Very Good Agricultural Practice

Guideline on Livestock Production

Content

1. Introduction

The LIFE Food & Biodiversity project supports food standards and food companies in the development of efficient biodiversity measures and in their implementation in their pool of criteria or sourcing guidelines.

In this guideline, we provide information on the current situation of livestock production in temperate climate regions of the European Union (EU), and also provide a background for the very good agricultural practices described in the "Recommendations to improve biodiversity protection in policy and criteria of food standards and sourcing requirements of food companies and retailers".

The main task of livestock production is to provide a secure protein supply for a fast-growing world population in order to contribute to food security. Consumption patterns in industrialized and emerging economies have led to an intensification of animal husbandry and a more globalized food market, resulting in tremendous changes in the use of agricultural land, grassland and pastures, highly intensive production systems and the worldwide trade of animal food and animal products.

Biodiversity according to the United Nations Convention on Biological Diversity

The United Nations Convention on Biological Diversity (CBD), known informally as the Biodiversity Convention, defines biodiversity as *"the variability among living organisms from all sources including,* inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species and of ecosystems."*

2. Livestock

2.1. The concept of Livestock

According to the Food and Agriculture Organization of the United Nations (FAO), the term 'livestock' refers to all animal species and breeds which are kept or reared in captivity mainly for agricultural purposes (FAO 2017). This concept includes not just many species and breeds of mammals and birds, but also insects such as bees and silkworms. However, aquatic animals are usually not included. Particularly regarded as livestock are the many different breeds of species of even-toed ungulates (the Artiodactyla Order) included in taxonomic Families such as:

1. Bovidae – which includes, for instance, bovines (*Bos taurus*), commonly designated as "cattle", sheep (*Ovis aries*) (Figure 1), domestic goats (*Capra aegagrus hircus*) and buffaloes (*Bubalus* spp.);
2. Suidae – which mostly includes the domestic pig (*Sus scrofa domesticus* or just *Sus domesticus*), frequently called swine, hog, or simply pig when the distinction from other pig species is not required;
3. Camelidae – which includes several species of camels (*Camelus* spp.).

Also regarded as livestock are the horse (*Equus ferus caballus*) and other equine species included in the Equidae Family, which in turn is included in the Order Perissodactyla.

Bird species which are considered as livestock are generally referred to as "poultry", i.e., domesticated bird species kept by humans for their meat, eggs or feathers. Most of the species belong to the Superorder Galloanserae (commonly designated as "fowl") and especially to the Order Galliformes – which includes the chicken (*Gallus gallus domesticus*), several turkey species (*Meleagris* spp.) and quails, among others.

Figure 1 – Sheep (*Ovis aries*) is among the most popular species reared worldwide as livestock. The global standing population for sheep and goats (*Capra aegagrus hircus*) is estimated at 1.87 billion individuals (Robinson et al. 2014). (source: © Terraprima)

2.2. Livestock systems

The practices involved in the process of raising livestock on a specific holding, and its general characteristics, can be summarized as the "livestock system" in place (FAO 2017). Livestock systems may be classified in different ways. One useful way to classify them considers the existence of:

1. Grazing systems – characterized by ruminants (e.g. cattle, sheep and goats) grazing mainly on grass species and other herbaceous plants, often on communal or open-access areas and in a mobile fashion. Grazing systems may be considered as: a) nomadic or totally pastoral; b) semi-nomadic, semi-pastoral or transhumant; and c) sedentary pastoral;
2. Mixed systems – the largest and the most heterogeneous livestock system , characterized by activities that connect livestock rearing and the production of agricultural crops and/or timber products (particularly in agro-silvo-pastoral systems);
3. Industrial systems – characterized by intensive livestock-raising methods, in which at least 90 % of the dry matter of the animal feed is produced outside of the holding or farm.

2.3. Livestock production

2.3.1. At the Global Scale

Livestock supports the livelihoods and food security of almost 1.3 billion people worldwide and represents about 40 % of the global value of agricultural output. The livestock sector is one of the fastest growing in the agricultural economy, due to the shift in diet and food consumption patterns towards livestock products. Higher demand for livestock products is expected for the next decades based on projections of population growth and the rising of incomes *per capita*. As a consequence, the pressure on land resources is expected to increase considerably (McMichael et al. 2007). The consumption of meat in Asian countries, such as China and Indonesia, has already increased significantly and dairy consumption is expected to increase in India (FAO 2018a). In 1978, meat consumption in China corresponded to 1/3 of that in the United States of America (USA). However, currently the former is more than the double of the latter (Larsen 2012). With dietary shifts in emerging countries significantly increasing global demand for animal products, there is no doubt that the risk of increasing negative impacts on biodiversity is also rising.

When the statistics which summarize the livestock production sector worldwide are considered, it is almost impossible not to perceive immediately the extremely relevant impact it has on the planet. The livestock production sector is the world's largest user of land resources. In fact, grazing takes place on 25 % of the Earth's ice-free terrestrial surface. Another 5 % of the surface corresponds to cropland dedicated to the production of animal feed (comprising about 1/3 of the total global cropland). This whole surface corresponds to almost 80 % of the total agricultural land and requires about 8 % of the total global water use (primarily for irrigation of feed crops) (Monfreda et al. 2008, Ramankutty et al. 2008, Teillard et al. 2016, FAO 2018b). The global livestock standing populations are estimated to include about 1.43 billion cattle, 1.87 billion sheep and goats, 0.98 billion pigs and 19.60 billion chickens (Robinson et al. 2014) (Figure 2).

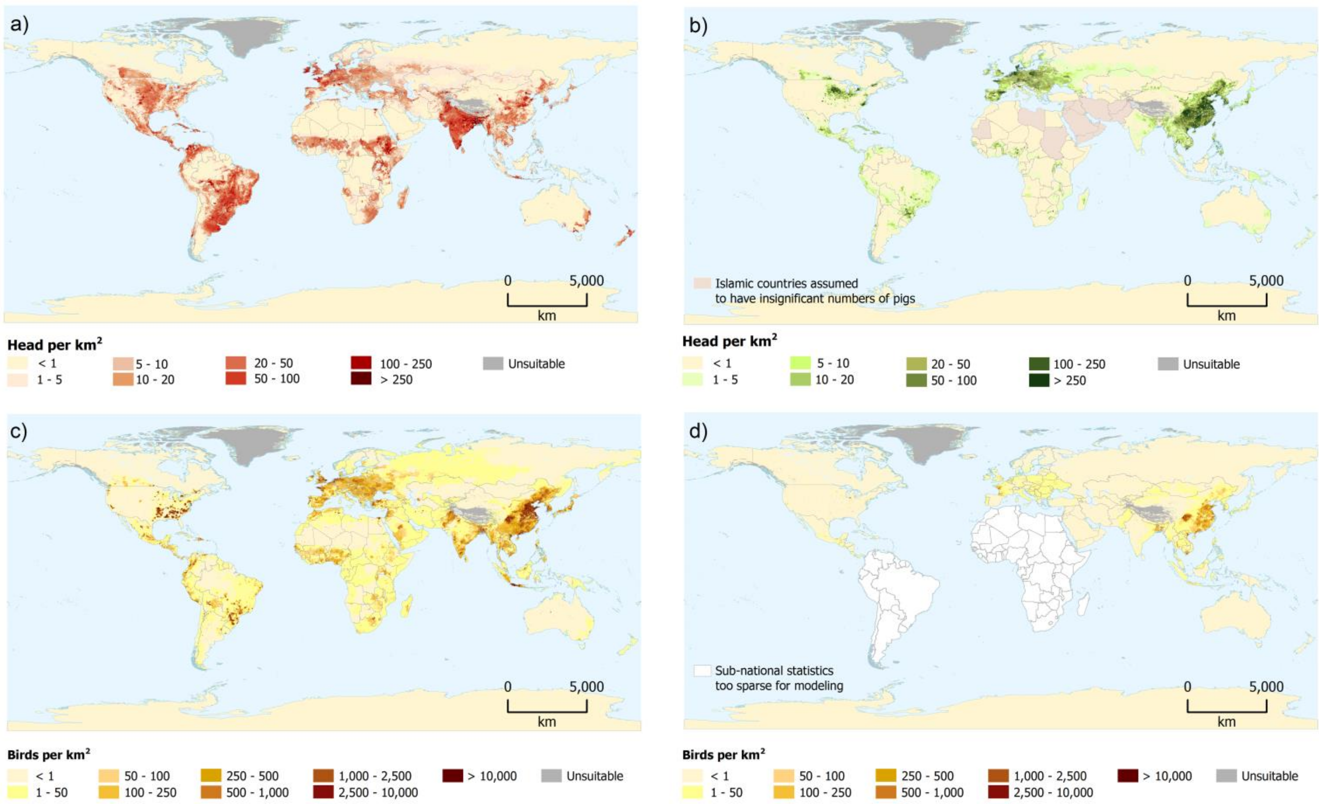

Figure 2 – Global distributions of a) cattle; b) pigs; c) chickens; and d) ducks, excluding South America and Africa (Robinson et al. 2014).

2.3.2. In the European Union

The EU livestock sector is the largest in the world and meat, milk, and eggs make up about 39 % of the EU's agricultural industry output. In 2015, about 10 million people were employed in agriculture in the EU-28, with the majority dedicated to crop and animal production, hunting and related service activities (Eurostat 2018). Pastures and meadows occupy nearly 22 % of Europe's agricultural area (Eurostat 2018). In 2016, the largest total populations of livestock in the EU-28 were held by Spain, Germany, France, the UK and Italy. Different Member States hold the largest populations of the different animal groups, namely: cattle (France: 19 million), sheep (UK: 23.8 million), goats (Greece: 3.9 million) and pigs (Spain: 29.2 million).

3. The Environmental Impacts of Livestock Production

3.1. Livestock and Climate Change

The livestock production sector contributes to global climate change through the significant emissions of greenhouse gases (GHG), i.e., methane (CH_4) (≈44%), nitrous oxide (N_2O) (≈29%) and carbon dioxide (CO_2) (≈27%) it produces (Gerber et al. 2013). Worldwide, this sector has been estimated to generate about 7.1 Gt of CO_2-equivalent per year, representing about 14.5 % of all anthropogenic GHG emissions (Gerber et al. 2013). In the EU, it is estimated that about 9.1 % of total GHG emissions result from this sector (if the impact of sourcing animal feed, for which the EU is a significant importer, is included), 12.8 % if land use and land use change emissions are included (JRC 2010).

3.2. Livestock and Biodiversity

Biodiversity is complex and multivariate by nature. The assessment of biodiversity is complicated by the lack of a common "currency" for biodiversity, and thereby it is extremely context-dependent. Due to societal value judgements, there is great variation in the conservation value of different species and habitats, which complicates decision-making about conservation objectives and priorities – and ultimately complicates the assessment of impacts on biodiversity (FAO 2016a).

Currently, the production of animal food and animal husbandry in general depend on biodiversity and at the same time play an important role in shaping biodiversity. On the one hand, agriculture and animal husbandry led to the decline of many wild species in Europe since the Neolithic. However, on the other hand, in some instances these activities allowed for an increase in landscape and species diversity, at least at the local scale. The European continent used to have large areas 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 is closely linked to agro-ecosystems ever since, particularly after the decline of species such as the wild herbivores that used to roam in herds and in higher numbers. Currently about 40 % of Europe's surface (EU-28), i.e., about 176 million hectares of arable and grassland areas, is used for agriculture (EC 2017). Consequently, it is estimated that about 50 % of European wild species of fauna and flora are associated with agricultural habitats (EEA 2003).

Generally, livestock production has been described as having both positive and negative impacts on biodiversity, through five main drivers of change (Teillard et al. 2016) (Figure 3):

1. Habitat change, degradation and destruction;
2. Pollution ;
3. Climate change ;
4. Over-exploitation ;
5. Invasive species.

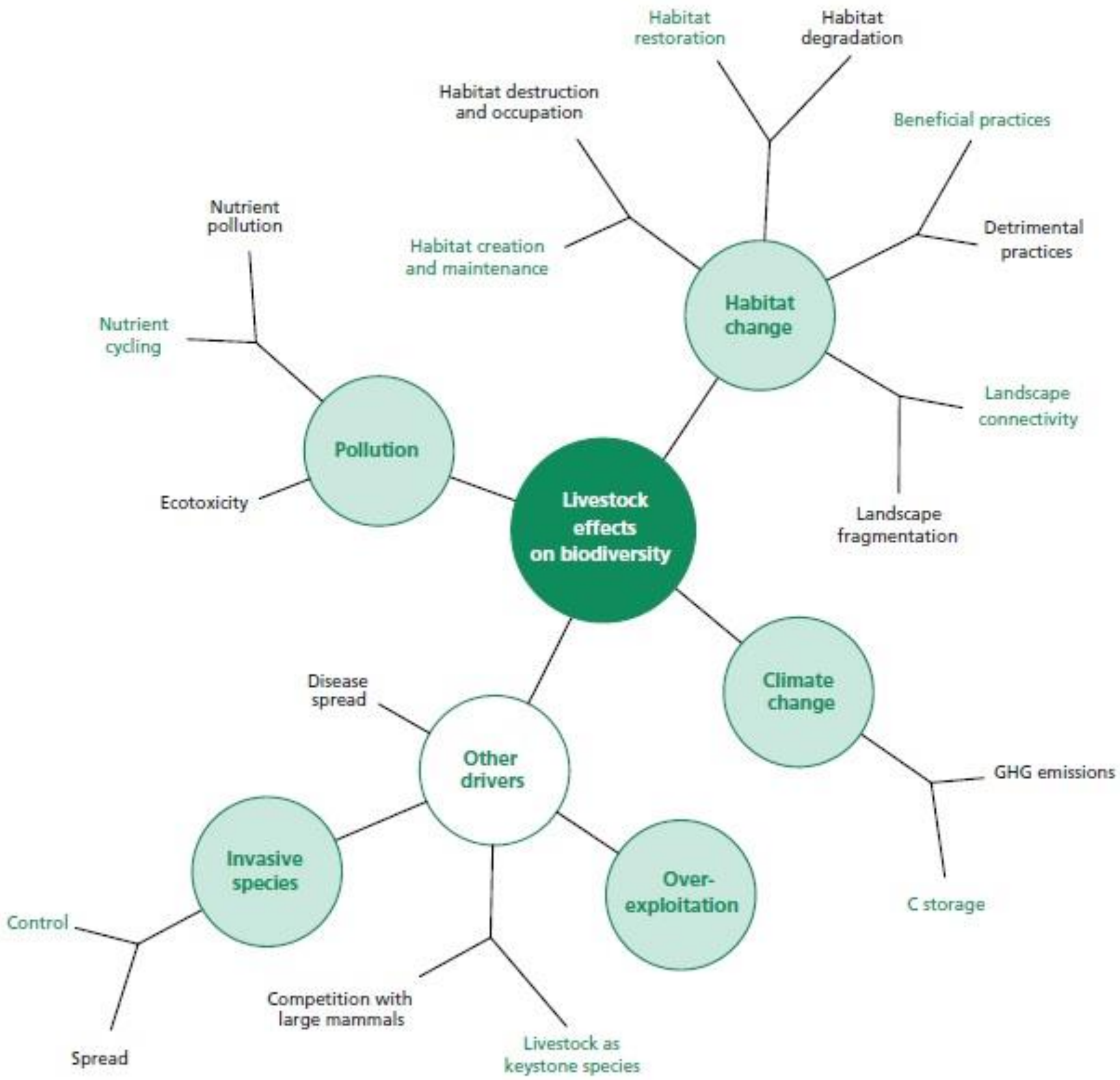

Figure 3 – Categories of influence of livestock on biodiversity. The five main drivers of biodiversity loss recognized by the Millennium Ecosystem Assessment (MEA 2005) appear in green circles. However, for most of these drivers, livestock can either put pressure (black) or provide benefits (green) to biodiversity (Teillard et al. 2016).

Notwithstanding the role that livestock has played and still plays in shaping part of Europe's biodiversity in relation to agroecosystems, particularly through grazing, the main impacts highlighted in literature and scientific reports, and frequently by environmental non-governmental organisations (ENGOs), are negative. These include:

1. The destruction of habitats through the conversion of native primary forest into pastures or feed crop production areas, mostly in South America and particularly in the Amazon rainforest and the Brazilian Pantanal regions (Lambin et al. 2003, Wassenaar et al. 2007, Nepstad et al. 2009, Teillard et al. 2016);
2. The degradation of soils due to excessive livestock densities and/or intensification practices;
3. The acidification and eutrophication of soils and water bodies due to diffuse pollution driven by nutrient run-offs and caused by inadequate animal waste disposal and/or excessive fertilizer use.

As far as the negative impacts of livestock production on biodiversity are concerned, some agricultural practices are particularly relevant to the drivers of change.

All the agricultural practices regarding nutrient management, fertilization, pest control and plant protection, harvesting and mowing of grasslands – which are the basis for the different grazing systems underlying livestock production in many parts of the world – are significantly involved with the driver ”pollution”. This driver translates itself in negative impacts such as the acidification and eutrophication of soils and water bodies due to diffuse pollution driven by nutrient run-offs and caused by inadequate animal waste disposal and/or excessive fertilizer use. Nutrient run-offs due to excessive fertilization cause relevant diffuse pollution and impact aquatic ecosystems, particularly through acidification and eutrophication, i.e., the oxygen depletion that takes place in a water body after an excessive growth of plants and algae as a consequence of higher nutrient and mineral availability (Carpenter et al. 1998, EEA 2018).

Eutrophication

According to the definition considered by the European Environment Agency, it is a process of pollution that occurs when a lake or stream becomes over-rich in plant nutrient; as a consequence it becomes overgrown in algae and other aquatic plants. The plants die and decompose. The process of plant decomposition depletes the oxygen in the water, and the lake, river or stream becomes lifeless. Nitrate fertilizers which drain from the fields, nutrients from animal waste and human sewage are the primary causes of eutrophication (EEA 2018).

The way livestock is managed, and particularly the way grazing is conducted, are two other agricultural practices significantly involved with an important driver: “Habitat change, degradation and destruction”. High grazing livestock densities increase the risk of overgrazing and have highly negative impacts, leading to soil compaction, erosion and degradation (and causing desertification in arid regions) (Asner et al. 2004, Eurostat 2018). High grazing livestock 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 (Asner et al. 2004, Eurostat 2018). Overgrazing 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) (Thórhallsdóttir et al. 2013), and of wild animal species that use that vegetation. Contrastingly, in some regions, low grazing livestock densities (due to land abandonment) and the lack or low density of wild herbivores may increase the risk of scrub and woodland invasion of meadows, fire and the homogenization of the landscape. This situation may also lead to the decline of soil fertility due to an insufficient input of organic nutrients previously supplied by the presence of manure.

The production of livestock is dependent on how much agricultural land is available to supply animal feed. The livestock population is usually accounted for in “livestock units” (LU or LSU) – a unit that aggregates livestock from various species and ages using coefficients estimated on the basic nutritional or feed requirements of each species. As a reference, 1 LU corresponds to the grazing equivalent of one adult dairy cow producing 3,000 kg of milk annually, without additional concentrated foodstuffs (Eurostat 2018).

The ratio of total livestock (including animals kept indoors) to the **total utilised agricultural area** (UAA) represents the **total livestock density (TLD) (LU/ha of UAA)** (also designated as “stocking density”). However, while omnivores (like pigs) and granivores (like poultry) are usually fed specific foodstuffs and do not necessarily require significant agricultural land, herbivores (e.g., cattle, sheep, goats and horses) may be raised indoors (and be fed with harvested fodder) or outdoors – grazing directly on pastures and grasslands. For the latter, the ratio of total herbivores to the **total fodder area**, i.e., the **grazing livestock density (GLD) (LU/ha of fodder area)** can be considered.

Total Livestock Density (TLD) and Grazing Livestock Density (GLD)

The livestock unit, abbreviated as LSU (or sometimes as LU), is a reference unit which facilitates the aggregation of livestock from various species and age as per convention, via the use of specific coefficients established initially on the basis of the nutritional or feed requirement of each type of animal (see table below for an overview of the most commonly used coefficients). The reference unit used for the calculation of livestock units (=1 LSU) is the grazing equivalent of one adult dairy cow producing 3,000 kg of milk annually, without additional concentrated foodstuffs (Eurostat 2018).

Livestock Unit Coefficients

Type of Animal	*Characteristics*	*Coefficient*
Bovine animals	Under 1 year old	0.4
	1 but less than 2 years old	0.7
	Male, 2 years old and over	1.0
	Heifers, 2 years old and over	0.8
	Dairy cows	1.0
	Other cows, 2 years old and over	0.8
Sheep and goats		0.1
Equidae		0.8
Pigs	Piglets having a live weight of under 20 kg	0.027
	Breeding sows weighing 50 kg and over	0.5
	Other pigs	0.3
Poultry	Broilers	0.007
	Laying hens	0.014
	Ostriches	0.35
	Other poultry	0.03
Rabbits, breeding females		0.02

In the EU-28, the TLD values registered in 2013 averaged about 0.7 LU/ha of UAA and the GLD values averaged about 1.0 LU/ha of fodder area. The highest TLD values (> 3.5 LU/ha) were observed in the Netherlands, Malta and Belgium (3.6, 3.2 and 2.7 LU/ha, respectively) and the highest GLD values were observed in Cyprus, Malta, the Netherlands and Belgium (2.6, 2.6, 2.5 and 2.3 LU/ha, respectively). Both the lowest TLD values (≤ 0.3 LU/ha) and lowest GLD values (≤ 0.5 LU/ha) were observed in Slovakia, Bulgaria and the Baltic countries (Eurostat 2018).

In the majority of Member States (and also in Norway), grazing livestock densities are higher than total livestock densities. However, the inverse has been observed in countries such as Malta, the Netherlands and Belgium. Particularly high livestock densities have been registered in regions such as North Brabant, in the Netherlands (7.6 LU/ha), or West Flanders, in Belgium (6.0 LU/ha). Very low values were registered in regions such as the Scottish Highlands, where very extensive grasslands occur.

A grazing livestock density of 1.4 LU/ha was established in 1989 in order to limit the compensation benefits paid to farms located in less favoured areas (LFA), according to the Common Agricultural Policy (CAP). Additionally, obtaining support for beef farming has required compliance with stocking density limits since 1992 (and at that time immediately helped to reduce average values from about 3.5 LU/ha, in 1993, to 2 LU/ha, in 1996). The 1.4 LU/ha limit has since been used to define extensive livestock farming and limit the eligibility for receiving support for the application of extensification measures (Piva et al. 1999).

In some cases, more ambitious livestock density limits have been set in the National Rural Development Programmes of Member States, and compliance with such limits is required in order to obtain support for HNV farming both within and outside Natura 2000 areas. In France, for instance, concerning supports for LFA, a range of minimum and maximum livestock densities were fixed for livestock farms at regional levels, with the minimum ranging from 0.1 to 0.35 LU/ha and the maximum ranging from 1.6 to 2 LU/ha, depending on the type of disadvantage (Boccaccio et al. 2009). In the wood-pasture systems of the New Forest (UK), during the main regeneration stages, maximum grazing livestock densities for cattle, ponies and deer have been set at 0.3, 0.15 and 0.45 LU/ha/year, respectively (Mountford and Peterken 2003, Plieninger et al. 2015). In Belgium, grazing livestock densities in former pastures and arable fields have limits of 0.35 to 0.5 LU/ha/year in order to allow tree regeneration in the developing mosaic vegetation during the first 5–10 years after the end of the previous agricultural use (Van Uytvanck 2009, Plieninger et al. 2015).

For wood-pasture systems such as the *montado*, in Southern Portugal (also called *dehesas* in Spain), higher cattle and sheep stocking densitites are correlated with increased fragmentation and decreased heterogeneity, respectively (Almeida et al. 2015), and therefore stocking densities should be kept under 0.3 LU/ha for cattle and 1.2 LU/ha for sheep. Overall, in order to prevent *montado* loss under current ecological conditions, grazing livestock densities should remain between 0.18 and 0.60 LU/ha (Godinho et al. 2016).

4. Very Good Agricultural Practices (VGAP) to promote Biodiversity

In a general manner, good agricultural practices are specific environmental and operational conditions which, when applied to agriculture, create food for consumers or further processing that is safe and wholesome. While there are numerous competing definitions of what methods constitute good agricultural practices there are several broadly accepted schemes that producers can adhere to. In order to prevent and reduce the negative impacts of livestock production on biodiversity, and also to help revert the less favourable condition found in many agricultural lands, some “very good agricultural practices” (VGAP) are available for adoption by farmers and companies in the agricultural and food sectors. A few important examples are highlighted below.

4.1. VGAP for Grassland Management

Increased biological activity improves the self-regulation of soil ecosystems and the decomposition of organic materials. Superficial treatments, such as mulch-seeding and direct-seeding, are usually less harmful to soil biodiversity than ploughing and therefore have lower impacts on soil biodiversity such as earthworms, spiders and ground beetles. The latter also benefit from conservational soil preparation (Farooq and Kadambot 2015). In order to protect small invertebrates, which are basal in soil trophic webs, it is recommended to avoid mobilizing the upper soil layer (0 to 30 cm). In Central and Northern Europe, adopting mechanical soil preparation techniques to control weeds is recommended as a replacement for the use of agrochemicals. In Southern Europe, reduced soil mobilization is preferable, but the application of herbicides before heavy rains should be avoided (Basch et al. 2015).

4.2. VGAP for Nutrient Management and Fertilization

Fertilization practices aim at increasing crop and pasture growth, yield and quality (digestibility and nitrogen content) by supplementing the soil with additional nutrients and increasing soil organic matter. However, fertilization practices may lead to: a) changes in the trophic state of plant and animal communities; and b) changes in the global nutrient cycles (mostly through nutrient run-offs to the surrounding environment and the diffuse pollution that follows, caused by nitrogen and phosphorous) (Basch et al. 2015).

Council Directive 91/676/EEC, concerning the protection of waters against pollution caused by nitrates from agricultural sources (EEC 1991), lists the type of provisions that should be covered in good agricultural practice codes regulating fertilization practices. These provisions cover aspects such as the appropriate periods and procedures for the application of fertilizers, as well as the capacity and construction of adequate storage facilities for them. Annex III of the same directive proposes measures ensuring that, for each farm or livestock unit, the amount of livestock manure applied to the land each year (including by the animals themselves) does not exceed a specified amount per hectare. Except when Member States justify the need for a different limit, that amount must not exceed 170 kg/ha for nitrogen.

The analysis of the possibility and advantages of using organic fertilizers is recommended. This may mean that different kinds of organic matter may have to be used. The use of liquid manure (also designated as slurry – a mixture of faeces, urine and water, with no significant quantities of bedding) and solid manure (from a variety of livestock species) is common. These may be applied after composting (which provides a dark, friable, stabilised, high dry matter final product) (Shepherd et al. 2002).

Large quantities of phosphate and potash may be removed from the soil when cutting grass for silage or hay. The application of manure helps to replace what has been removed. Applying manure also benefits arable crops. Rapid incorporation after application decreases losses of nitrogen as ammonia (Shepherd et al. 2002).

The application of fertilizers according to some basic rules may prevent nutrient run-off into existing water bodies. Manure must not be applied on: a) water-saturated or flooded soils; b) deeply frozen soils; and c) soils covered with snow. Member States have established specific, minimum buffer zone distances to be respected between water bodies and the areas where organic fertilizers are to be applied. Despite some variation regarding minimum values, it is recommended that a buffer zone of primarily native vegetation along each border of seasonal and permanent water bodies should respect a minimum of 10 meters in width in order to be effective.

In Central and Northern Europe, fertilization usually takes place from February to October. In Southern Europe, closer to the Mediterranean, the application of mineral fertilizers on rainfed, permanent and biodiverse pastures must take place before the productive cycle initiates, i.e., in August and September (installation and maintenance). The application of solid and liquid organic fertilizers should take place in the same period, but the former should only be applied during the installation (first seeding) stage, in order for incorporation into the soil to take place, while the latter may be applied during the installation and maintenance stages. In the same region, the application of mineral fertilizers on irrigated pastures rich in legumes also takes place in August and September, but maintenance may be performed in February and March. Both solid and liquid organic fertilizers must be applied exclusively during the installation stage. The application of liquid organic fertilizers during the productive cycle must be avoided as it may burn the young emerging plants.

In order to be able to respect the adequate periods for organic fertilizer application, assuring enough storage capacity is essential.

4.3. VGAP for Pest Control and Plant Protection

As stated above, all agricultural activities of a chemical or mechanical nature have effects on biodiversity. In Central and Northern Europe, reducing the presence of weeds using mechanical measures has less negative effects on the environment compared to the use of herbicides. In Southern Europe, avoiding tillage and preserving the existing soil organic matter is necessary and frequently complemented with localized and precise use of agrochemicals (with lower persistence due to less tillage).

Integrated Pest Management is a reference found in European legislation which aims at preventing the use of pesticides by applying cultivation techniques to reduce pests and diseases in crops. These measures should always guide the farm management. Among the agricultural practices that reduce the risk of pests and diseases, the optimal use of organic matter and the promotion of beneficial organisms are important for grasslands. The spreading of harmful organisms can also be prevented through field sanitation and hygiene measures such as: a) the removal of affected plants or plant parts; b) the regular cleansing of machinery and equipment; and c) balanced soil fertility or water management.

In order to protect open water bodies, buffer zones must be installed and maintained along the edges of waterways and water bodies (minimum width: 10 metres). The use of mechanical weeding is recommended in order to substitute pre-emergence herbicides. The use of pesticides which are dangerous to bees, pollinating insects, beneficial organisms, amphibians or fish should be prohibited. Furthermore, very harmful substances and their salt equivalent versions should not be allowed (e.g., glyphosate, diquat, paraquat, glufosinate-ammonium, indaziflam).

4.4. VGAP for Harvesting and Mowing of Livestock Feed Production

A series of measures can help to reduce the impact of mowing on biodiversity:

1. Strategically delaying the mowing season;
2. Establishing a minimum mowing height of at least 7 cm;
3. Reducing the mowing frequency.

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

1. Mowing when insects and other arthropods are less active;
2. Mowing different areas in different moments;
3. Adopting an adequate mowing pattern.

4.5. VGAP for Livestock Management and Grazing

A maximum of 1.4 LU/ha of fodder surface should generally be respected, but more ambitious limits should be adopted in the case of HNV farmland, such as wood-pasture systems, depending on several factors. Farms with higher stocking densities must work towards a reduction of density values in order to match this limit within a given period. Farms with lower stocking densities should hold these lower densities. Overall, livestock density values should be subject to a continuous reduction over time until the optimum level is reached.

Management plans should include adequate grazing strategies and patterns, reducing the impact on the grassland and on biodiversity. Basic grazing systems may be:

1. Continuous (the pasture is not divided in sub-pastures or paddocks and the livestock is allowed to graze all the pasture area at any given time);
2. Rotational (the pasture is divided into sub-pastures or paddocks, using appropriate mobile and wildlife-friendly fences, and the cattle is allowed to graze each paddock for an adequate time period before being moved);
3. Ultra-high density, mob grazing and flash-grazing (usually in the morning, high livestock densities are allowed in a pasture to control invasive species, but may also later be moved according to a rotation system).

4.6. VGAP for Reducing and Halting Deforestation

VGAP may be adopted to reduce and halt the destruction of habitats through the conversion of native primary forest into pastures or feed crop production areas.

The EU imports about 35 million tonnes of soy (*Glycine max*) every year (about 35 % of global soy trade), mainly from South America (Brazil, Argentina, Paraguay, Uruguay and Bolivia produce over 50 % of the world soy and export about 80 % of the production) (Lambin et al. 2003, Wassenaar et al. 2007, Nepstad et al. 2009, Teillard et al. 2016). Soy production grew tremendously over the last four decades and is still increasing, leading to deforestation and the destruction of *cerrado* and wetland areas, besides usually requiring an extensive use of pesticides.

The European CAP regulations do not apply to South American agriculture. Therefore, the best practice is to prioritize the certified production of fodder in Europe. Importing from other biodiversity-certified sources is an alternative, but local production is preferable as it prevents GHG emissions from transport.

Choosing not to import soy products from sources outside of the European Union also makes it easier to avoid genetically modified (GMO) varieties. About 95 % of the soy produced in South America consists of GMO varieties. In 2006, the European Commission approved the use of two GM soybean varieties for food or animal feed production. However, such products require compliance with the EU's labelling and traceability rules.

4.7. VGAP for Promoting Traditional Livestock Breeds

Traditional livestock breeds constitute an important part of global agro-biodiversity and are essential for the provision of ecosystem services, transforming food sources originally unsuited for human consumption and interacting with ecosystems. Many of the traditional breeds resulted from human (artificial) selection and have specific traits that allow them to: a) adapt to specific environments; b) convert particular types of vegetation; c) resist to certain diseases, and d) tolerate certain climatic extremes. These breeds provide ecosystem services that emerge from their adaptations to different environments, production systems, societal requirements and cultural dynamics (FAO 2016b). Therefore, livestock diversity enables production systems to adapt to current and future global change, providing them with more resilience (FAO 2015). For this and other reasons, European citizens have demonstrated significant interest in the conservation of native breeds and varieties (Pouta et al. 2016).

Currently, there are about 11,062 national breeds of livestock mammals and about 3,807 national breeds of livestock avian species (FAO 2015). However, about 565 breeds of mammals and 82 breeds of avian species have already become extinct and about 1458 other livestock breeds are currently threatened (FAO 2015) by small effective population sizes (most domestic breeds have small populations with tens or a few hundred individuals), genetic erosion, high risks of inbreeding and high vulnerability to demographic and environmental stochasticity (FAO 2006, Kristensen et al. 2016).

Conservation programmes and good practices may help reduce the risk of further extinctions among traditional livestock breeds. Programmes should involve as many animals as possible in order to minimize genetic drift. Genetic erosion may be fought by adopting good practices likes: a) well-planned breeding; b) increasing the number of males used for breeding; c) lengthening the generation interval; and d) optimizing the contribution of each individual to the next generation.

Food companies and retailers may motivate producers/suppliers towards agro-biodiversity and old or traditional, autochthonous, livestock breeds. This may be achieved by assuming a share of the costs that those producers may become subject to (due to their selective agro-biodiversity performance) as well as by binding purchase commitments to producers that employ the best practices.

5. References

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Overview of the Project EU LIFE Food & Biodiversity

Food producers and retailers are highly dependent on biodiversity and ecosystem services but 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, 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 of advisors and certifiers of standards as well as product and quality manager of companies;
C) Implementation of a cross-standard monitoring system on biodiversity;
D) Establishment of a European-wide sector initiative.

Within the EU-LIFE Project Food & Biodiversity, a Knowledge-Pool with background information linked to agriculture and biodiversity is provided. You can access the Knowledge Pool under the following link:

www.business-biodiversity.eu/en/knowledge-pool

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