Synthesis of systems of European grassland typologies at plot, farm and region levels

Peeters A.
RHEA – Research Centre, Rue Warichet 4 Box 202, 1435 Corbais, Belgium

Abstract

On the basis of a literature search, a compilation of agronomic, agri-environmental and phytosociological typologies of grasslands are presented at plot, farm and region levels.

Keywords: agronomy, agri-environment, phytosociology, synthetic indexes

Introduction

Grassland typologies have been developed in Europe since the beginning of the 20th century by phytosociological research. At that time, grassland vegetation was still very diverse in most parts of the continent and plant communities were good indicators of environmental and management characteristics. After the beginning of the intensification period starting roughly in the 1960s, grassland communities were progressively homogenized, vegetation differences were reduced and phytosociological typologies became less relevant. Agronomic typologies based on the forage value of dominant or reference species, or synthetic indexes were designed in different countries. In addition to these efforts developed at plot and farm levels, attempts were made for defining typologies at international and European levels. Several administrations developed their own systems while scientists recently also contributed to the definition of grassland terms and their use in a coherent statistical classification system. However, these typologies were never harmonized on a European scale. This paper is a first attempt to develop a synthesis of grassland typologies.

Materials and methods

This paper is based on an analysis of the literature of the last 60 years. It envisages agronomic, agri-environmental (*sensu lato*) and phytosociological typologies and tries to make a synthesis at plot, farm and region levels.

Results and discussion

Table 1 shows a synthesis of classification systems. The Pastoral value (PV) mentioned in Table 1 is a synthetic index calculated in the following way:

$PV = (\Sigma A_i \% \times I_i) / 10$ where A_i = proportion of species i and I_i = forage value of species i.

A similar formula can be used for the plot ecological index, that can be calculated on the basis of species indicator values of Ellenberg (1952) and Ellenberg *et al.* (1992) for light (L), moisture (F), reaction (R), nitrogen (N), salt (S), temperature (T) and continentality (K) (Peeters, 1989). Briemle and Ellenberg (1994) and Briemle *et al.* (2002) proposed a set of grassland utilization indicator values. The indicator values cover mowing tolerance, grazing tolerance, trampling tolerance, forage value for livestock, forage value for deer. Some examples of agronomic typologies are illustrated in Table 2.

Conclusions

This first synthesis should now be completed. A European system could then be developed on this basis.

Table 1. Agronomic, agri-environmental (*sensu lato*) and phytosociological typologies at plot, farm and region levels.

	Agronomic	**Agri-environmental**	**Phytosociological**
Plot level	• List or proportion (%) (species forming the first 80% of the biomass) (Hédin *et al.,* 1972; Vivier and Binet, 1972) • Proportion (%) of the best forage species (ex.: perennial ryegrass (De Vries and De Boer, 1959)) • Proportion (%) of the best group of species (ex.: 'good grasses' (De Vries and De Boer, 1959)) • Proportions (%) of each of the following categories: grasses, legumes and other species • Proportion (%) of weeds (e.g. *Cirsium* spp., *Urtica* spp., *Rumex* spp.) • Grassland utilization indicator values (Briemle and Ellenberg, 1994; Briemle *et al.*, 2002) • Pastoral value (Daget and Poissonnet, 1972; De Vries and De Boer, 1959) and the similar Sward Quality Index (SQI) (Briemle, 1996; Klapp *et al.,* 1953; Stählin, 1971) • Functional trait classification (Ansquer *et al.,* 2009)	According to the national/ regional agri-environmental schemes: • Late cut or very late cut meadows • Low stocking rate pastures • Etc.	Identity of the plot vegetation in the: • Natura 2000 habitats • EUNIS classification (Davies and Moss, 2002) • Phytosociological alliances (Rodwell *et al.,* 2002) Ecological index that can be calculated on the basis of species indicator values of Ellenberg (1952) and Ellenberg *et al.* (1992)
Farm level	Same indicators by calculating a weighted average for all plots at farm level	Same indicators by calculating a weighted average for all plots at farm level	Proportion (%) in the farm of each habitat of the: • Natura 2000 habitat types list • EUNIS classification list (Davies and Moss, 2002) • Phytosociological alliances (Rodwell *et al.,* 2002) Same indicator by calculating a weighted average of ecological index for all plots at farm level
Region level	• UNFCCC, IPCC Good Practice Guidance for LULUCF (2003) • LUCAS nomenclature • FAO Land Cover Classification System (LCCS) • FAOSTAT under the land statistics (part of the Resource statistics) • EAGLE group (EIONET Action Group on Land monitoring in Europe) • Eurostat: Farm Structure Survey • Common Agricultural Policy classification • International terminology for grazing lands and grazing animals (Allen *et al,*. 2011) • EGF Grassland term definition and classification (Peeters *et al.,* 2014)	• Proportion (%AA or % permanent grasslands) of grasslands into the agri-environmental scheme • HNV classification (Oppermann *et al.,* 2012): – Proportion (%) of grasslands in the HNV farming area – Proportion (%) of HNV grasslands in the AA	Proportion (%) of habitat from the following classifications in the region: • European habitat classifications, including Annex I habitats of the EU Habitats Directive • EUNIS habitat classification (Davies and Moss, 2002) • Phytosociological alliances (Rodwell *et al.,* 2002) Nomenclatures of the following databases: • CORINE Biotopes • CORINE Land Cover (CLC) classification DG Environment project: Ecologically Valuable Grassland

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Table 2. Typologies based on frequency (F%) of perennial ryegrass (*Lolium perenne*), good grasses or weeds in the sward.

Plot value	F% of perennial ryegrass in the sward	F% of good grasses in the sward	F% of weeds in the sward
Good	>60	>30	<25
Medium	51-60	16-30	26-50
Low	≤50	<15	>50

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