Synthèses

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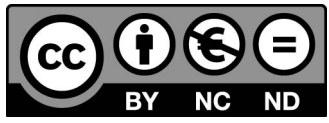

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Executive summary

European grasslands have been significantly reduced during the last thirty years in favour of the production of green maize and other annual crops. But permanent and temporary grasslands still cover 33% and 6%, respectively, of the total utilised agricultural area (UAA) in 2007. The percentage of UAA used as grassland varies considerably between countries and regions. Data collection for grasslands is difficult because different countries have various grassland systems and definitions. Semi-natural grassland, for example, is classified differently in many countries. Forage maize developed considerably since the 1960s in parallel with the import of protein-rich feedstuffs, soybean especially. Since then, energy and protein productions from grasslands were progressively replaced by maize and soybean, respectively. Legume forage crops are of variable importance in European countries, but legumes have a large potential everywhere and can contribute to sustainable herbivore husbandry.

Organic farming is growing significantly (3.6% UAA in 2007). Permanent grassland represents 47% of the whole organic area in the EU-27. This higher share in UAA in comparison with conventional farming (31%) can be explained by the relatively greater ease in managing organic grasslands compared to organic annual crops (weeding and crop protection, for instance, are not so crucial in grasslands), the need to increase nitrogen and protein autonomy of farms and the combination of organic and agri-environmental payments for permanent pastures.

Grassland productivity is affected by several factors: soil characteristics, climatic conditions—particularly total and seasonal distribution of rainfall and temperature—altitude, latitude and management. A spatial distribution of grassland productivity across regions in Europe is presented in several figures in the text.

The total EU-27 livestock in 2007 (132.56 million livestock units) is divided as follows: 41% monogastric animals and 59% grazing livestock, of which 82% are cattle and 18% sheep, goats and equidae. In the EU-27, 75% of cows are dairy breeds and 25% are beef cattle. Grazing livestock density is an indicator of the intensity of grassland use and of the pressure of livestock farming on the environment. Manure produced by livestock contributes to greenhouse gas and NH_3 emissions in the atmosphere and nutrient leaching into water. A higher density means a higher amount of manure per ha UAA, which increases the risk of N-leaching. An excessively low livestock density increases the risk of land abandonment in extensive livestock systems or the need for industrial fertilisers in arable cropping systems. Farming practices also impact the environment. Sheep and goats represent about 12% of the grazing livestock in EU-27, with higher concentrations in the Mediterranean countries, the United Kingdom and Romania. Equines contribute to less than 5% of the grazing livestock but are more common in central and northern Europe.

The increasing cost of fossil fuels and environmental concerns about climate change also influence agrofuel production and demand. Grassland and fodder areas compete with arable land for first-generation bio-fuels like bioethanol (maize, wheat, barley, sugar beet), biodiesel (oilseed rape extraction) and methane (biogas).

Combustion of grassland biomass is less favourable than other crops or residues such as straw because of the NO_x, SO_2 and HCl emissions and ash content. Combustion of grassland biomass is carbon negative and provides a net energy gain even at very low biomass yield levels. Intensification of management for this purpose is thus not recommended.

Biorefinery is a concept that involves using green biomass (pasture) as raw material to produce high value biochemicals from the liquid fraction and lower value products for energy generation from the grass fibre fraction. The grass resource could be semi-natural or cultivated grassland or verge grass that is not needed for traditional use (i.e., forage for herbivores). The general challenges in biomass processing are the transportation costs, the use of dry or wet products, the choice of a central or mobile unit, and the choice between storage for a year-long period versus a campaign during the growing season.

Traditional grassland management has resulted in large areas of semi-natural grasslands in Europe. During the past century, these surfaces have declined because land use has intensified and some land has been abandoned by agriculture and usually reforested. Today, in intensified agricultural regions, semi-natural grasslands represent only a low percentage of the total grassland area, mostly in locations that are less suitable to agriculture. Moreover, overall grassland surface has declined. These shifts are threatening European biodiversity in all its aspects, as well as the ecosystem functions related to them.

Grasslands can act as a carbon sink. Several studies have shown a steady increase in soil organic carbon in grassland soils, where over time the carbon levels rise above those of arable soils. However, carbon losses happen much faster after ploughing up the sward. This illustrates the importance of conservation of grassland surfaces and sward longevity for climate mitigation. On the other hand, emissions of N_2O from grassland soils and CH_4 from grazing ruminants partially counterbalance the mitigating effects of carbon sequestration.

Grasslands can also mitigate soil erosion and pollution. They provide a dense rooting system and a permanent soil cover. Ploughing grasslands is seen as one of the causes of increased erosion problems in some European regions. Organic nutrients and pollutants left on the grassland surface decompose quickly due to intensive biological activity. Grassland thus acts as a biological filter for the migration of various chemicals towards surface and groundwater systems. Grassland-based systems also use much lower levels of pesticides than arable systems.

One of the most important functions of (semi-natural) grasslands in Europe is supporting high biodiversity levels. Grasslands are crucial not only for a great variety of plant species but also for many species of farmland birds, butterflies, beetles, etc. Many species are rarely found in other vegetation types. Moreover, the grassland soil fauna can amount to several tonnes per hectare. Agriculturally improved permanent and temporary grasslands, even lower in biodiversity than semi-natural grasslands,

can be essential for the survival of bird species. Intensive permanent grasslands host higher biomass and diversity of soil life than arable land. Lastly, grasslands contribute to an attractive landscape as they are perceived as a rather natural landscape feature and preferred over other land uses such as settlements or arable fields. Semi-natural grasslands especially tend to improve the "naturalness" of a landscape as they show the increased colour and structure that is often associated with low-intensity land use. For this reason, grassland areas are beneficial for tourism and outdoor recreation.

European grasslands are characterised by multiple functions and provide multiple services and benefits which are increasingly recognised by the society and notably by the European Union (EU).

The importance of the grassland area in all European countries is not easy to assess for several reasons that are developed in the book. The permanent grassland area decreased significantly but at the same time the importance of the grassland area and of the different grassland types is not yet well documented at a European level. This book aims to clarify and quantify more precisely the importance and the changes in grasslands and grassland-based systems in the EU and to synthesise the role of socio-economic and political driving forces in this evolution. The reasons for the decline of the grassland area are also analysed.

Permanent grasslands cover over 57 million ha in the EU-27 (2007), temporary grasslands about 10 million ha. Together, they occupy about 39% of the European UAA. These grasslands are the basis of feed for about 78 million livestock units (LU) of grazing livestock. They are managed by about 5.4 million holders, or about 40% of all European farm managers. Among these farms managing permanent grasslands, 41% have an European size unit (ESU) lower than one (very small farms).

The estimation of losses of the permanent grassland area is difficult. In the EU-6, these losses are estimated at about 30% and 7 million ha between 1967 and 2007 (Eurostat). However, there were major differences in evolution trends between countries. Losses were very high in Belgium, France, Germany, Italy and the Netherlands. Surfaces remained almost stable in Luxembourg and the United Kingdom and Ireland. Surface losses calculated from the FAOSTAT database are estimated at about 15% and 10 million ha for the EU-13 (EU-15-Belgium and Luxembourg) between 1961 and 2007. These losses are clearly underestimated notably because of changes in survey methods over time in some countries (e.g., Greece, Italy, Portugal). The variation of the temporary grassland area can only be calculated for short periods due to a lack of data. Between 1990 and 2007 (Eurostat), the temporary grassland surface increased in 11 EU countries. It seems that this surface stabilised between 2001 and 2007. It is likely that temporary grassland areas used through cutting decreased over the last twenty years while grazed temporary grassland areas rose in some countries (Belgium, the Netherlands).

The dairy cow population fell by 10 million head in the EU-9 between 1975 and 2007 (drop of 40% from 1975 levels). This decline started after the implementation of the milk quotas in 1984. Inversely, suckling cow and sheep populations increased by about 3 and 8 million head respectively, over the same period in the EU-9. In the former communist countries, cattle and sheep numbers declined sharply, by at least 50%, in the 1990s and started to stabilise or increase slowly in the first years of

the 21st century. The total number of agricultural holdings in the EU-9 was reduced by almost 50% in thirty years (1975–2007). The decline of dairying specialists was very high (72%) while cattle rearing and fattening specialists and sheep, goats and other grazing livestock specialists remained much more stable (3% decline and 15% increase, respectively). The size of grazing livestock holdings nearly doubled during that period.

Certain **sociological driving forces** support the use of grasslands. There is an increasing demand from society to reward farmers for the multiple services that grasslands offer and for a sustainable management of associated public goods such as biodiversity and carbon stocks. However, other sociological forces lead to grasslands being replaced by annual crops. A steady decline in beef and sheep meat consumption per capita by European citizens in favour of pork and poultry meat has been observed. Despite export markets, this influenced the production. For instance, between 1995 and 2008 in the EU-27, cattle meat production decreased by about 9% while pork meat increased by 17%. If less ruminant meat is consumed and the grassland area does not change, an extensification of grassland management is possible, but it is more likely that a higher demand for monogastric meat will bring about the replacement of a part of the grassland area by crops or other land uses.

Economic driving forces have different effects on grassland use**:** certain factors lead to the replacement of grasslands by annual crops, while others promote grasslands. Compared to annual forage crops (forage maize and fodder beet), product costs per hectare are similar for grass silage and much lower for grazed grasslands; grass silage has higher costs per kg of dry matter and per energy content and grazed grasslands lower. All types of grasslands, and especially grazed grasslands, have lower costs per kg of crude protein. In late 2008, farm commodity prices dropped considerably. Milk prices were particularly affected, threatening the profitability of dairy farms integrated in industrial production chains. Products such as high quality cheeses protected by Protected Designation of Origin (PDO) and organic labels held out much better than raw milk. The crisis had almost no impact on the profitability of dairy farms producing this type of dairy product. This was a clear sign that quality labels can have a positive effect on the income stability of dairy farms. Furthermore, quality product-based systems use on average more grass in livestock feeding than more intensive dairy farms; quality labels thus have a positive effect on grassland-based systems.

Several Common Agricultural Policy (CAP) instruments are of special importance: direct payments and the respect of the 'Good Agricultural and Environmental Conditions' (GAEC) in the cross-compliance principle, milk quotas, investment aids, agri-environmental measures (AEM), less favoured area (LFA) allowances and diversification support. Some have not been favourable to the maintenance of grassland. Firstly, before the CAP reform of 2003, a higher proportion of the budget (especially from Pillar 1) was spent per hectare of arable land, including silage maize than on grasslands and for field crop specialist holdings than for grazing livestock specialist holdings. This difference was partly compensated by some Pillar 2 expenditures but an overall imbalance remained. This difference still existed even after 2003, although to a lesser extent. Secondly, the implementation of the milk quotas in 1984 has supported milk prices by controlling production in the EU.

High milk prices have encouraged dairying systems using high inputs of chemical fertilizers, concentrate feeds and mechanised methods for silage production at the expense of grazing. These tendencies were largely reinforced by the convenience of managing dairy herds indoors particularly with cows calving in autumn and fed with maize silage and by the decrease of the price of cereals after the CAP reform of 1992. It has reduced the number of dairy cows, leading to a decreased stocking rate in some cases or the development of suckling cows or sheep systems independently or in complement to dairy systems in other cases. National and regional rules for quota transfers have helped some Member States (e.g., France and Italy) to maintain dairy production in LFA. Quota transfers in Germany gave rise to a concentration of dairy production in regions with a high proportion of permanent grasslands in the UAA. In a first step, milk quotas have encouraged farmers to lower their production costs and produce more milk per cow on the basis of grass and forage maize, which are cheaper than concentrates. Thirdly, the effect of milk quotas was combined with those of the CAP reforms of 1992 and 2000, causing a significant drop in cereal prices (about 50%), thereby again encouraging dairy farmers to use cereals in animal feeding, often at the expense of grass. Fourthly, farmers also tried to reduce their production costs by increasing milk yield per cow (lower maintenance costs per litre), but by doing so they tended to use more maize silage and more concentrates at the expense of grass grazing and grass silage. This was because they did not trust the capacity of their high-yielding cows to produce enough milk from grass. This trend, resulting from a combination of policy decisions and breeding progress of dairy breeds, led to a decrease in the grassland proportion in the UAA in dairy farms.

Rural Development (RD) support are *a priori* more favourable to the maintenance of permanent grassland areas and the support of specialist grazing livestock holdings than Pillar 1 support measures, especially AEM and LFA allowances. More than half of grazing livestock farmers operate in LFA. LFA payments contributed significantly to their income and helped keep farmers in these areas. For instance, in France between 1979 and 1995, LFA payments appeared to have had a positive impact on changes in the number of holdings, agricultural area (including the permanent grassland area), number of cattle and dairy cows and available labour in mountain areas. AEM also have a significant impact on the income of grazing livestock specialists. In several Member States, AEM aimed to promote grassland areas and limit increases in forage maize and cash crop areas, but were unable to reverse the general trend. However, they most likely slowed the reduction rate of permanent grassland areas, the decline of grassland biodiversity and the simplification of landscapes. Although there were exceptions in some regions and Member States, organic farming remained marginal and did not change the main evolution trends in EU agriculture. Pluri-activity and diversification activities are also supported by the second pillar budget. Income provided by these activities can be of great importance for holders of grazing livestock farms and is thus an indirect support to the maintenance of permanent grassland areas.

After the reform of 2003, the perverse effects of Pillar 1 subsidies on the grassland area were reduced. Premiums were no longer linked with crop or animal types but to the eligible area. This eliminated the 'maize premium' that encouraged farmers to use this forage crop at the expense of grasslands. The use of grasslands was also

no longer indirectly supported through animal premiums but directly through area payments (the system was, however, applied with a certain flexibility among Member States according to the re-nationalisation principle). The reform radically changed the context and the way farmers think about their forage system. After 2003, the forage maize area started to decrease in some countries where this forage crop is proportionately high in the UAA (Belgium, the Netherlands, France) but not in several others like Germany, for instance where silage maize is increasing used for biogas production. The major impact of decoupling was the increase of the median direct payments per farm (+76%) and per ha (+64%) of dairying specialists, and which, over the short term, was a higher support to grassland areas. In the meat sector, about 60% of the suckling cow herd of the EU-15 still benefited from coupled payments in 2010. This possibility for Member States to retain coupled payments appears to be an efficient system for protecting cattle rearing and fattening holdings as well as sheep and goat specialist holdings. Surprisingly, in Member States with fully decoupled payments—such as Germany—suckling cow numbers remained stable while sheep numbers declined slightly. Grazing livestock specialists remain highly dependent on single payments, more so than all other farm types. Most grazing livestock specialist farms would not be profitable without financial support.

Harmonisation of direct payments per hectare will change the situation, with the most intensive farms attracting more per-hectare subsidies, calculated on a historical basis. Changes underway in payment harmonisation should support more extensive systems going forward. Since these systems rely more on permanent grasslands than intensive systems do, this measure should also help stabilise grassland areas.

The cross-compliance rule on the protection of permanent grasslands aims to reduce and even avoid further conversion of permanent grasslands into arable land. The proportion of grasslands in the UAA is calculated at regional or national levels. Land use changes can thus occur at farm and sub-regional levels in Member States that do not impose strict rules at the farm or plot level. The grassland proportion is calculated based on the difference between grasslands converted to arable land and arable land converted to grasslands. However, protection is not at all complete. For instance, old permanent grasslands and species-rich grasslands can be replaced by newly resown, species-poor grasslands. Moreover, the cross-compliance rule has been an incentive for a rapid conversion of grassland before restrictions at the farm level were implemented. Nevertheless, permanent grassland area has increased since 2003 in 11 Member States (the Czech Republic, Denmark, Estonia, Finland, Greece, Luxembourg, the Netherlands, Poland, Slovenia, Spain and Sweden) and in the Wallonia region (Belgium). In three Member States (Austria, Hungary and Lithuania) and in the Flanders region (Belgium), it has decreased slightly.

Overall, the 2003 reform has been positive on the permanent grassland area. The surface appears to have stabilised (EU-6) or increased slightly (EU-15, EU-27) between 2003 and 2007 (Eurostat). However, since then, a decline has been noted again, mainly because of high grain prices, which, when combined with high subsidies, encourage European exports to the global market.

Over a fifty-year period, the successive EU CAP reforms led to modernisation of the sector, increased farm sizes, a dramatic decline in farmer numbers, specialised production, intensification of grassland and stockbreeding, higher production

volumes, a rise in grassland and animal yields, lower legume use (more than 80% reduction in sown legume-based mixtures between 1960 and 2010 in France), a drop in the grassland area and its proportion in the UAA, and diminishing diversity of landscapes, grassland species and communities, domestic animal breeds and local products. The Nitrates Directive had a significant influence on farm structures and practices of intensive livestock systems by regulating the stocking rate and the management of nitrogen.

The political changes in Central and Eastern Europe in the 1990s brought about tremendous changes in the use and management of grasslands in these countries. The structure of agricultural production was very different between countries before 1989. The political transition period resulted in even larger differences. Farmers' attitudes towards the new political conditions were diverse. However, large areas of permanent grassland were abandoned in many countries and cattle and sheep populations decreased dramatically in all countries. The adhesion of new Member States to the European Union in 2004 and 2007 has started to produce some effects. Since statistics are available only until 2008, it is still early to analyse evolution trends. However, it would appear that the recent stabilisation or increase in cattle and sheep populations is due to this political change.

The structure of European agriculture has changed dramatically over the last fifty years. A large part of red meat production and consumption was replaced by white meat production. One possible explanation is that since the early 1960s, no taxes are levied on imports of protein-rich feedstuff in the EU. As a result, it became more profitable to feed livestock with imported feed than with local grassland forage. Soybean and cereal grains were increasingly used for producing meat and milk. European consumers ate progressively more grain-based monogastric meat than grass-based ruminant meat. This affected product quality: grain-based meats are higher in total and saturated fats, lower in omega3 fatty acids and have a higher omega6/omega3 ratio than grass-based meats, with possible impacts on human health. The development of this global forage system also caused environmental destruction. The Amazon rainforest, Cerrado and Pampas of South America were largely converted into soybean fields. Permanent grasslands regressed in Europe, replaced by green maize and cereals that complement soy in animal feeding. All these changes led to massive biodiversity losses on both sides of the Atlantic and N and P pollution in waters in Europe from slurry spreading in pig and poultry production areas. Europe became perilously close to not being able to sustain its protein needs, which is of strategic importance. New policies are needed to cope with these challenges. The solution most certainly implies decreased white meat production and consumption, new development of forage legumes, redeployment of grassland areas by paying farmers for ecosystem goods and services, development of short marketing chains and high quality animal products.

Introduction

Grassland is the main survival resource for about one billion people worldwide. In industrialised Europe, grassland covers some 30% of the agricultural area and forms the basis for a strong ruminant livestock sector. Grassland performs a broad range of functions that benefit humans. In addition to the production of herbage for livestock, grassland contributes to the maintenance of biodiversity, sequesters carbon into soil, cleans surface and groundwater, and provides an attractive environment for recreation and leisure activities, among others. Grassland farming, the intensity of management and use, and the production of goods and environmental services at a given site are strongly affected by global markets, international societal developments, information exchange and climate change. These factors seriously challenge the multi-functionality of grassland. In Europe, pressure on land use is high and it is important to establish the possibilities and constraints of combining grassland functions.

This book aims to determine the importance, roles and utility of grasslands in Europe at the catchment and landscape levels. It examines this issue from economic, agronomic and environmental perspectives.

It inventories the spatial localisation of grasslands within landscapes as well as the spatial and temporal interactions between grasslands, arable crops and other elements of the landscape. This is done for different farming systems and different pedo-climatic and socio-economic conditions in Europe.

Peeters (2010) reviewed literature and economic data to assess the impact of past agricultural policies on the promotion of sustainable systems in Europe including grassland use. This study and the present literature overview about the current distribution and the multiple functions of grassland have been developed by mutual agreement.

Definitions and data

Definitions

In the narrowest sense, 'grassland' may be defined as ground covered by vegetation dominated by grasses, with little or no tree cover. UNESCO defines grassland as 'land covered with herbaceous plants with less than 10% tree and shrub cover'. According to FAO, grasslands are the largest habitat type in the world with an area estimated at 40.5% of the earth's landmass (EC, 2008).

Under wet conditions, such as those found in most temperate climates, grassland communities only exist because they experience regular defoliation by herbivores, either domestic or wild, or by mowing. They are thus secondary vegetation. Under drier (the steppes of Hungary or Ukraine, for instance) or colder (Inner Mongolia, above the tree line in Alpine environments) conditions, the soil and climate conditions make it impossible for succession by shrubs and trees. In this case, grasslands are natural vegetation. Natural grasslands are restricted to limited areas in Europe.

Eurostat, the statistical office of the European Union, has developed a classification for fodder and grassland types to distinguish differences in forage and grassland systems (Table 1).

In the EU, **permanent grassland** is defined as follows: land used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that is not included in the crop rotation of the holding for five years or longer; it may include other species suitable for grazing provided that the grasses and other herbaceous forage remain predominant (COM(2011) 625). Except for grasslands in wet valleys and those above the arborous stratum, most so-called permanent grasslands were actually sown, at a time when animal production had to be boosted.

In the Eurostat database, 'permanent grasslands and meadows' include rough grazing. Rough grazing is defined as 'low-yielding permanent grassland, usually on low-quality soil (for example on hilly land and at high altitudes), usually unimproved by fertiliser, cultivation, reseeding or drainage, which can normally be used only for extensive grazing and are normally not mown or are mown in an extensive manner and which cannot support a large density of animals'. The majority of them can be considered as rangelands and grazed common lands. It is not always clear if for each country 'grazed common land' or all 'rough grazing' are included in the Eurostat database 'permanent grassland and meadow'.

Table 1. Eurostat classification of the fodder area.

Fodder crops and grass
Fodder roots and brassicas
Forage plants
Temporary grass
Green maize
Leguminous plants
Permanent grassland and meadow: Total
Pasture and meadow
Rough grazing
Permanent grassland and meadow not used for production, eligible for subsidies

Source: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Fodder_area.

A ley is an area of land where grass is grown temporarily instead of permanently or in rotation with crops (Oxford Dictionary). **Temporary grassland** is a typical crop in the Atlantic and Continental parts of Europe and in southern Scandinavia. The EU definition of temporary grassland is 'grass plants for grazing, hay or silage included as a part of a normal crop rotation, lasting at least one crop year and less than five years, sown with grass or grass mixtures. The areas are broken up by ploughing or other tilling or the plants are destroyed by other means as by herbicides before they are sown again. Mixtures of predominantly grass plants and other forage crops (usually leguminous), grazed, harvested green or as dried hay are included.' Depending on the country, temporary grassland may be maintained for a very short time or for a longer period (Reheul *et al.*, 2007). In Denmark, this type of grassland is managed for about two to four years and in Ireland for at least four years, but usually for much longer. In the Mediterranean area, the term 'temporary grassland' is not in use but is replaced by 'artificial grassland' containing wheat/barley or some forage grasses or legumes that are grazed during one or two seasons, respectively. This term is ambiguous, as artificial grassland has been used in the rest of Europe to describe, since the middle of the 18th century, the pure stands of forage legumes, such as lucerne, red clover or sainfoin. The term 'artificial' also implies an idea of not being 'natural', but non-natural grasslands can be semi-natural or 'improved' permanent grasslands or recently sown grasslands. This term should no longer be used.

Fodder crops from arable land may include annual or perennial crops. Perennial fodder crops, or temporary grasslands**,** include grasses, legumes and grass/legume mixtures such as grass/clover, despite their separate classification in the Eurostat classification.

The total **fodder area** includes arable fodder crops (e.g., temporary grasslands, green cereals (C3 cereals, green maize and sorghum), fodder roots (including fodder beet), fodder brassicas, fodder Compositeae (sunflower)) and permanent grasslands.

Utilised agricultural area, abbreviated as **UAA**, (or **agricultural area**, abbreviated as **AA**) describes the area used for farming. It includes the following land categories:
– arable land;

– permanent grassland;
– permanent crops;
– other agricultural land such as kitchen gardens (even if they only represent small areas of total UAA).

As such, utilised agricultural area does not include unused agricultural land, woodland and land occupied by buildings, farmyards, tracks, ponds, etc.

Arable land, in agricultural statistics, is the land which is worked (ploughed or tilled) regularly, generally under a system of crop rotation.

Land cover is the actual distribution of forests, water, desert, grassland and other physical features of the land, including those created by human activities. **Land use,** on the other hand, characterises the human use of a given land cover type.

A Working Group has been established by the European Grassland Federation and the EC MULTISWARD project (Peeters *et al.*, 2013). It includes 22 experts from 13 countries (Belgium, Bulgaria, France, Germany, Italy, Poland, Rumania, Slovakia, Spain, Sweden, Switzerland, the Netherlands, United Kingdom).

In 2013, it defined **grasslands** as 'land devoted to the production of forage for harvest by grazing/browsing, cutting, or both, or used for other agricultural purposes such as renewable energy production. The vegetation can include grasses, grass-like plants, legumes and other forbs. Woody species may also be present. Grasslands can be temporary or permanent.'

Regarding management types of grasslands, two categories have been identified:
– **Meadows**, grasslands that have been harvested predominantly by mowing over the last five years[1] or since the establishment of the sward if it is less than five years old.
– **Pastures**, grasslands that have been harvested predominantly by grazing over the last five years[2] or since the establishment of the sward if it is less than five years old.

The Working Group defined:
– **Permanent grasslands,** as grasslands used to grow grasses or other forage (self-seeded or sown and/or reseeded) and that have not been completely renewed after destruction by ploughing or spraying (herbicide) for ten years or longer. They can be agriculturally-improved, semi-natural or no longer used for production.
– **Temporary grasslands**, as grasslands sown with forage species that can be annual, biennial or perennial. They are sown on arable land and can be integrated in crop rotations or sown after another grassland vegetation. They are kept for a short period of time (from a couple of months to usually a few years). They can be established with pure sowings of legumes, pure sowings of grasses or grass/legume mixtures.

It proposed definitions for:
– **Agriculturally-improved permanent grasslands**, permanent grasslands on good or medium quality soils, used with more frequent defoliations, higher fertilisation rates, higher stocking rates and producing higher yields than semi-natural grasslands.

1. In case of recent change in the management strategy (more recently than five years), the new management type must be taken into account.
2. In case of recent change in the management strategy (more recently than five years), the new management type must be taken into account.

Semi-natural grasslands, low-yielding permanent grasslands, dominated by indigenous, naturally occurring grass communities, other herbaceous species and, in some cases, shrubs and/or trees. These mown and/or grazed ecosystems are not substantially modified by fertilisation, liming, drainage, soil cultivation, herbicide use, introduction of exotic species and (over-)sowing.

The following structure was suggested for the classification of grassland terms into statistical databases (Table 2).

Table 2. Classification of fodder crops and permanent grasslands into the Utilised Agricultural Area (UAA) (Peeters *et al.*, 2013).

1. Arable land
1.1. Fodder crops
1.1.1. Temporary grasslands
1.1.1.1. Pure legume sowing
1.1.1.2. Grass/legume mixtures
1.1.1.3. Pure grass sowing
1.1.2. Green cereals
1.1.2.1. Green oats, spelt, triticale, rye and other C3 cereals
1.1.2.2. Green maize and sorghum
1.1.3. Fodder roots (including fodder beet)
1.1.4. Fodder brassicas
1.1.5. Fodder *Compositeae*: sunflower
1.2. Fallow lands
1.2.1. Grazed fallow lands
1.2.2. Non-grazed fallow lands
1.3. Other crop types
2. Permanent grasslands
2.1. Agriculturally-improved permanent grasslands1
2.2. Semi-natural grasslands
2.2.1. Pastures, including rangelands, rough grazing, wood pastures, etc.
2.2.1.1. Sole use
2.2.1.2. Common land
2.2.2. Traditional hay meadows
2.3. Permanent grasslands no longer used for production
3. Permanent crops
4. Other agricultural land such as kitchen gardens

[1] Almost always under single use but occasionally common land.