*Book Review*

# A review on the book, *Grasslands: Types, Biodiversity and Impacts*

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**Abstract**
The book, *Grasslands*: *Types, Biodiversity and Impacts*, edited by WenJun Zhang and published by Nova Science Publishers, USA, was briefly reviewed in present report.

**Keywords** grasslands; book; review.

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## 1 Introduction

Grasslands are one of most important ecosystems on earth. Grasslands provide not only forage, livestock and fur, but also biodiversity and other ecosystem service functionalities. How to prevent grasslands from overgrazing, disertification, and other types of overexploitation is a pressing issue. In recent years, grasslands have been dramatically changing as the changes of global climate and aggravation of human activities. ptotection and reasonable use of grasslands are thus attracting more attention worldwide. The book, *Grasslands*: *Types, Biodiversity and Impacts*, is published to reflect recent achievements of scientists in grasslands.

This book covers a lot of topics, for example, global biodiversity review, biotic interactions in the Rhizosphere, evaluation of soil quality, insect assemblages, orchargrass, soil microbial communities, grassland biodiversity maanagement, soil nematodes, etc. Articles in this book are contributed by more than 10 scientists from China, Japan, Sweden, Spain, Slovak, Hungary, Argentina, etc. It will provide researchers with diverse aspects of the latest advances in grasslands research. It is a valuable reference for the scientists, university teachers and graduate students in ecology, environmental sciences and agruculture.

## 2 Contents

The book contains the following reports:

Commentary (Gardiner, 2012): Sea wall flood embankments protect a large area of coastal land in eastern England (particularly in the county of Essex) from tidal flooding. These important defenses also provide grassland habitats for scarce insects in Essex, including several declining bumblebees (*Bombus* spp.). The grassland of many sea walls is mown once annually to maintain the structural integrity of the defences;

however, cutting also exerts an influence over insect populations. Many sea walls are mown in midsummer (July and August) which can lead to high mortality of insects in the sward and also remove forage resources for bumblebees in particular. A review was undertaken of recent case studies investigating the response of insect populations to various sea wall mowing regimes in Essex in eastern England. This review highlighted the importance of rotational mowing regimes for limiting damage to populations of the rare moth *Gortyna borelii lunata*; it seems that cutting sea wall grassland in strips allows this insect to persist on flood defences. Other small-scale studies indicated that leaving a strip of unmown grassland on the folding (or berm) on the landward side of a sea wall is essential for promoting high abundance and species richness of bumblebees and butterflies. It is possible that conservation management for insects may conflict with the annual mowing that may be needed to maintain high floristic diversity. Leaving sections of sea walls unmown for insects, particularly on the folding, may lead to a decline in the floristic diversity of the sward due to the building up of litter and development of tussocky grassland. Implementing a system of rotational mowing which incorporates unmown grassland on the folding could be a key step toward more environmentally sustainable sea wall maintenance regimes in Essex. It is also clear that more research is needed into the effects of sea wall mowing on insect abundance and diversity, as there have been very few replicated studies in the east of England.

Chapter 1 (Zhang and Ou, 2012): Due to human disturbances, global biodiversity is rapidly losing. Long-term biodiversity monitoring has been conducting in the past years. Assessment of global biodiversity is a necessity. In present study large amounts of surveyed data on global biodiversity were collected and analyzed. Global situation of biodiversity loss and conservation, especially the situation in China, was reviewed and discussed. It was found that the total number of estimated species on earth is approximately eight times of the number of species described. Rainforests harbored the most diverse species in the world. Great risk for species extinction exists in these areas. Human disturbances to species have largely exceeded the natural selection. Less distribution areas, habitat destruction, unregulated logging, pollution and human hunting have been pushing the extinction of large numbers of plant and animal species in the world. Environmental legislation, green GDP, and other environmental concerned policies must be formulated and implemented by every country in order to prevent species extinction. In the past surveys some organisms like insects, fish, non-vascular plants, reptiles and amphibians have not yet been attracted enough attention due to their difficulties to be sampled. Moreover, biodiversity surveys were not accurate enough, especially that for vascular plants. Sampling countries or regions were not reasonably distributed. Some important countries, such as Madagascar, Zaire, etc., have not been surveyed. All of these problems should be solved in the future surveys.

Chapter 2 (Ladygina and Rineau, 2012): Today we recognise the *rhizosphere* as a biologically active zone of the soil around plant roots that contains different living organisms such as soil-borne microbes including bacteria, actinomycetes, fungi, algae, protozoa, invertebrates (collembolans, nematodes, earthworms) in their abiotic environment. Constant supply of carbon compounds from plant roots fuels complex interactions among rhizosphere organisms, including those between microorganisms and plants, among microorganisms, between animals and microorganisms, between animals and plants, and among animals. The animal-microbial-plant interactions in the rhizosphere are very complex, where indirect effects potentially play a significant role in structuring soil communities and, consequently, there is a growing appreciation and a need to start including indirect effects when studying biotic interactions in the rhizosphere. Therefore, interest of this chapter lies in the definition of indirect biotic interactions in the rhizosphere; the studies of grasslands soil food webs and their consequences for plant growth and importance for rhizosphere processes. Interactions between organisms that involve physical contact such as in predation and parasitism are said to be *direct*. As a consequence of these interactions, other organisms or resources are affected indirectly. *Indirect* interactions include any mechanism of interaction between species that is mediated through a number of steps, where one species affects another one without direct contact. The types of indirect interaction that occur within the rhizosphere can be classified by considering the nature of the interacting organisms and grouping them accordingly as microbe-fauna, plant-microbe, microbe-microbe, fauna-plant etc. This scheme seems more useful than any other in the context of the rhizosphere as the precise nature of the interaction is often difficult to identify and can more conveniently be considered in terms of the organisms involved. The authors propose a simplistic model of interactions to illustrate carbon fluxes in multi-dimensional relationships between microbial populations, plants, soil fauna, organic matter and exudates. Methods that are applied to study direct and indirect effects in soil food webs are also highlighted in this chapter.

Chapter 3 (Paz-Ferreiro, 2012): Approximately one quarter of the agricultural surface is covered by grasslands. In the last decades there has been a dramatic increase in the productivity of many grasslands. Nowadays, intensive and traditionally managed grasslands coexist in many regions. Management changes have caused alterations, mainly in the nitrogen and phosphorus cycles and in the composition of the botanic and microbial communities of grassland soils. However, the impact of management changes on soil quality has seldom been evaluated. On the other hand, soil biochemical and biological properties are considered as suitable and quickly responsive parameters to estimate soil quality. My work wants to summarize the state of art of the study of soil quality in grassland soils, comparing different managed grassland and utilizing soil biochemical and biological properties as a tool to evaluate soil quality. This review will put a strong emphasis in the temperate grasslands located in NW Spain.

Chapter 4 (Peri, 2012): Orchardgrass is a widespread perennial grass, which is well-adapted to dry conditions and is suitable for silvopastoral systems due to its shade tolerance. The main environmental (temperature, nitrogen, water and shade) and management (regrowth duration) factors that affect morphology, physiology, dry matter (DM) production and nutritive value (crude protein, organic matter digestibility and macro-nutrient concentrations) of orchardgrass (*Dactylis glomerata* L.) in temperate climate are reviewed. Regrowth duration is a management factor that can be modified through the frequency and severity of defoliation (e.g. infrequent cutting for hay or silage, rotational or continuous grazing). The emphasis is on open pasture and silvopastoral systems conditions. This is followed by a review of how DM production could be predicted from a canopy photosynthesis model based on the photosynthetic capacity of leaves, the light intercepted by leaf surfaces (dependent upon canopy architecture and leaf area index, (LAI)). The predictive capability physiologically based pasture models makes them powerful tools for pasture management or in assisting agronomists to improve practices in pastoral or silvopastoral systems.

Chapter 5 (Hossain and Sugiyama, 2012): Grasslands are complex terrestrial ecosystems where interactions among producers (green plants), consumers (grazing animals) and decomposers (soil microorganisms) determine its productivity and functions. Although a number of management activities are practiced in the grassland systems to maximize the efficiency of conversion of solar energy or plant mass into animal product, effects of managements on structure and functions of the below-ground communities has not been well studied. The present chapter discusses about the effects of management history on plant and soil microbial communities in grasslands by comparing two types of semi-natural grasslands (tall-type by infrequent grazing and short-type by frequent grazing) and the improved grassland in northern part of Japan. Plant species richness was highest in the tall-type grassland and lowest in the improved grassland. Short-type and tall-type grasslands were dominated by the proportions of $C_4$ and forbs species, respectively, while the improved grassland was by $C_3$ species. Microbial communities were studied by phospholipid fatty acid (PLFA) profiling and rDNA finger printing methods. Major soil microbial communities including total microbial

PLFA, mycorrhizal PLFA, and the saprophytic fungal PLFA showed significant differences among the three grassland types. Fungal DNA band number also differed significantly among the grasslands. However, significant differences in community composition of microbial groups mostly appeared between semi-natural tall-type and the improved grasslands indicating the role of human management on structuring soil microbial communities. All these results also suggest that a complex interaction of human management and grazing might have altered the structure of plant and soil microbial communities in grasslands.

Chapter 6 (Péter et al., 2012): Grasslands are vital landscape elements in Europe. Recently, the 180 million hectares of grasslands have a crucial role in maintaining the landscape level biodiversity. Alkali grasslands are typical in Central- and Eastern part of Europe, with large areas in the Carpathian-basin. These types of grasslands were not the most favorable targets of arable farming, but large areas affected by mineral fertilization, drainage, soil melioration and/or commercial seeding in the last 60 years. In this paper the authors present important vegetation characteristics, species composition and management of five different grassland types from the open annual alkali pioneer swards to tall grasses dominated wet alkali meadows. In general, alkali grasslands are usually species poor communities characterized by short (*Festuca pseudovina*, *F. rupicola*, *Poa angustifolia*) or tall grasses (*Alopecurus pratensis*, *Elymus repens*). They harbor several steppe endemics (e.g. *Plantago schwarzenbergiana*, *Cirsium brachycephalum*, *Limonium gmelinii* ssp. *hungarica*, *Puccinellia limosa* and *P. peisonis*) and halophyte species (*Salicornia prostrata*, *Salsola soda*, *Suaeda pannonica*, *S. maritima*,), adapted to high salt contents of soil. According to the uneven pattern of soil salt and water alkali grasslands are spatially very diverse. Maintaining alkali grasslands the extensive grazing mostly by cattle and sheep is essential. Nowadays, in large areas of alkali grasslands former grazing are ceased or replaced with mowing. This resulted in a change of species composition, decreased richness and/or litter accumulation. Alkali grasslands are refugees of alkali steppe vegetation, thus, restoration and preservation of their biodiversity have a high conservation priority in Habitats Directive of the EU (Pannonic salt steppes and salt marshes, 1530).

Chapter 7 (Renčo, 2012): Grasslands are the most widespread ecosystem worldwide. They are the natural habitats of a multitude of the grasses and herb species. They are of particular economic and ecological importance. Grasslands, as a part of natural ecosystem, represent the natural habitat for many soil microorganisms and animal species. An important part of the natural microfauna of grass ecosystems are nematodes, which are a complex of morphologically diverse species. According to their life strategy, the soil nematodes are divided into two groups: free living soil species and the plant parasitic species. Plant composition in grasslands plays a key role in determining soil nematode composition both in above and belowground resource-based mechanisms and in altering abiotic conditions. Nematodes can also play an essentials role in the retention of grasslands ecosystems. As primary consumers of saprophytic bacteria and fungi, nematodes make mineral nutrients available to higher plants. Parasitizing on grass roots, plant parasitic species affect the viability of grass plants, due to reduction of water and plant nutrient uptake, leading to nutrient deficiencies, while other nematodes are antagonists of organisms that negatively affect plant growth, and thus benefiting the plants. Nematodes are omnipresent, various, abundant, in a direct contact with soluble compounds in the soil water through their permeable cuticle, easily extracted and divided into trophic or ecological groups differing in their food source that have developed during their evolution. Representation of nematode trophic groups in soil, species diversity and abundance of genera or species of nematodes within their community may serve as an indicator of the environmental assessment of land ecosystem based on ecological and diversity indices.

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