GRASSLAND USE IN EUROPE

A syllabus for young farmers

A. van den Pol-van Dasselaar, L. Bastiaansen-Aantjes,
F. Bogue, M. O'Donovan, C. Huyghe, eds

éditions Quæ

Grassland use in Europe

A syllabus for young farmers

Agnes van den Pol-van Dasselaar, Leanne Bastiaansen-Aantjes,
Fergus Bogue, Michael O'Donovan, Christian Huyghe, eds

Éditions Quæ

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727368.

Shared Innovation Space for Sustainable Productivity of Grasslands in Europe

Project Acronym: Inno4Grass

Deliverable 5.3. Specific grassland syllabus (D5.3.1) and PowerPoint presentations (D5.3.2) available for young farmers and advisors

Responsible partner: Teagasc (WP Leader) and Aeres (Task Leader)

Other contributors: GLZ, WUR, RHEA, IDELE, APCA, LWK, UGOE, TRAME, AWE, SLU, NLTO, CNR, PULS, WIR, AIA, LRC

Submission date: 28 February 2019

ISBN: 978-2-7592-3145-4
e-ISBN (pdf): 978-2-7592-3146-1
x-ISBN (ePub): 978-2-7592-3147-8

Preface

Agnes van den Pol-van Dasselaar, Leanne Bastiaansen-Aantjes, Fergus Bogue, Michael O'Donovan, Christian Huyghe

The future of grassland farming in Europe is in the hands of young farmers. Compared to other topics, grassland management has often been a weak point of teaching delivered by agricultural technical schools in several European countries. The training of future farmers and advisors could thus be significantly improved, which could lead to better grassland management in the medium and long terms. For this reason, the European project Inno4Grass created a syllabus and a set of PowerPoint presentations on practical grassland management for current and future generations of grassland farmers and advisors. The PowerPoint presentations can be downloaded from Encylopedia pratensis (www.encyclopediapratensis.eu) in the different languages of the countries participating in Inno4Grass. The syllabus and the PowerPoints contain the necessary practical and technical knowledge required for sustainable grassland management.

The syllabus is written by a group of authors. By combining the expertise of experts from the different Inno4Grass partner countries, we were able to create a document that provides both general knowledge and country-specific information and examples. Every part of this syllabus was written by at least two authored and reviewed by at least two other individuals, usually from different countries, to ensure that all relevant and available information was included. This process also ensured that the text provides examples from various European countries. The authors of specific parts of the syllabus are mentioned at the beginning of the relevant sections. A full list of authors can be found on the following page. The preface of this syllabus contains additional general information about Inno4Grass as well as the state of the art of European grasslands. Thereafter, the important general aspects of grassland management are presented in the different chapters: grassland production (Chapter 1), grazing management (Chapter 2), hay and silage making (Chapter 3), soil and nutrient management (Chapter 4), environment and biodiversity (Chapter 5) and quality of products from grass (Chapter 6). The syllabus ends with specific information on characteristics of the individual countries participating in Inno4Grass (Chapter 7).

We hope and expect that this syllabus will be a source of inspiration for all (future) farmers and advisors.

List of authors

Sweden	Nilla Nilsdotter-Linde	Swedish University of Agricultural Sciences
	Eva Spörndly	Swedish University of Agricultural Sciences
	Rolf Spörndly	Swedish University of Agricultural Sciences
Ireland	Fergus Bogue	Teagasc
	Michael O'Donovan	Teagasc
The Netherlands	Agnes van den Pol-van Dasselaar	Aeres University of Applied Sciences / Wageningen University
	Hein de Kort	LTO
	Leanne Bastiaansen-Aantjes	Aeres University of Applied Sciences
Belgium	Alain Peeters	RHEA Research Centre
	Benoît Delaite	TR@ME
	Xavier Delmon	TR@ME
	Daniel Jacquet	AWE: Association Wallonne de l'Élevage
	Patrik Gauder	AWE: Association Wallonne de l'Élevage
Germany	Johannes Isselstein	University of Göttingen
	Martin Komainda	University of Göttingen
	Nora Schiebenhöfer	University of Göttingen
	Felicitas Kaemena	LWK: Landwirtschaftskammer Niedersachsen
	Talea Becker	Grünlandzentrum
	Lena Dangers	Grünlandzentrum
	Arno Krause	Grünlandzentrum
Poland	Piotr Goliński	Poznan University of Life Sciences
	Barbara Golińska	Poznan University of Life Sciences
France	Fanny Sauvaire-Baste	APCA: Assemblée Permanente des Chambres d'Agriculture
	Julien Fradin	IDELE: Institut de l'Élevage
	Christian Huyghe	INRA
Italy	Giovanni Peratoner	Laimburg Research Centre
	Riccardo Negrini	Associazione Italiana Allevatori
	Lorenzo Pascarella	Associazione Italiana Allevatori
	Rita Melis	ISPAAM-CNR
	Claudio Porqueddu	ISPAAM-CNR

Table of contents

CHARACTERISTICS
OF INDIVIDUAL COUNTRIES

Objectives of Inno4Grass

Arno Krause and Talea Becker

European farmers, and especially grassland farmers, are facing tremendous challenges. Not only must they deal with instable prices for milk and meat coupled with rising input prices, but they must also take into consideration high societal demands with regard to environmental protection and animal welfare standards. Grasslands are vitally important both for agriculture and society. Permanent and temporary grasslands cover 61 million ha across the EU-28, which accounts for 16% of the total EU land area and 40% of the EU agricultural area (Eurostat, 2010). These grasslands serve multiple functions, including the local provision of fodder for animal husbandry (and hence high-quality food provision for people), biodiversity conservation, carbon storage and the provision of 'traditional' landscapes that European citizens appreciate for recreational purposes and cultural heritage. The large diversity of management practices, soils and climates enhance the range of ecosystem services provided by grasslands. Farmers in the EU often do not perceive the multi-functionality of grasslands as an advantage. This leads to undervaluation and a lack of valorisation strategies. Since market-oriented concepts to create rewards for ecosystem services have not yet been sufficiently understood or developed, their multi-functionality increasingly turns grasslands, especially in intensive production systems, into areas of conflict between food demand and calls for the provision of other ecosystem services. The potential for better use of grasslands to reduce production costs in livestock farming has also been underestimated.

To cope with the challenges and better capitalise on the advantages of grasslands, farmers need dedicated innovations that help them improve grassland economic performance. It is important for these innovations to not only have been developed and tested in scientific institutions, but that they have also been used on practical farms and are adapted to the conditions on farms.

Several reasons explain the low adoption of innovations in grasslands:
– Grassland-based production systems are complex and therefore innovative systems must be implemented as a combination of innovative practices that take local conditions into account.
– Innovation benefits from grasslands are not immediately apparent and require patience.
– Grassland innovation affects various aspects of sustainability (profitability, environment, social acceptance), often in a contradictory manner.
– There is limited to no interaction between practice and research.

Despite these issues, some farmers are very innovative – especially early adopters, who develop solutions and techniques on their own or adapt existing ideas to the conditions of their farm. It takes time for these innovations and techniques to spread among the community of farmers, and sometimes they do not reach the entire community. Collaboration between farmers, advisors and scientists is insufficient in the countries concerned. For this reason, the latest research results are not sufficiently applied and valuable knowledge related to grasslands is discovered by practitioners at a late stage.

The aim of Inno4Grass is to overcome these issues and to foster the gathering, spreading and creation of knowledge. The overall objective of Inno4Grass is to close the gap between practice and science, to identify innovations that would otherwise be ignored and to ensure the implementation of innovative systems on productive grasslands. The project's long-term goal is to increase the profitability of European grassland farms and to preserve environmental values. Apart from identifying innovations, Inno4Grass facilitates the process of knowledge co-creation. For this, Inno4Grass brings together farmers, scientists, advisors and teachers to develop solutions for typical problems and to adapt existing ideas to practical farms. These groups are moderated by facilitator agents, which facilitate communication and exchange between members of the groups. They use a participatory approach to initiate discussions on innovation using online discussion groups and farmer networks. Inno4Grass is an international project that fosters the exchange of ideas within eight European Member States: Belgium, France, Germany, Ireland, Italy, Poland, Sweden and the Netherlands. Within the project there are meetings of facilitator agents and exchange visits of farmers between countries to support the cross-border flow of information, thereby helping the project to benefit from diversity amongst farmers.

The innovations identified through the project are shared with the community of farmers. They are documented with farm portraits and can be found on the project homepage (https://www.inno4grass.eu/en/dissemination). Along with this syllabus, additional dissemination materials are available (innovations, abstracts, video clips, leaflets) and used for the enrichment of national and European Wikimedia and the Encyclopedia pratensis (https://www.encyclopediapratensis.eu).

Kick-off meeting for the Inno4Grass project, Berlin.

Material for training available at:
https://www.encyclopediapratensis.eu/encyclopedia_pratensis/educational-resources/material-for-training/

Diversity of European grasslands

Alain Peeters and Johannes Isselstein

The vast majority of European grasslands are man-made. They have developed concomitantly with livestock husbandry. European grasslands are extremely diverse with regard to their management, soil types, plant composition, production potential and fodder quality. They can be divided in two main categories: permanent and temporary grasslands (Peeters *et al*., 2014).

Main grassland types

Permanent grasslands are grasslands that have not been completely renewed after destruction for ten years or more. They can be agriculturally-improved, semi-natural, natural or no longer used for production. They can be species-rich or species-poor. They comprise grasses, legumes, forbs and grass-like plants in variable proportions. Trees and shrubs can be present, such as in grazed wooded areas.

Agriculturally-improved permanent grasslands are located on soils with a moderate or high fertility that allow for intensive agricultural management. Compared to semi-natural grasslands, fertilisation and stocking rates are higher, and the swards are defoliated more frequently and have a higher herbage and livestock production.

Natural and semi-natural grasslands are 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 have not been substantially modified by agricultural practices. Natural grasslands are rather rare in Europe and occur spontaneously in marginal environments such as mountain tops, tundra or salty soils. Semi-natural grasslands are associated with human

activities; indeed, without human intervention most of them would be colonised by woody vegetation.

Temporary grasslands are grasslands that are sown with annual, biennial or perennial forage species. They are sown on arable land and can be integrated in crop rotations or sown after a preceding grass crop. They are kept for a short period of time, from a couple of months to usually a few years. They are generally established with pure sowings of legumes, pure sowings of grasses or grass/legume mixtures.

⏩ Economic and social importance of European grasslands

Permanent grasslands are an important component of European landscapes and farming systems. They cover about 60 million ha in the European Union (EU-28, 2013), while temporary grasslands cover about 11 million ha. Together, they occupy about 40% of the European utilised agricultural area (UAA) (Eurostat).

These grasslands are the feeding basis of about 196 million head of grazing livestock. They are managed by about 3.6 million holders, i.e. about 33% of all European farm managers (Eurostat: EU-28 in 2013). There were about 134 million livestock units (LSU) of total livestock and 78 million LSU of grazing livestock (59%) in the EU-27 in 2007, with the vast majority of livestock located in the EU-15. For the grazing livestock population (in LSU) in the EU-27, 82% were cattle and 14% small ruminants (sheep and goats). Dairy cows accounted for 31% and other cows (mainly suckler cows) for 16% of the total LSU of grazing livestock; two-thirds of cows were thus dairy cows and one-third other cows. Beef and veal, sheep and goat meat totalled 11% and milk 14% of total agricultural production value (Eurostat).

Grasslands are essential for feeding livestock, which then supply milk and meat to human populations. They are the cheapest source of feed to supply grazing livestock and can thus contribute to reducing production costs. Grass-fed milk and meat have unique nutritional properties for consumers that are sometimes highlighted by certified trademarks, such as ‘Pasture for Life’ in the United Kingdom.

Milk can be processed on farms into a wide range of products such as butter, cheese, yoghurt and ice cream. Meat can also be processed, usually by butchers, and sold by farmers as meat parcels or delicacies. These products can be sold through short and local marketing chains, which has the potential to significantly increase farmers’ income and create jobs in agriculture.

⏩ Environmental importance

Over the centuries, agriculture in Europe has created a patchwork of habitats that are very favourable to biodiversity. For instance, extensive grazing on common lands and haymaking in meadows have created diverse semi-natural ecosystems and attractive landscapes. These semi-natural grasslands are among the most species-rich habitats

on the continent. Even intensively used permanent grasslands, although less diverse in terms of plants and insects, provide more ecosystem services than arable crops. Grasslands play a very important role in conserving European biodiversity, creating attractive landscapes (including for tourists), storing carbon in soils, improving soil fertility, and protecting soils from erosion and surface and groundwater from nitrate and pesticide pollution. They are also increasingly important in addressing climate change challenges as they offer the possibility of i) mitigating climate change effects thanks to a stable carbon storage and ii) limiting greenhouse gas emissions, and especially nitrous oxide (N_2O), as legumes may be used as the main source of nitrogen for plant growth, including in grass-legume mixtures.

⏩ Threats

Permanent grasslands are threatened. In the EU-6 (Benelux, France, Germany, Italy), permanent grassland losses have been estimated at about 30% and 7 million ha between 1967 and 2007 (Eurostat). In some places, the losses have been even more substantial; for example, in Upper Normandy (France), the permanent grassland area fell by about 50% between 1970 and 2000.

Chapter 1

Grassland production

Alain Peeters, Nilla Nilsdotter-Linde, Giovanni Peratoner, Martin Komainda and Johannes Isselstein

Characteristics of grass

A. Peeters and N. Nilsdotter-Linde

Grass species are a major component of most European grassland swards.

Grass seeds include the coleoptile (shoot sheath), the scutellum, the radicula and the coleorrhiza (root sheath) (Figure 1.1). The scutellum is homologous to the leaf lamina of the cotyledon and the coleoptile to the leaf sheath of the cotyledon. Coleoptile and coleorrhiza are membranes that protect shoot and leaf meristems and the radicula, respectively, during the first step of the germination process when these fragile organs have to find their way through the soil. When a seed germinates, it first produces the radicula (the first root) that quickly absorbs water and nutrients. The coleoptile is then pushed upward and elongates to reach the soil surface, where the first leaf emerges from it. Side roots are produced quickly around the primary root. When the first three leaves are deployed, a bulge appears just above the seed and below the soil surface. It is the tillering plateau from which all secondary roots and aerial tillers are produced. Primary roots and seeds disappear afterwards.

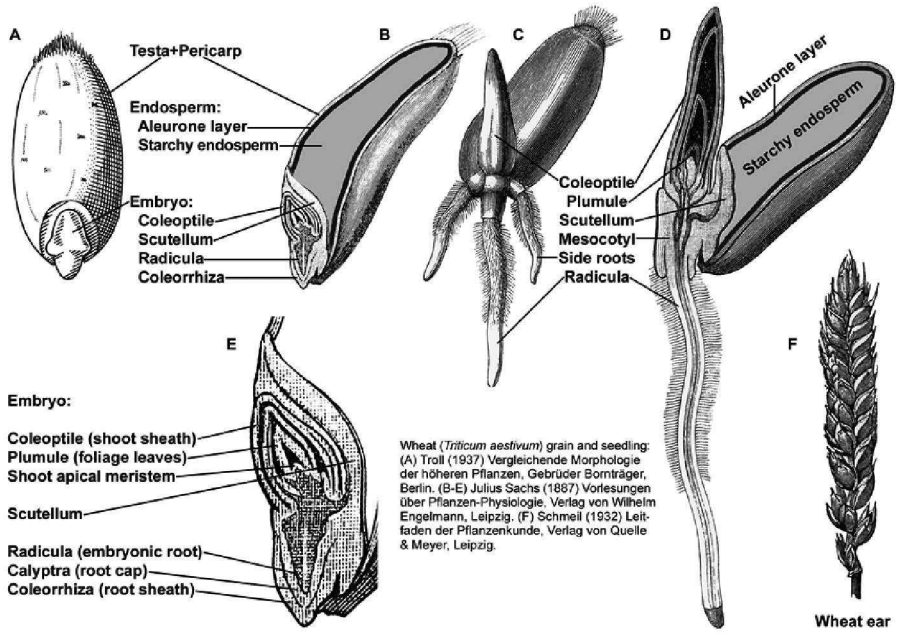

Figure 1.1. Seed anatomy. © The Seed Biology Place, Gerhard Leubner, http://www.seedbiology.de, 2019.

Grass leaves comprise three sections. The first is the upper part of the leaf, the lamina or blade, which is the most visible because it usually detaches from the stem). The second is the lower part of the leaf, the sheath, which encircles the stem (Figures 1.2 and 1.3). Finally, at the intersection of the lamina and the sheath, there can be two organs: the auricle and the ligule. Auricles are often claw-like appendages which tend to clasp the sheath. The ligule is an extension of the sheath at the base of the lamina. Its axis is parallel to the stem and thus perpendicular to the lamina. It may prevent water penetration between the sheath and the stem which could cause stem rotting. Tillers are the equivalent of branches in woody species. A tiller appears at the internal base of a leaf sheath. Each tiller can again produce leaves and new tillers at the base of these leaves. Tillering is thus theoretically exponential, but it is limited by light, nutrient and water resource availability. After germination, when four leaves are visible on the main tiller, there is a moment when two secondary tillers appear at the base of the first two leaves. The full **tillering phase** is then reached.

During the vegetative phase described above, all meristems are located just below or just above soil surface, keeping them well protected from herbivore teeth. This gives grasses a unique capacity to regrow quickly after defoliation compared to many dicotyledons. Grass plant species are thus well adapted to herbivore presence and activity. In fact, the two plant and animal species groups co-evolved and depend on each other. Most dicotyledon species are not especially well adapted to grazing because most of their meristem is located well above the soil surface. Because these plants can be easily destroyed by grazing animals, most swards grazed by herbivores are dominated by grasses. In a way, herbivores 'weed' herbaceous swards by reducing