 million hectares, an area equalling the approximate size of Spain, Sweden, France or the Ukraine. Overall, 80 % of soy produced is exported from these countries. Soy production grew considerably over that last four decades. The first 12 ha were harvested in Mato Grosso in 1970, today around 6 million ha are cultivated with soy there. The area is still extending, Brazil is currently offering a further 50 million hectares for planting with soy, mainly in Mato Grosso.

4.6

The soy coming from these countries is genetically modified (GMO) to a degree of 95 %. Production follows a round-up-ready system. This means very basic soil treatment, no crop rotation, the extensive use of pesticides, mainly glyphosate, and a highly effective, industrialised agriculture. GM crops must be certified before they can be legally imported into the European Union due to considerable reluctance on the part of suppliers and consumers to use GM products for consumer or animal use.

EFFECTS ON BIODIVERSITY

Soy production used to be one of the main drivers in the loss of primary Amazonas and Pantanal rainforest and unique wetlands. Environmental organisations have reported that soybean cultivation has destroyed vast areas of the Amazon rainforest, and has led to further deforestation. Since 2006, a memorandum on saving tropical rain forests has helped to ease the pressure, but a great deal of Amazonian and Pantanal forest still gets lost due to deforestation for soy production.

CAP regulations do not apply in South America agriculture. The use of GMO in general is extensively discussed among environmentalists and agronomists. Problems with EU compliance rules and cross-contamination of non-GM stocks have caused shipments to be rejected and have put a premium on non-GM soy today. What that specifically means is that production in South America causes high intakes of pesticides into the environment and is accompanied by all negative impacts of intensive agriculture (compare with the Wheat and Sugar Beet Fact Sheet).

4.6

Very good agricultural practices to ensure more biodiversity

In general, fodder production in Europe has advantages compared with production in South America, in terms of biodiversity and environmental concerns, as European legislation does not apply abroad. If guaranteed GMO-free production is required, it is better not to use any soy products from overseas. Even crops certified according to sustainable agricultural standards do not necessarily guarantee GMO-free production. For very good agricultural practices in agriculture, please compare with the Wheat and Sugar Beet Fact Sheet.

4.7 Further environmental effects of dairy production

Dairy production directly and indirectly affects the environment. Besides the obvious side-effects of grassland management, dairy production also causes light and noise pollution as well as the production of greenhouse gas emissions.

According to the EU Agricultural Outlook for agricultural markets and income 2017-2030, agriculture accounts for around 10 % of GHG emissions in total EU-28, including CO² and other non CO² (CH4 and N2O) emissions. By far the biggest part of non CO² emissions come from livestock. It is anticipated that this will stay relatively stable in the future, ending up at around 72 % of CH_4 and N_2O in 2030 from dairy and meat production.

5. BIODIVERSITY MANAGEMENT

A tool which is being proposed to tackle the issue of biodiversity at farm level is the Biodiversity Action Plan (BAP). The BAP facilitates the management of biodiversity at farm level. Some food standards prescribe the implementation of a BAP without defining the content and the approach to develop it. Such a plan should include:

1. Baseline assessment

The baseline assessment gathers information on sensitive and protected biodiversity areas, endangered and protected species and semi-natural habitats on or around the farm/collection area, including fallow/set aside land, cultivated and uncultivated areas as well as already existing biodiversity measures. These provide the information necessary to identify priorities, define measurable goals, assess the impact of implemented measures and if necessary, select approaches that are more appropriate.

2. Setting goals

Based on the baseline assessment the farmer sets goals for improvement. The aim is to identify the main impacts of the farming activities on biodiversity, which should be avoided, and the main opportunities existing to protect/enhance biodiversity.

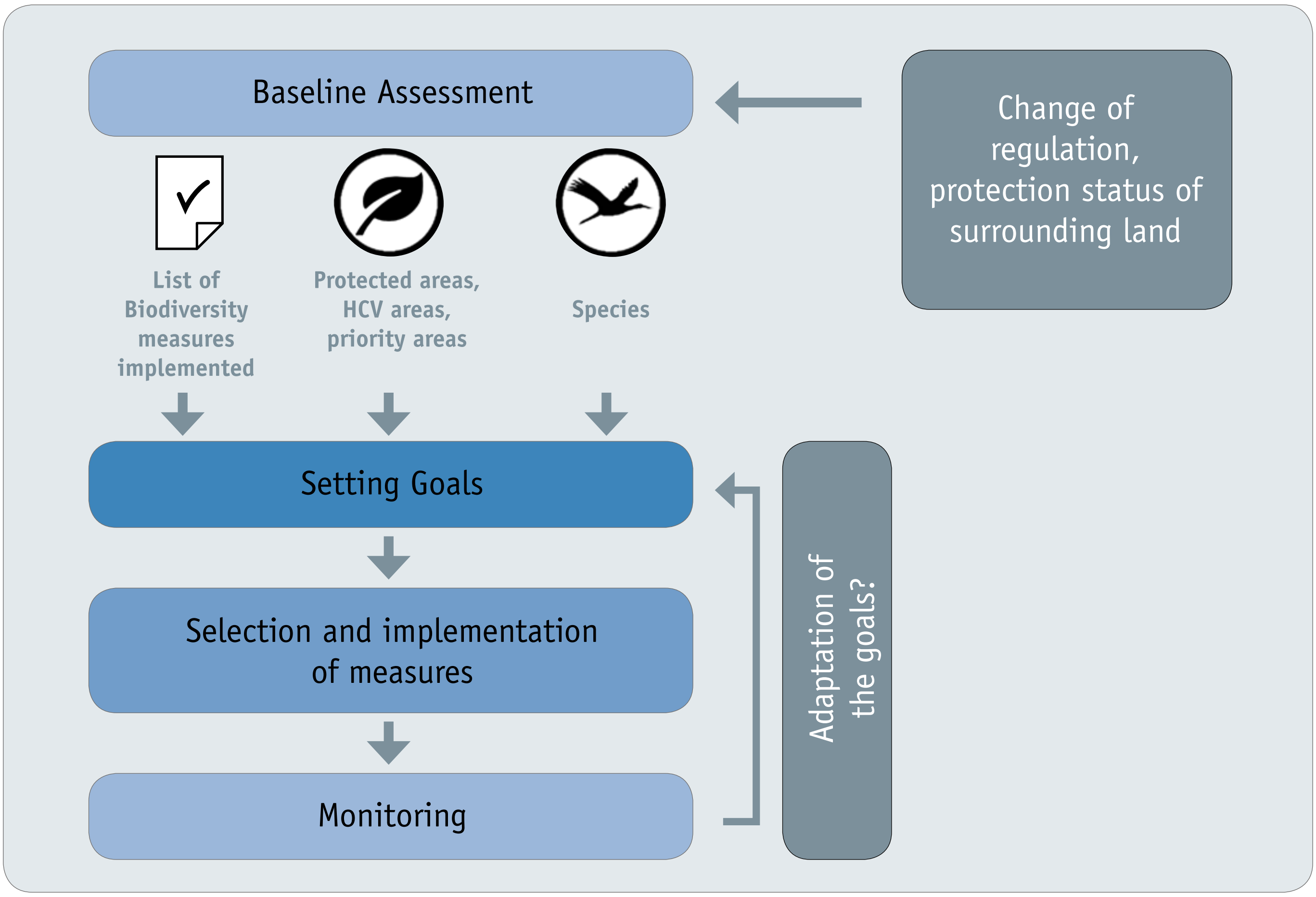
3. Selection, time line and implementation of measures for enhancing biodiversity

Some examples of measures are:

- **Semi-natural habitats (trees, hedges, dry stones)/set aside areas:** Criteria will be set for type, size, and minimal quality of semi-natural habitats and ecological infrastructures, for areas set aside or fallow land, and for newly acquired areas for agricultural production. A minimum of 10 % of the UAA (utilised agricultural area) is used to provide semi-natural habitats.
- **Establishing biotope corridors:** Specified areas for biodiversity on the farm will be connected with habitat corridors such as hedges and buffer strips.
- **Grassland conservation:** Grassland is not transferred into other kinds of agriculturally used land; grazing densities are kept in a sustainable range and the regeneration rate of grassland is respected in grassland management.

The whole catalogue of measures was published within the recommendations of the EU LIFE project: www.business-biodiversity.eu/en/recommendations-biodiversity-in-standards

4. Monitoring and evaluation



6. OVERVIEW OF THE EU LIFE PROJECT

Food producers and retailers are highly dependent on biodiversity and ecosystem services but they also have a huge environmental impact. This is a well-known fact in the food sector. Standards and sourcing requirements can help to reduce this negative impact with effective, transparent and verifiable criteria for the production process and the supply chain. They provide consumers with information about the quality of products, environmental and social footprints, and the impact on nature caused by the product.

The LIFE Food & Biodiversity Project "Biodiversity in Standards and Labels for the Food Industry" aims at improving the biodiversity performance of standards and sourcing requirements within the food industry by

A. Supporting standard-setting organisations to include efficient biodiversity criteria into existing schemes; and encouraging food processing companies and retailers to include biodiversity criteria into respective sourcing guidelines

B. Training advisors and certifiers of standards as well as product and quality managers of companies

C. Implementation of a cross-standard monitoring system on biodiversity

The project has been endorsed as a "Core Initiative" of the Programme on Sustainable Food Systems of the 10-Year Framework of Programmes on Sustainable Consumption and Production (UNEP/FAO).

European Project Team:

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