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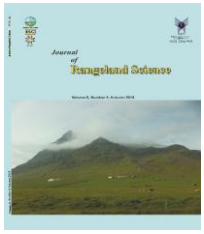

BOOK REVIEW

Grasslands of the World: Diversity, Management and Conservation

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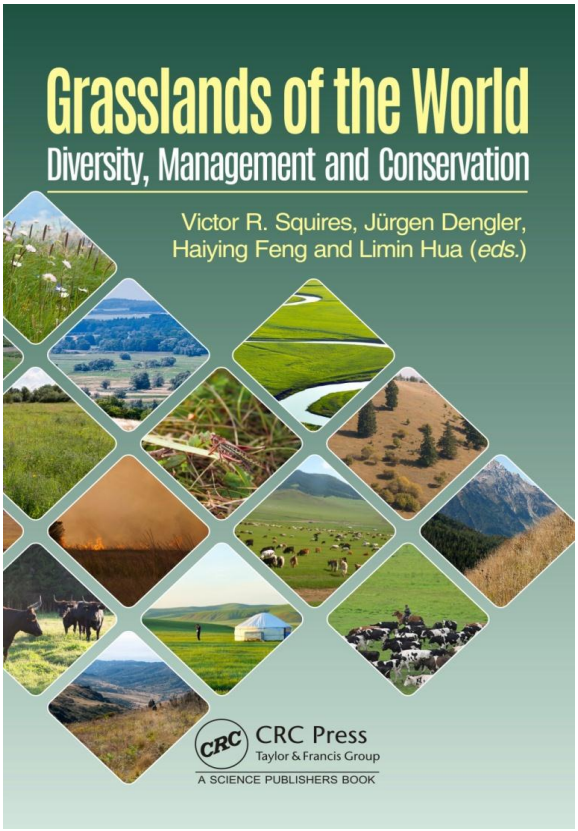

Grasslands are an important land cover and have a world-wide distribution with grass-dominated communities from the equator to the polar tundra, from the sea level to the alpine zone, and occurring both naturally (such as tropical savannas and temperate steppes) and secondary (as in the cultural landscapes of Europe). *Grasslands of the world: diversity, management and conservation*, edited by Victor Squires, Jürgen Dengler, Haiying Feng and Hua Limin, is a tribute to these important grass-dominated ecosystems. It was written by international teams of grassland experts, who compiled information from more than 90 countries, in the form of regional syntheses and case studies. Together, these chapters provide a fascinating glimpse into the various grasslands, their value for nature, culture and agriculture, and the threats they are facing today. The 18 chapters contain essential background information on topics such as the history of agriculture, grassland communities (including fauna) and the connection between grasslands and climate. The book also analyses the opportunities and risks of current policies to conserve these grasslands throughout the various grassland biomes against the background of global (including climate) change. It explores the exploitation of grasslands from the earliest time to the present and examines the impact of recent human interventions and global warming on their productivity, diversity and survival. The

challenges of conserving biodiversity, maintaining livelihoods of land users while protecting the land and ensuring sustainable use are highlighted.

In almost every grassland ecosystem on Earth there are pressures from rising human and livestock populations, new demands for products from the grasslands as well as the ongoing expectation that grasslands will deliver ecosystem services under the changing climatic regimes. Climate change is likely to have major impacts on grasslands of several regions, and many of these will have serious implications for people whose livelihoods are absolutely dependent on the grasslands but also for people far away who depend on grasslands to provide water, clean air, and a steady stream of food, fiber and recreational opportunities. Environmental goods and services provided by grasslands are many and varied, and recent assessments of the monetary value of grasslands reveal that these ecosystems are severely underestimated by many. Non-monetary value, in terms of biodiversity conservation, put grasslands at the forefront of natural ecosystems worth conserving. Expanding cropland, wrought by converting grassland, is a serious threat in many regions. Often the encroachment onto grasslands is on marginal land (too dry, too steep, too rocky) where land abandonment quickly follows as the stored soil nutrients are exhausted or simply agriculture is not profitable anymore when agricultural products can be produced cheaper elsewhere. Abandoned pasture lands and hay meadows can cause accelerated land degradation in some regions, especially encroachment by undesirable plants, such as invasive species and woody plants. In other regions, succession following abandonment might lead back to a more natural state, which could be desirable in some cases.

This is what we believe will be a useful book for those who are interested in ecological, economic and policy issues in grassland ecosystem management, environmental protection and likely impacts of climate change. It will also be a valuable reference book for academics, researchers and policy makers in bi-lateral and multi-lateral donor organizations and various UN agencies. The book fills the gap in the literature admirably. Grassland ecologists, land use change specialists, policy makers and natural resource management agencies will find the book very useful. It is also a valuable reference book for university students in ecology, geography, environmental studies and development studies in general.

The book is in four PARTS:

PART 1 Context and Setting

Squires and Feng open the book with a brief account of the extraordinary sequence of events that led to emergence of grasslands as major vegetation formation that now occupy some of the driest and hottest and the highest and coldest places on earth as well as vast steppes and prairies in more temperate climates. It is the story of grasses successfully competing with forests and woodlands, aided and abetted by grazing herbivores and by humans and their use of fire as a tool. It is the story of adaptation to changing climates and the changing biophysical environments.

PART 2 Grasslands of the Palaearctic Region

This PART is the first comprehensive study ever of both the natural and secondary grasslands across the whole Palaearctic biogeographic realm, which is the largest on Earth. It provides the reader with a new synthesis and updates data on many aspects where ambiguity prevailed. The series of treatises in this PART has been organized by the Eurasian Dry Grass Group (EDGG), a large international organization devoted to ecology and conservation of all types of natural and semi-natural grasslands throughout the region. It comprises one synthesis chapter and seven regional chapters. Contributors were teams of

grassland specialists drawn from 17 countries, ranging from Central Europe and the Mediterranean through the Middle East, Russia, Kazakhstan, Middle Asia, Mongolia and China to Japan.

Török and Dengler provide a synthetic view on the grasslands of the Palaearctic, a vast region that encompasses more than 70 countries in Europe, North Africa, West, North, Central and East Asia. Most importantly, they quantify, probably for the first time, areas of natural and secondary grasslands throughout the realm, broken down to major subtypes. Moreover, they provide a consistent assessment of the relative importance of various factors threatening grassland biodiversity in each of the comprised seven regions.

Dengler and Tischew describe the major grassland types in northern and western Europe including significant areas of secondary grasslands in place of former forests, but often of High Nature Value. They explain origin, extent, types and land use practices of grasslands in the region. A major focus is a comprehensive assessment of the threat factors that negatively affect the biodiversity of these grasslands. Of particular importance is the policy framework, specifically the Common Agricultural Policy of the European Union, which plays a key role in grassland abandonment and intensification, both of which negatively affect grassland biodiversity. Further the authors provide an overview on suitable management techniques to maintain or restore High Nature Value grasslands.

Török et al. enumerate the threats to grasslands throughout Eastern Europe, giving special attention to land abandonment, woody plant invasion and the biodiversity implications of the Common Agricultural Policy of the European Union. Cessation of traditional grassland management practices such as mowing, periodic burning and rotation grazing are identified as major drivers of change toward a reduction in biodiversity. Biodiversity in some 'hotspots' is critically endangered for some birds, mammals and invertebrates as is the loss of some important sites on major flyways (including grassland wetlands) for migrating birds. Particular attention is paid to grassland rehabilitation and to ecological restoration

Ambarlı et al. provide an overview of the problems faced by grasslands and their users in the southern part of Europe, around the shores of the Mediterranean Sea including North Africa and the Middle East. Climate change impacts are discussed here but attention is also given to population pressure, land use and land cover change. The authors present the prospects for grassland communities and the peoples who depend on them in this vast region where political instability and mass migrations and re-settlement are occurring. The spatial extent, predominant land uses and biogeography of each of the countries in the region are discussed and analyzed. Problems are both on-going and emerging and relate to population pressure, land conversion, land abandonment and incursions by alien plants.

Reinecke et al. tackle the task of summarizing the issues occurring on the huge and diverse steppes and grasslands of Russia. Particular attention is paid to defining the management practices that maintain grassland ecosystem health and biodiversity. The status of nature reserves and other protected areas is updated. Climate change impacts are discussed. Lives and livelihoods of millions of people who depend on grasslands, pasturelands and hayfields are at risk in some places. Future prospects for grasslands and grassland users are discussed.

Bragina et al. address the problems and prospects confronting a major region of global importance. The Kazakhstan-Middle Asia region has some of the world's major alpine areas and some of the driest deserts. Grasslands (steppes) occupy huge tracts of land in Kazakhstan – many of them degraded by massive land conversion to cropland. Burgeoning populations, critical water shortages, expansion of soil salinity are problems that are addressed. Management of water resources and watersheds on which the rivers depend are

key issues. Climate change impacts will impinge heavily on the millions whose livelihoods depend on using grasslands.

Pfeiffer et al. turn attention to the dry grasslands in Mongolia and in western China with special attention being given to the Tibetan plateau. Biodiversity of plants and animals (some of them endangered species) in the mountainous regions (in particular) receive attention here. An extremely high proportion of the human population in Mongolia and on the Qinghai-Tibet Plateau depends on grasslands for their livelihoods and as their spiritual home. Government policies aimed at arresting and reversing land degradation has led to large-scale resettlement of pastoralists and their herds, especially in critical watersheds that are the source of major rivers, some of them transnational. Climate variability and global warming have already begun to cause glaciers to melt and permafrost to thaw. Climate change over the next 50 years will present major challenges to achieving the balance between improving livelihoods, conserving biodiversity and land protection.

Ushimaru et al. present an overview of the status of Japan's semi-natural grasslands, focusing on the rapid reduction in area. Biodiversity has been severely compromised, and local extinctions of key species seem to be inevitable. Traditional grassland management approaches sustained grassland vigor and productivity. These practices are outlined and the role of local ecological knowledge in conserving biodiversity is highlighted. Climate variability impacts on land use and prospects of climate change are discussed.

PART 3 Grasslands of Other Biogeographic Regions: Problems and Prospects

Most biogeographic regions outside the Palaearctic also support extensive grassland vegetation. The six chapters in this PART deal with grassland and their management in India, East Africa, Southern Africa, North America, South America, and Australia.

Malaviya et al. present an overview of Indian grasslands from the tropics in the Southeast to the deserts in the Northwest. India supports the world's largest cattle inventory, and forage and fodder to support them are vital resources. Grasslands, either as grazing or as 'cut and carry' for stall-fed animals is important. India's human population is expected to peak at near 1.5 billion; so livestock, principally as draft animals and for milk, must be maintained and increased where possible.

Starrs et al. make an assessment of the scale, geographical distribution, and diversity of grasslands in North America (including Canada and Mexico). Discussion topics include: categorization of grassland according to species composition and productivity levels and the merits of making an indicative assessment of the carrying capacity of the different types of grassland including the seasonal variations in carrying capacity. They discuss invasive plants, fire frequency and biodiversity.

Maltitz reviews and describes the situation on grasslands in Southern Africa, that is, the countries south of 10° S, namely South Africa, Botswana, Namibia, Swaziland, Lesotho, Angola, Zambia, Zimbabwe, Malawi and Mozambique. A typology based primarily on functions of the grass layer, using a grass-and grazer-centric lens of analysis is proposed. The biogeography is outlined. The likely consequences of climate change receive attention.

Otieno and Kinyamario consider the grasslands of Eastern Africa. The landscape of Eastern Africa, which includes Ethiopia, parts of the Horn of Africa, Sudan, Kenya, Uganda, Rwanda, Burundi and Tanzania, receives attention here. The authors provide a review of Eastern African grasslands, their functions and the current status. Future climate-induced changes in land cover will occur concurrently with human-induced changes in land use, compounding their effects on grassland. The future of grasslands in the region will, therefore, depend on how they will respond to future warmer and wetter or drier climates and on how much national governments in the region will be able to curb human population increases and the mitigation measures against climate change.

Morales reviews the principal grassland types in South America, using Chile as a north-south transect stretching more than 4600 km from the north (18° S) to the extreme tip of South America at 53° S latitude. This chapter provides a general overview of the rainfed grasslands in the vast South American continent. Key features of the biogeography of each of the major biomes are presented. Changing land use patterns wrought by the expansion of cropping agriculture and the decline in productivity of many grasslands are discussed. Special attention is given to the increased density of woody plants and the implications for ranching and livelihoods but also for the impact on carbon sequestration. The potential of grasslands to sequester carbon is discussed. Special attention is given here to the important role of grasslands in provision of environmental goods and services. Changes are occurring to the provision of ecosystem services by the main grasslands biomes in South America in response to accelerated land degradation that is now found in parts of every grassland biome.

Nie and Campbell describe the principal grassland types in Australia where upwards of 80% of the land surface is (or has been) grassland, including sown pastures based on self-regenerating annuals. The focus is on the various livestock/crop systems that grasslands support. The current issues and challenges faced by the grassland industries and opportunities and strategies for future grassland research and development are briefly reviewed.

PART 4 Concluding Remarks and Summing Up

Hua et al. provide an analysis of the way in which climate change is already affecting lives and livelihoods of people who are entirely dependent on grasslands. The research (described here) on herders' responses to climate change was based on studies in Inner Mongolia, Ningxia, Gansu, Qinghai and Tibet. As background they give a brief overview of the main grasslands in China as a whole and present key elements of the climatic data associated with each major grassland type.

Huntsinger and Starrs review the different land tenure arrangements governing grassland use and the rights associated with each type in Mexico, USA and Canada. This is done in the context of rising environmental concerns about mining and mineral exploration, biodiversity conservation and the notion of 'rewilding' rangelands to better cater for needs of wildlife. The chapter also looks to the future as a new regulatory framework emerges. The implications for grasslands are discussed.

Finally, *Squires et al.* ask what future the world's grasslands have under global (not only climate) change? This concluding chapter examines a set of themes arising from the chapters that make up the bulk of this book. The following provide a focus for the text that follows in this chapter. The recent history of grasslands using examples drawn from many countries with a brief recap of current thinking and recent trends. Special attention is given to dry grasslands in the Palaearctic region. We offer an overview of the current status of grasslands and germplasm resources (biodiversity) in a range of grassland types from alpine to desert. We discuss the management systems that ensure sustainability and outline measures to recover degraded grasslands. The impacts of environmental problems such as future climate change and socio-economic issues like land abandonment and the impact of intensification on grasslands receive special attention.

Competing interests

The author declares that he has no competing interests.