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GRASSLANDS of the WORLD

Edited by

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FOREWORD

The Food and Agriculture Organization of the United Nations has long been concerned with grasslands, forage crops and pastoral development issues, which have been the focus of various field-based activities and Regular Programme work of the Grassland and Pasture Crops Group within the Crop and Grassland Service.

Grasslands cover a very large portion of the earth's surface and are important as a feed source for livestock, as a habitat for wildlife, for environmental protection and for the *in situ* conservation of plant genetic resources. In both developed and developing countries, many millions of livestock farmers, ranchers and pastoralists depend on grasslands and conserved products such as hay and silage and on a range of fodder crops for their livelihoods. Rapid increases in human and livestock populations have contributed to increased pressures on the world's grasslands, particularly in arid and semi-arid environments. Now more than ever, information is needed on the status of the world's grasslands.

FAO, through the Grassland and Pasture Crops Group, has endeavoured over many years to make available information on grassland themes to a range of audiences. Earlier books included those of Whyte, Nillson-Leissner and Trumble (1969) on *Legumes in Agriculture* and Whyte, Moir and Cooper (1975) on *Grasses in Agriculture*, *Tropical Grasses* by Skerman & Riveros (1990) and *Tropical Forage Legumes* by Skerman, Cameron and Riveros (1988), *Pasture - cattle - coconut systems* by Reynolds (1995), with *Managing Mobility in African Grasslands* by Niamir-Fuller (1999). More recent publications have included studies on: *Hay and Straw Conservation* (Suttie, 2000); *Silage in the Tropics* (t'Mannetje, 2000); *Grassland Resource Assessment* (Harris, 2001); *Transhumant Grazing Systems in Temperate Asia* (Suttie & Reynolds, 2003); *Know to Move, Move to Know* (Schareika, 2003); *Site-Specific Grasses and Herbs* (Krautzer, Peratoner and Bozzo, 2004); *Wild and Sown Grasses* (Peeters, 2004); *Fodder Oats: a world overview* (Suttie & Reynolds, 2004); *Forage Legumes for Temperate Grasslands* (Frame, 2005); and *Grasslands: Developments, Opportunities, Perspectives* (Reynolds & Frame, 2005). The publications are complemented by detailed information on grassland species and extensive *Country Pasture Resource Profiles* to be found on the FAO Grassland Web site at <<http://www.fao.org/ag/grassland.htm>>.

The present book provides an overview of a range of grassland systems worldwide, with contributions by experts from many regions, and in a final chapter briefly assesses the state of the grasslands, their management, various grassland resources, the complementary roles of sown pastures, fodder crops and natural grasslands and concludes by looking at various social, economic

and environmental factors. Researchers, grassland scientists and policy-makers will find the material useful and the book will contribute towards the accumulated knowledge on the world's grasslands. The contributions of authors are much appreciated by FAO in its efforts to disseminate information on grasslands and pastoral systems. The considerable input made by the editors is particularly acknowledged – retired staff member James Suttie, and Stephen Reynolds and Caterina Batello of the Grassland and Pasture Crops Group of the Crop and Grassland Service – both for their personal contributions and Stephen Reynolds for ensuring that the book was brought to publication.

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Dr J. Boonman died tragically after preparing the draft of Chapter 10 with Professor Sergey Mikhalev, but indicated while preparing the paper that he wished to dedicate it to the memory of Dr David Pratt and his early work on the grasslands of East Africa.

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Photographs, unless otherwise acknowledged, are by the authors of each chapter or by the editors. Stephen Reynolds selected and located photographs in the text. Cathleen J. Wilson generously agreed to three of her photographs being used in Chapter 2 on the understanding that they are not used elsewhere

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Glossary of technical terms and abbreviations used in the text

ABARE	Australian Bureau of Agricultural and Resource Economics
AFLP	amplified fragment length polymorphism
<i>aimag</i>	largest Mongolian rural administrative unit, \approx province, comprising several <i>sum</i>
<i>airag</i>	fermented mares milk, mildly alcoholic
AMBA	Argentine Merino Breeder Association
ANPP	annual above ground primary productivity
AR	accumulation rate
ARC	Agricultural Research Council (South Africa)
ARC-RFI	Range and Forage Institute (South Africa)
ARC-ISCW	Institute for Soil Climate and Water (South Africa)
ARS	Agricultural Research Service (United States of America)
AUM	animal unit month
AUY	animal unit year
AVHRR	advanced very high resolution radiometer
<i>bag</i>	smallest Mongolian administrative unit below <i>sum</i> , replacing the former soviet-type brigade
<i>badia</i>	semi-desert grazing land (Arabic)
<i>bod</i>	traditional large livestock unit in Mongolia
brigalow	<i>Acacia harpophylla</i> forest and woodlands
BSE	bovine spongiform encephalopathy (mad cow disease)
CAM	Crassulacean acid metabolism
camp	paddock (South Africa)
CCD	[United Nations] Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa
CEC	cation exchange capacity
CIS	Confederation of Independent States
CISNR	Commission for Integrated Survey of National Resources (China)
CONICET	Consejo Nacional de Investigaciones Científicas y Técnicas (Argentina)
CP	crude protein
CRP	Conservation Reserve Program (United States of America)

CRSP	Collaborative Research Support Program (United States of America)
CSIRO	Commonwealth Scientific and Industrial Research Organization
CYE	comparative yield estimate
DGR	daily growth rates
DLWG	daily liveweight gain
DSS	decision support system
DWR	dry weight rank
EEA/EEPRI	Ethiopian Economic Association/Ethiopian Economic Policy Research Institute
ENSO	El Niño-Southern Oscillation
ephemeroids	Russian term denoting perennials whose vegetative parts die down annually (<i>e.g. Poa bulbosa</i>)
foggage	reserved standing herbage for grazing after the growing season
FO	forage offer
FSAU	Food Security Analysis Unit (Somalia)
FSU	former Soviet Union
garrigue	low growing secondary vegetation with aromatic herbs and prickly dwarf shrubs in the Mediterranean basin
GEF	Global Environment Facility
ger	Mongolian herders mobile felt dwelling (Russian <i>yurt</i>)
GIS	geographical information system
GLASOD	Global Assessment of Soil Degradation (global study published in 1990 by the UNEP and the International Soil Reference and Information Centre in cooperation with the Winand Staring Centre, the International Society of Soil Science, FAO and the International Institute for Aerospace Survey and Earth Sciences)
GSSA	Grassland Society of Southern Africa
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HPG	high performance grazing
HUG	high utilization grazing
IBP	International Biological Program
IEA	Instituto Ecologia Applicata, Rome, Italy
IGAD	Intergovernmental Authority on Development
IGBP	International Geosphere-Biosphere Programme
INIA	Instituto Nacional de Investigación Agropecuaria
INTA	Instituto Nacional de Tecnología Agropecuaria [National Institute for Agricultural Technology, Argentina]
IFEVA-UBA	Instituto de Investigaciones Fisiológicas y Ecológicas – Universidad de Buenos Aires (Argentina)

IUCN	The World Conservation Union
<i>khainag</i>	yak × cattle hybrid (Mongolia)
<i>khot ail</i>	traditional herding unit of households camping and working together (Mongolia)
Kolkhoz	a collective or cooperative farm in the soviet system
Kray	territory (Russian Federation)
LADA	land degradation assessment in drylands
LAI	leaf area index
Landsat TM	land remote-sensing satellite – thematic mapper
LAR	leaf appearance rate
LER	leaf expansion rate
LEWS	Livestock Early Warning System
LFA	landscape function analysis
<i>liman</i>	flood meadow (Russian Federation)
LLS	leaf life span
LSU	livestock unit
LTER	Long-Term Ecological Research (this is a Network/Program in the United States of America)
LWG	liveweight gain
<i>malezales</i>	marshy, low-lying wetlands – South America
masl	metres above sea level
<i>matorral</i>	drought-resistant Mediterranean scrub, taller than garrigue (= French <i>maquis</i>)
MAP	mean annual precipitation
<i>negdel</i>	Mongolian former cooperative – replaced by <i>sum</i>
NDVI	normalized difference vegetation index
NIRS	near infra-red spectroscopy
NOAA	National Oceanic and Atmospheric Administration (United States of America)
nomadism	generally used of pastoral groups thought to have no fixed base, but follow entirely erratic rain storms
Oblast	region (Russian Federation)
OM	organic matter
<i>otor</i>	movement of livestock to distant pasture to improve condition
PAGE	policy analysis of the greenhouse effect
PAR	photosynthetically active radiation
PAP	primary aerial productivity
ppm	parts per million
PROLANA	El Programa para Mejorar la Calidad de la Lana Argentina
<i>rakhi</i>	alcoholic drink distilled from <i>airag</i>
RAPD	random amplified polymorphic DNA

RASHN	Russian Academy of Agricultural Sciences
RCE	regional centre of endemism
SAGPyA	Secretaría de Agricultura Ganadería, Pesca y Alimentos, (Argentina)
SETCIP	Secretaría de Ciencia, Tecnología e Innovación Productiva
Sovkhozy	state-operated agricultural estate in the former USSR for specialized large-scale production
SP	secondary production
SPOT	Satellite probatoire d'observation de la Terre (Experimental Earth Observation System)
SPUR2	Simulation of Production and Utilization of Rangelands (software)
<i>sum</i>	Mongolian administrative unit, below <i>aimag</i>
transhumance	pastoral systems where people with their animals move between distinct seasonal pastures, usually at considerable distance or altitude from each other
tugrik or togrog	Mongolian national currency
UFRGS	Universidade Federal do Rio Grande do Sul [Federal University of Rio Grande del Sul, Brazil]
UNEP	United Nations Environment Programme
USGS/EDC	United States Geological Survey/EROS Data Center
UVB	ultraviolet B
veldt	extensive grasslands in South Africa
WWF	World Wide Fund for Nature
<i>zud</i>	climatic disaster that affects livestock – usually deep frozen snow which denies access to grazing, but may be lack of snow to drink, unusual cold, or drought (Mongolian)