

# How do grasslands benefit humans

Introduction to grassland  
ecosystem services



 **LIFE**  
Viva  
Grass



## **How do grasslands benefit humans: introduction to grassland ecosystem services**

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*Photo: Žymantas Morkvėnas*

# Introduction: Grasslands are more than hay and species

From nature's viewpoint, grasslands stand among the most diverse ecosystems in the world – while tropical rainforests host the highest number of plant species in areas above 50 m<sup>2</sup>, natural grasslands win in smaller areas<sup>1</sup>!

Of course, over centuries humans mostly saw the value of grasslands in their ability to provide food for domestic animals. To be honest, the present grassland ecosystem as such has developed in the Baltic Region and most parts of Europe as a symbiosis between nature and man – disturbances provided by haymaking or grazing prevented grasslands from being overgrown by trees and bushes, and from reaching their final transformation back into forests. Before men, large wild grazers (horses and aurochs) took care of clearing the landscape and forming grassland patches. When first crop-growing tribes came into the Baltic Region, they implemented slash and burn agriculture, clearing vast forest areas and opening places that facilitated spreading grassland species.

The role of grasslands as fodder providers has decreased nowadays, and we see the transformation of grasslands back into forests in many places, thereby losing the areas and the quality of this valuable ecosystem.

With this small brochure, we would like to prove that the perception of grasslands only as an animal fodder provider, or just as a biodiversity pool, is rather narrow-minded. There are many other benefits, which we usually do not notice in our busy lives. Scientists have granted them the name “ecosystem services”. The aim of the brochure is to introduce the reader to the concept of ecosystem services, with particular emphasis on grasslands.

We hope that the brochure will help you discover new aspects of grasslands, which you probably knew but maybe did not pay attention to! Now, go to the nearest meadow or pasture and look at it with fresh eyes and a different mind!



*Photo: Žymantas Morkvėnas*

<sup>1</sup> Wilson, J.B., Peet, R.K., Dengler, J., Pärtel, M. 2012. Plant species richness: the world records. *Journal of Vegetation Science* 23. 796–802

# 1. Various components and dimensions

When coming to a grassland, at first people usually tend to see mostly grass. By taking a closer look, we can discover that the grass actually includes a number of various plant species. In the Baltic Region, semi-natural grasslands host up to 700 plant species (in Estonia)<sup>2</sup>. Some grassland habitats are particularly rich – botanists have counted up to 76 plant species per m<sup>2</sup> in the wooded meadows of Estonia<sup>3</sup>.

Grassland plant species provide habitats for many animals. One can see plenty of insects flying above or hiding in grass: nice butterflies, beetles and grasshoppers and, of course, annoying flies and gadflies. Moreover, this is only the visible part of the world of insects. Many of them live in the soil.

Grasslands also serve larger animals - various birds, such as corncrakes and white storks, amphibians (frogs and toads), and reptiles (lizards and snakes). Even larger mammals (roe deer, wild boars) benefit from grasslands for *stealing* grass from cattle and sheep, or like foxes hunting for mice.

We usually perceive grasslands only in the dimension of grass. In addition, there is the soil below the grass that feeds plants and hosts plenty of soil animals (worms, snails) and various microorganisms. If you raise your eyes, there are insects and birds flying above in the air.

All these dimensions form the ecosystem characteristics for grasslands, which are highly valued by humans.



Old World Swallowtail (*Papilio Machaon*)  
Photo: Ilze Priedniece



Yellow wagtail (*Motacilla flava*)  
Photo: Ilze Priedniece

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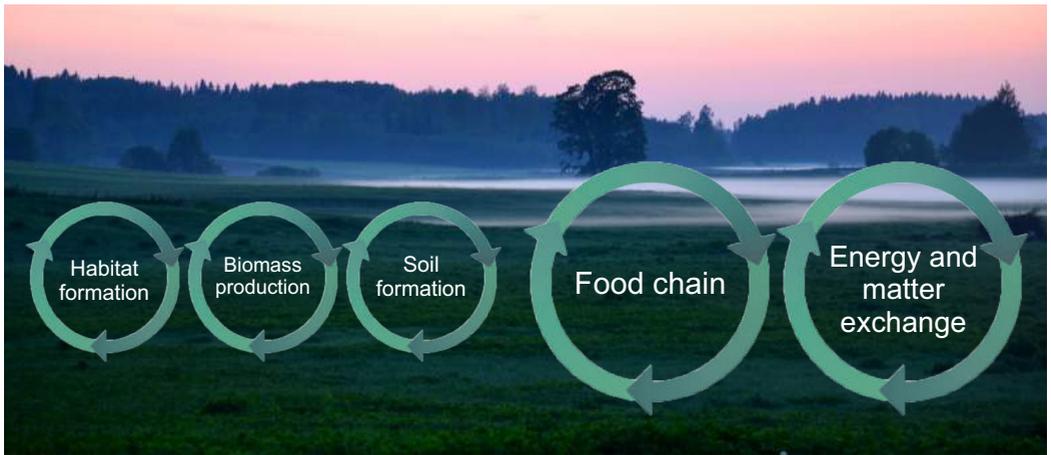
<sup>2</sup> Keskkonnaministeerium 2013. Poollooduslike koosluste tegevuskava aastateks 2014-2020 (Ministry of the Environment 2013. Action plan for semi-natural habitats for 2014-2020)

<sup>3</sup> Sammul, M., Kull, K., Tamm, A. 2003. Clonal growth in speciesrich grassland: the results of a 20 year fertilization experiment. *Folia Geobotanica* 38: 120

## 2. Various processes

Every ecosystem maintains various processes linking together the living (biotic) and non-living (or abiotic) environments. For the maintenance of a functional and healthy natural and man-made environment, the preservation of these processes is as important as the protection of species and habitats. Numerous processes in nature ensure the availability of essential resources, such as water, oxygen and nutrients, for organisms - including humans.

Although these processes are common for different ecosystems, they differ in their performance. While overall biomass production can be similar in both forests and grasslands, the biomass flow is much more intensive in grasslands - opposite to forests, where biomass is mostly being accumulated in timber. Also, soil formation processes are different in both ecosystems. In grasslands, the accumulation of organic matter is much more intensive.



*Figure 1: Various processes in grasslands*  
Photo: Dace Iraids

## 3. Providing hay and honey

There are many ways for direct use of grassland products, which can be collected, consumed or sold, thus contributing to human well-being.

For millennia, grasslands have been a source of food for domestic animals, either in the form of raw grass or hay for feeding in winters. Although more and more farms



Natural grasslands provide high quality mutton  
Photo: Valdo Kuusemets



Healing Cowslip (*Primula veris*)  
Photo: Dace Iraids



Honey is taken  
Photo: Kaspars Teilāns (TV broadcast "Ēdiena daba")

start using crops for feeding, grass remains as the most natural forage for cattle, horses, and sheep providing minerals, vitamins and other active substances supporting living processes and providing healthy meat and milk for people.

Nowadays, when grass is losing its primary role due to a decrease in forage, still, it may be used for energy production needs. Lihula municipality in Estonia uses local grass for burning and heating houses that also helps to maintain high nature value grasslands and keeps a healthier environment by using renewable biomass instead of fossil oil-shale.

Medical plants are another important good, and the more diverse the grassland is, the more possibility to find the species

needed to improve your health. Tea of the meadowsweet *Filipendula ulmaria* picked in a wet meadow will let you relax after a stressful day. But in dry meadows, you can find the cowslip *Primula veris*, which is being used for fighting cough, and more.

Nothing sweetens life like good honey collected by bees in a diverse natural meadow. It is also good for the health. Medical properties of other bee products - pollen, ambrosia and propolis - beat many pills.

Did you know that some grassland plants might be used as natural dyes for colouring clothes? E.g. St. John's wort *Hypericum perforatum* offers red and brown colours.

Rest assured, there are more ways how to use the grass!

## 4. Protecting soil and cleaning water

When you step on arable land and look back, usually you see a deep footprint in the soil. If you step on grassland, you hardly see changes in the soil. Thus, grassland plants with their root system keep the soil stable and prevent erosion – the washing out of soil particles by water and wind. This is particularly important in hilly places.

Often in spring, you can hear in the media about the damage done to settlements by flooding. A huge amount of melting snow water quickly runs through ditches and straightened rivers, significantly raising the water level. Before, when humans had not changed the natural flow of water streams, excess water was stored in floodplain meadows that served like a sponge and regulated the water flow. Traditionally, society tried to solve the flooding problem by building dams around settlements, but the smartest people restore floodplain meadows. A good example is the ongoing Lower Danube green corridor

initiative to restore 224 000 ha of natural floodplain along the Lower Danube River. While, overall, restoration costs have been estimated at 183 million EUR, damage from the 2005 flood alone resulted in a 396 million euro loss<sup>4</sup>.

Grasslands have also another benefit related to water – they clean it by removing solid particles, nutrients and other substances, which results in cleaner surface waters.



*Grasslands effectively prevents  
Photo: Ra*



*Rich floodplain meadows purify water and store it during flooding  
Photo: Baiba Strazdina*



*the soil from erosion  
imonds Kasparinskis*



*A bumblee providing a „pollination service“  
Photo: Valdo Kuusemets*

Have you heard of people in China going to fields and pollinating crops by hand? Or beehives being transported across long distances to ensure pollination of crops where no natural pollinators are available? The easiest (and cheapest) way is to maintain natural grasslands nearby – bees, bumblebees and flower flies will visit the crop field and provide pollination.

According to the European Commission, the average contribution of insect pollination to European agriculture is at least 22 billion EUR a year<sup>5</sup>.

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<sup>4</sup> Lower Danube green corridor: floodplain restoration for flood protection (2014) - <http://climate-adapt.eea.europa.eu/metadata/case-studies/lower-danube-green-corridor-floodplain-restoration-for-flood-protection>

<sup>5</sup> Honey bees - [https://ec.europa.eu/food/animals/live\\_animals/bees\\_en](https://ec.europa.eu/food/animals/live_animals/bees_en)

## 5. Providing inspiration and keeping traditions

The role of grasslands goes far beyond providing products and regulating natural processes. It is a significant part of the cultural landscape, which has formed the traditional mosaic living environment over many centuries in Europe. A landscape itself has a scenic value for many people enjoying it through a car window or a walk in the countryside. Can you imagine the countryside only with forests? Mosaic landscapes are used for many recreational activities including hiking, riding a bike, skiing, and animal watching.

Northern European countries have old Midsummer celebration traditions. Setting a fire on the top of hilly grasslands and making a summer solstice crown from various flowering plants are important traditions of Midsummer celebrations.

Grasslands give inspiration for the arts: painters and photographers produce nice pictures, which are later enjoyed by other people. The beauty of grasslands has inspired people to create folk songs.

All these benefits are physically intangible and are not usually perceived in everyday life, but they highly improve the quality of human living. They are probably the most difficult to measure, however, most people will admit that they gain some pleasure when seeing or being in grasslands.



*Kids explore the world of grassland insects  
Photo: Ilze Priediece*

## 6. What are ecosystem services?

Ecosystem services are all those benefits that ecosystems (e.g. grasslands, forests, mires) provide to humans, and they include provisional (goods that can directly be used by humans), regulating (benefits gained from processes in nature) and cultural (non-material) services.

Ecosystem goods and services that are produced in an area but not used right away (e.g. grass that is growing but currently not being grazed by animals) form the ecosystem service potential of an area.

When these services are actually used (e.g. harvested grass that is fed to animals), an ecosystem service flow from nature to society is generated.

The sum of all ecosystem services used in a certain area in a certain period of time denotes the demand for ecosystem services. This also includes goods and services that are imported to the region (e.g. fodder for animals). In highly populated areas, the current demand for most ES is much higher than the supply<sup>6</sup>.



*Photo: Valdo Kuusemets*

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<sup>6</sup> Burkhard, B., Maes, J. (Eds.) 2017. Mapping Ecosystem Services. Pensoft Publishers, Sofia, 374 pp.



*Photo: Valdo Kuusemets*

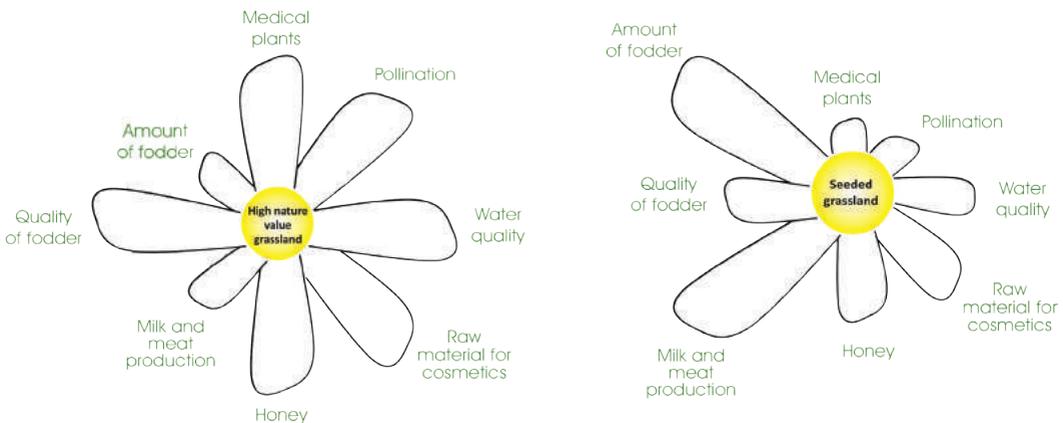
# 7. Trade-offs or “Different grasslands – different services”

There are many types of grasslands. Although most of them provide the same set of ecosystem services, their values are different. By analysing differences in ecosystem service provision in various grassland types (trade-offs - losing one quality or aspect of something in return for gaining another quality or aspect), people can plan the most appropriate agricultural land use structure to satisfy economic, social and environmental needs of the society.

Semi-natural grasslands do not necessarily provide more or better ecosystem services compared to seeded grasslands. Particularly, it is related to the quantity of fodder - intensively managed grasslands where farmers use fertilisers,

soil processing and seeding can give a much higher amount of grass biomass compared to natural grasslands. This is the way how intensive farming usually goes. However, natural grasslands often provide a better-quality biomass, richer in minerals and active biological substances that have been ensured by the high diversity of plants – the way relevant for organic farming.

Semi-natural grasslands, especially of a high nature value, hold a higher biodiversity and, accordingly, offer more medical plant species or host more pollinator species. Also, richness of species attracts humans who enjoy the aesthetics of the habitat.



**Figure 2:** Trade-off of various provisioning and regulating ecosystem services in high nature value grasslands and seeded grasslands

Author: Ilze Kalvāne

## 8. How to measure an ecosystem service?

Ecosystem services can be assessed to show the importance of ecosystems in human life and to the society, by directly measuring and calculating a monetary value or giving an agreed scoring unit.

The most precise way is to apply physical units. This can be better applied for measuring provisioning and regulating services, e.g. production of grass biomass in tonnes/ha a year or carbon sequestration in tonnes/ha, or water retention capacity in floodplain meadows in m<sup>3</sup>/ha a year.

In many cases, direct measurements are not available, and it might be very expensive to obtain data. Then, assessment can be based on the values society or experts attribute to each ecosystem service. This method can particularly be applied to the valuation of non-material ecosystem services. Various target groups with certain knowledge or expertise may be approached to identify their preferences, mark important areas or score an ecosystem service. While local respondents are especially welcome to provide their opinion on cultural services, scientists and experts are important for assessing regulating services.

The importance of an ecosystem

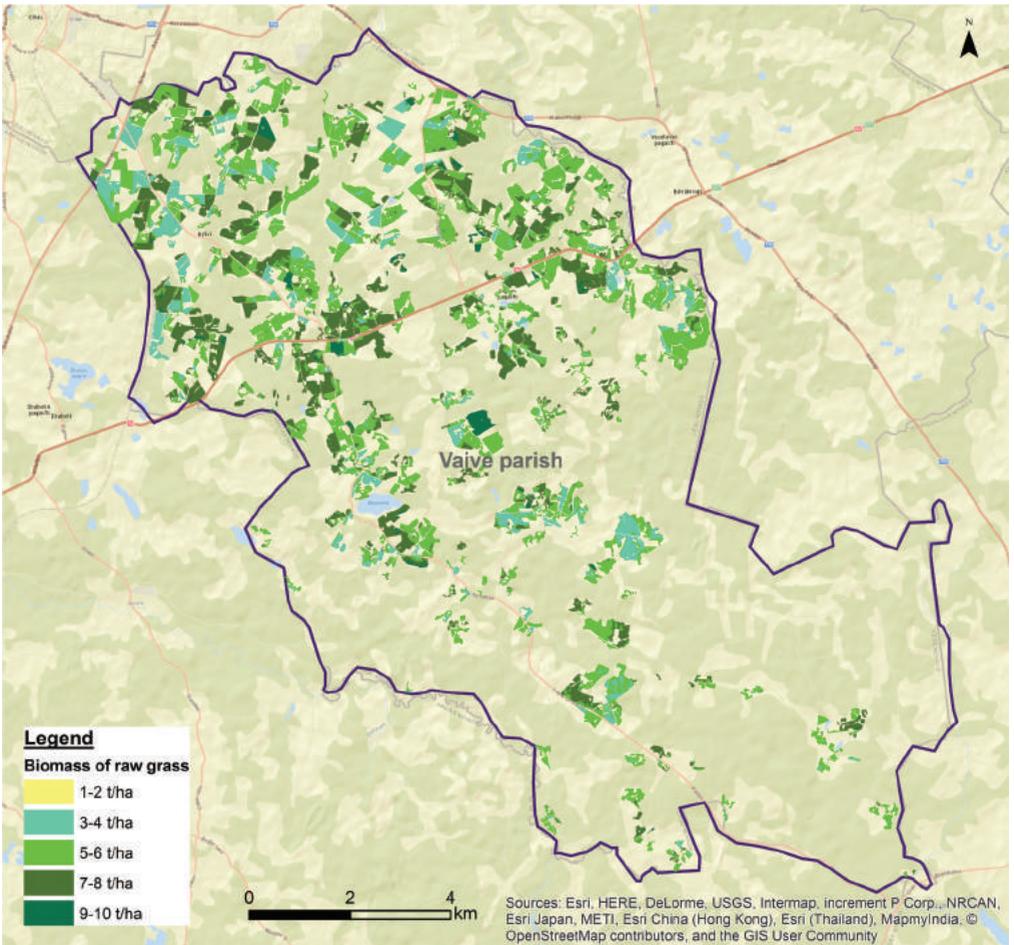
service can also be assessed in monetary terms. A study in the Czech Republic suggests that the benefits of grass cover in reducing erosion reach 265 EUR/ha a year<sup>7</sup>.

Grassland ecosystem services are being evaluated also in the LIFE Viva Grass project areas.



*Photo: Žymantas Morkvėnas*

<sup>7</sup> Zisenis, M, Richard, D., Vačkář, D., Lorencová, E., Melichar, J., Hönigová, I., Oušková, V., Hošek, M., Chobot, K., Götzl, M., Sonderegger, G. 2011. Survey on grassland ecosystem services in the Czech Republic and literature review. ETC/BD report to the EEA. 85 pp.



**Figure 3:** An example of assessing ecosystem services - grass biomass resources in Vaive Parish of Cēsis Municipality, Latvia  
Source: LIFE Viva Grass project

## 9. Why to measure ecosystem services?

There is always a question about the practical use of the ecosystem service concept. At first, it allows to have a holistic look of an ecosystem not only as

a place where various species live together (nature conservationists' world) or as a source of resources that can be used (pure industrial or agriculture world),

but also as a possibility to quantify and map benefits to society. If governments wish to include environmental aspects into economic accounting, the ecosystem service approach provides a feasible ground.

Valuation and assessment of ecosystem services should extensively serve various planning processes. Particularly, spatial planning would benefit, as it allows local municipalities to determine areas which serve the local residents most. In Sweden, the value of ecosystem services should be integrated in planning and other decision-

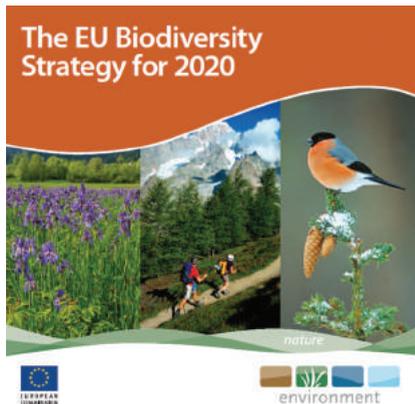
making processes by 2018.

More and more experts propose the integration of ecosystem services in the Agri-Environment Payment Schemes within the European Rural Development Programmes, with the future aim to support farms for delivery of various ecosystem services towards food security and protection of farmland biodiversity.

Mapping and assessment of ecosystem services in the European Union is being done under the initiative of the EU Biodiversity Strategy adopted by the European Commission in 2011.



*Photo: Žymantas Morkvėnas*



The EU Biodiversity Strategy for 2020 already includes the headline target to halt the loss of biodiversity and the degradation of ecosystem services by 2020, and restore them in so far as is feasible. The strategy targets mapping and assessing the state of ecosystems and their services in EU national territories, as well as assessing the economic value of such services, and promoting the integration of these values into accounting and reporting systems at the EU and national level.



The aim of the LIFE Viva Grass project is to find economically viable and area specific management models for the multifunctional use of grasslands.

[www.vivagrass.eu](http://www.vivagrass.eu)

