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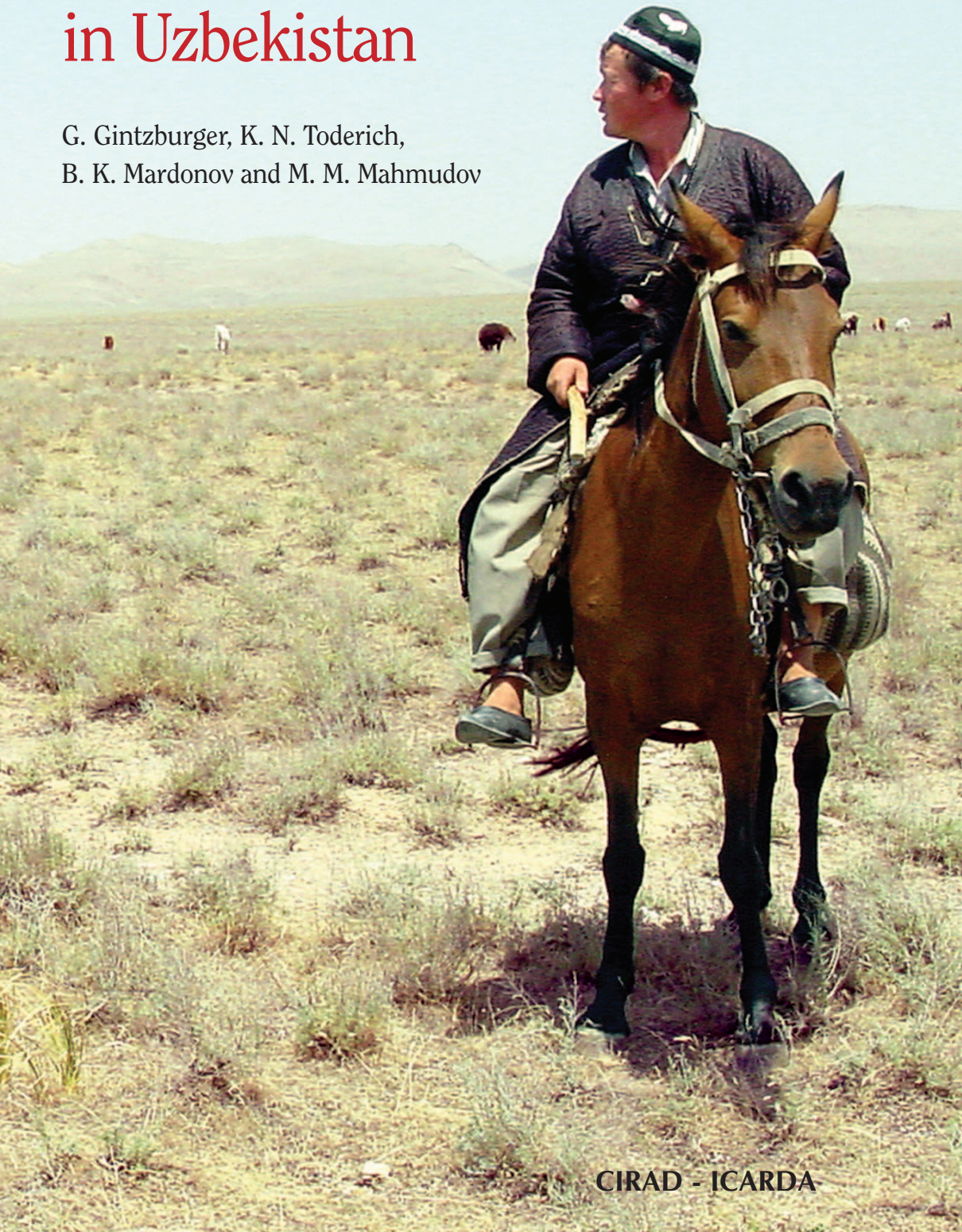

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Acknowledgements

This book presents an overview of the arid and semi-arid regions of the Uzbek Republic describing the native flora, together with its ecology, fodder properties and utilization. The practical purpose is to provide information on rangeland and plants of the steppe and desert of Uzbekistan. The intention is to contribute to a better understanding of these challenging arid environments for the conservation and sustainable use of their fragile natural resources.

The original concept for this book, the preparation, financial and logistic work and co-ordination were carried out by G. Gintzburger (INRA-CIRAD, France) whilst working (1997–99) as a range scientist at the International Center for Agricultural Research in the Dry Areas (ICARDA, Aleppo, Syria) and then (2000–2003) at the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD-EMVT/ECONAP, Montpellier, France).

The book was prepared with the support of scientists of the Department of Desert Ecology Research (Samarkand Division of the Academy of Science of Uzbekistan) and the Uzbek Institute of Karakul Sheep Husbandry in close collaboration with G. Gintzburger. The descriptions of the plant species were prepared by K. N. Toderich, G. Gintzburger and B. K. Mardonov. K. N. Toderich prepared the chapter on fodder value, seed characteristics and germination ecology. The chapters on climatology, bioclimatology, general ecology and current land use were developed and written by G. Gintzburger. The photographs were contributed by B. K. Mardonov and G. Gintzburger. They are also responsible for the determination of the species. N. V. Marmazinskaya largely contributed to the chapter on nature reserves and national parks. The original English version of the text was produced by K. N. Toderich and G. Gintzburger. The overall management of the book was the responsibility of G. Gintzburger.

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We hope that this book will provide a valuable resource and tool for livestock owners, range managers, pastoralists, ecologists, conservationists, botanists, seed collectors, veterinarians, extension officers and decision-makers in developing a strategy for the sustainable management of Middle and Central Asian rangelands for a better future for the people not only of Uzbekistan but also for the whole region.

Contents

Forewords

Of the 447,400 km^2 land area of the Republic of Uzbekistan, some 225,000 km^2 is used as rangeland and pastures for the Karakul sheep industry producing the famous 'Astrakhan' pelts, and for goat, horse and camel breeding. These rangelands are rich in medicinal and industrial plants, and represent a 'hot spot' for the conservation of unique flora and fauna. However, the vegetation of these lands is under pressure due to an increasing need for food and feed. Overgrazing and uprooting of shrubs for fuelwood are particularly threatening the precious biodiversity found in these lands, and the livelihoods of the people who live there.

Recognizing the importance of protecting the health of rangelands in Uzbekistan, and in Central Asia generally, the International Center for Agricultural Research in the Dry Areas (ICARDA), in 1997, launched a collaborative research project entitled 'Central Asian Range and Sheep Evaluation' in collaboration with the Uzbek Scientific Production Centre of Agriculture (USPCA) and with financial support from the United States Department of Agriculture (USDA). The key objective of the project was to understand the range-based sheep production systems under the new economic reforms in Uzbekistan. This effort was probably the first collaborative venture of the Consultative Group of International Agricultural Research (CGIAR) in Central Asia after the breakdown of the Soviet Union, during a period of major reforms influencing the economies of this vast region.

As part of the project, a study was undertaken of the biodiversity of the arid and semi-arid regions of Uzbekistan, their climatology, native flora with their ecology, fodder properties, and utilization and range rehabilitation techniques. This book 'Rangelands of the Arid and Semi-Arid Zones in Uzbekistan' is a product of that effort. It is abundantly illustrated with high-quality color photographs, and presents a panorama of the existing biodiversity describing the location, ecology and specific flora of the natural reserves and national parks of Uzbekistan. While this work was carried out within the framework of the collaborative USDA project, CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour de Développement), France, joined the effort and undertook responsibility producing the book, in collaboration with the Karakul Sheep and Desert Ecology Research Institute of Uzbekistan and the Academy of Sciences of Uzbekistan, Samarkand Branch.

I congratulate the authors for their hard work and dedication in producing this book, which will serve as a reference source and help in better understanding the challenges of arid and semi-arid environments and in the conservation and rational use of their fragile and unique natural resources. It should prove useful to livestock owners, range managers, pastoralists, ecologists, conservationists, botanists, seed collectors, veterinarians, extension officers and national and international decision-makers in developing a sustainable management strategy for the Central Asian rangelands.

Prof. Dr Adel El-Beltagy

Director General ICARDA

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Академия Наук Республики Узбекистан (Самаркандское отделение) гордится тем, что преданные своей работе ученые - Кристина Тодерич, Бахтиер Мардонов (сотрудники отдела "Экологии пустынь и водных ресурсов") и профессор Мухиддин Махмудов (Институт Каракулеводства и экологии пустынь) в тесном сотрудничестве с доктором Густавом Гинтзбургером (CIRAD-INRA, Франция), который предложил и довел до завершения данный проект, смогли внести вклад в подготовку настоящей книги. Несомненно, этот совместный труд будет способствовать лучшему международному пониманию и обогащению знаний об экологии и растительности аридных и полуаридных зон Узбекистана.

Данная книга является результатом пятилетнего совместного сотрудничества, которое включает в себя изучение, анализ и тщательную обработку данных по пастбищам Узбекистана со ссылкой на другие пастбища Центральной Азии и Средиземноморья, предлагающей большой обзор будущим читателям.

Опубликование этой книги на английском языке позволит нам с удовольствием разделить сокровища биоразнообразия нашей пустыни с коллегами и учеными со всего мира.

Мы благодарны всем исследовательским организациям - ICARDA, USAID, CRSP и прежде всего CIRAD (Франция), которые оказали финансовую поддержку в организации опубликования данной книги.

Мы надеемся, что такие международные действия будут продолжаться в виде дальнейшего плодотворного сотрудничества, взаимовыгодного как для нашей страны, так и для других стран мира.

Председатель Самаркандского
Отделения Академии Наук
Республики Узбекистан, профессор Т.Ш. Ширинов

Preface

I felt honoured when 'Gus', as every one calls him, requested me to write a preface to the book he and his three Uzbek colleagues, Dr. K. N. Toderich, Dr. B. B. Mardonov and Professor M. M. Mahmudov, have written on the rangelands of the Uzbekistan steppes.

I came to know Gus in 1970 in Algeria, when he was a young 'VSN' ('Volontaire du Service National', the French equivalent of the United States Peace Corps). I had at that time been commissioned by the Food and Agriculture Organization of the United Nations (FAO) and the Government of Algeria to set up a Range Research Laboratory within the National Agriculture Research Institute of Algeria (INRAA). Gus was assigned to Algeria and INRAA posted him to the Range Research Station at Tadmit in the Highland Steppes, some 300 kilometres south of Algiers. He did his best to survey Tadmit's rangelands at a large scale (10,000 ha, 1:5000) with very little material support from the INRAA administration. I did what I could to foster his great interest in learning about arid and semi-arid zone botanical and rangeland ecology. A kind of complicity and mutual understanding was thus born between us.

After subsequently acquiring his Doctorate from the University of Strasbourg, Gus joined FAO in 1975. We maintained and built further on our previous relationship, particularly as I was then at FAO Headquarters in Rome and responsible for the work carried out by the organization in North Africa. Gus was sent as an FAO expert to contribute to an agriculture research project in Libya, where he worked for five years. He then moved on to West Australia for another 5 years to carry out research on rangelands and particularly range reseeding with annual medics (*Medicago* spp.) for the West Australian Ministry of Agriculture. He had become an expert in this subject during his stay in Libya and in the course of co-operation with various Australian projects in that country. Shortly thereafter I myself moved to Libya as co-ordinator of an FAO multidisciplinary rangeland project. Gus later decided to join the Institut National de Recherche Agronomique (INRA, France) in Montpellier in 1986. I came back to Montpellier during the same period after a 3-year stay at Texas A & I University.

We have thus followed similar, interwoven paths, always remaining in contact and often working in different institutions but in the same places and on similar or related topics.

When in 1990 I was entrusted with the duty of organizing the 4th International Rangeland Congress the following year, I naturally asked Gus to help me successfully fulfil the task as General Secretary. It was no surprise, that he did this superbly, and the Congress was internationally regarded as an innovative and successful effort. He thus became known to the 800 Congress participants and many other colleagues in the range science community throughout the world.

A few months later, he joined ICARDA (International Centre for Agricultural Research in the Dry Areas) in Aleppo, Syria. There he was commissioned to lead the 'Pasture, Forage, Livestock and Rangeland Program'. As part of his duties, he supervised and carried out major range surveys in Asia and northern Africa and thus became increasingly committed personally to the conservation and productivity of

the rangelands of south-west and Middle Asia. These days, Gus is back at INRA in Montpellier but with his heart and professional engagements still solidly in Middle Asia.

One result is the present monograph, prepared in collaboration with three of his Uzbek colleagues. This is the first major survey in English on Uzbekistan's and Middle Asia's rangelands. The expression 'Middle Asia', coined by Lavrenko, in the Russian-speaking biogeographic literature used to designate the 'Aralo-Caspian' zone of the older authors, characterized by winter rainfall and summer drought, unlike 'Central Asia' further east having summer rain and winter drought. Previous publications in English from nearby regions have been translations from Russian and, in particular, of the research work of N.T. Nechaeva, N.G. Kharin and their collaborators from the Turkmen Desert Institute of Ashgabat.

The present book represents a number of innovations in the rangeland field.

• The first innovation is the relatively large section devoted to bioclimatology. This section utilizes methods that are not commonly applied in the region under study, and thus contributes to international scientific understanding. These bioclimatic studies suggest rather tight kinship with other range regions of the world having both Mediterranean climates and cold winters: the highlands of northern Africa and Spain, other parts of the Irano-Turanian Phytogeographic Zone, the western 'Great Basin' of the United States, and Patagonia. Historically, significant range improvement in these regions actually came from the introduction of sown pastures with Middle Asian perennial grasses (*Agropyron* spp., *Elymus* spp., *Leymus* spp., etc.).

• A second innovation is the priority given to the description of some 140 key range species with their morphology, ecology and range importance (positive or negative). Particular attention is given to the original traits of the Middle Asian steppe region: a relatively large number of tall shrubs and small trees (*Calligonum* spp., *Ephedra* spp., *Haloxylon* spp., *Salsola* spp.), tall shrub legumes such as *Ammodendron* spp., *Astragalus* spp., *Caragana* spp., *Eremospartum* spp., *Halimodendron* spp., *Hedysarum* spp., *Smirnovia turkestana* and the extension and ground cover of ephemeroids (*Poa grex bulbosa* and *Carex grex pachystylis*).

• A third innovation is the importance given to biogeography, underlining the value of the research carried out by Russian-speaking scientists, which for linguistic reasons is not easily accessible to a large sector of the global scientific community.

• A fourth innovation is the substantial use of graphic information and images, particularly colour photographs and many graphs, tables and statistical correlations.

• A fifth innovation is the analysis of the range and livestock situation, and the evolution of livestock husbandry practices, consecutive to the end of the USSR era in Middle Asia. Particular attention is given to range/steppe vegetation dynamics and the impact of grazing systems.

I must also acknowledge some outstanding weak points such as the limited space given to range production, productivity and variability, and the correlation with rainfall amount and distribution, rain-use efficiency, etc. However, the authors cannot be blamed for this shortcoming given the lack of reliable data within the country, unlike adjacent Turkmenistan. Identifying such weaknesses points to promising areas for further research and publication in future.

I should, finally, like to congratulate the authors, the scientific editor and the publishers for this remarkable book, which I consider a major contribution to the knowledge of the bioclimatology, vegetation and rangelands of Middle Asia in general and Uzbekistan in particular. I had the pleasure of travelling in Tajikistan, Uzbekistan and Turkmenistan on two occasions – in 1972 and 1986 – and can testify to the importance of this region, which remains little known to researchers and the general public internationally. I am taking no risk in predicting this will soon become a classical reference in Range Science!

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Introduction

The Republic of Uzbekistan (Map 1, p. 340) is situated in the middle of the Eurasian land mass in the northern hemisphere between latitudes 37° and 45° N and longitudes 56° and 73° E. It lies approximately at the same latitude (40–45°) as southern France, Italy and Spain in Europe, Colorado, Utah, Wyoming and Oregon in North America, and the Taklamakan, the Gobi and Inner Mongolia in northern China. The Uzbek territory covers some 447,400 km^2, spread over some 1400 km from east to west, and has a population of about 25 million.

About 85% of Uzbekistan is classified as belonging to the Arid and Semi-arid Bioclimatic Zones, and these regions play an immensely important role in the sustainable development of the Uzbek agriculture and economy. This is partly due to the vast mineral resources, underground water reserves, and the resultant gold, oil and gas industries.

Approximately 255,000 km^2 of the territories of Uzbekistan (Map 2, p. 341; Table 1, p. 65) are used as pasture and rangeland for livestock. Only a small (10–11%), but economically important proportion is irrigated, mainly for cotton and wheat production. The arid zones and deserts are traditional pastures for Karakul sheep (which produce the famous 'Astrakhan' pelts), horse and camel breeding. The unique ecology of the rangeland areas has resulted in a distinct flora and fauna, including some medicinal plants.

However, the vegetation of these zones is threatened by degradation, mostly man-made, and by future requirements for human and animal foodstuffs (Nordblom *et al.* 1997). The productivity of the rangeland has been sharply reduced as a result of erratic cropping pressure in low rainfall zones, overgrazing of the best ranges, and by the uprooting and cutting of vital shrubs by local populations for fuelwood. It has lead to changes in floral diversity and often to the disappearance of useful, endemic or relic arid zone plants. It is estimated that degradation of pastures and ranges presently affects more than 30% of the Uzbek territory and this has a clear impact on the native fauna and flora of the country.

The pastoral system

For ages, nomadic and transhumant pastoralists of Middle and Central Asia have used the desert, steppe and mountain rangeland (Vinogradov and Mamedov 1975) for hunting and grazing (Tashbaeva *et al.* 2001).

Petroglyphs (rock engravings) along the Sarmish river (Karatau mountains, Navoi region).

Karakul sheep flock in Karnabchol.

Before the Soviet revolution, the desert livestock industry and Karakul sheep breeding in particular, was based entirely on rangeland forage and resources; hand feeding was carried out only in special cases such as breeding or weak animals.

In search of the best forage, pastoralists moved short distances from one place to another depending on the availability of forage and fuelwood. They also used to travel long distances to take advantage of the valuable forage of different types of winter or summer vegetation and vital water supplies for their flocks. This also allowed them to minimize feed storage and the need for supplementary feeding. In winter, the chol and sandy deserts were preferred as animals could shelter and graze between the sand dunes. In spring, the flocks would graze ephemeral and ephemeroid plants on the chol and adyr, which provided pregnant animals with nutritious food and plenty of water, thus reducing the need for frequent watering of the flocks. As summer and the dry season approached, pastoralists would move closer to wells and watering points, mostly on the adyr and the foothills of the higher rainfall zones, to graze the dry ephemerals, shrubs and perennial grasses. During the summer and autumn, they would climb up on to the tau, and when possible the alau, high into the mountains, until the first snow and frost arrived. With the approach of winter, they would descend and progress slowly back to the lowland and sandy desert.

The early pastoral industry mostly bred sheep and camels on rangeland. Sheep were mostly the fat-tail type (Karakul, Gissara sheep), bred on the boreal ranges of desert regions of Middle and Central Asia, and Karakul sheep, mainly concentrated along the Amu-Darya river and in regions around the Murgab and Tedjen rivers. Dromedary camels predominate in Uzbekistan and Turkmenistan (Arvana dromedary), to be replaced by the bactrian species in southern Kazakhstan and northwards.

Karakul ewe and lambs.

Karakul lambs.

Gissara (Hissar) rams in Samarkand.

Gissara (Hissar) ram in Samarkand.

Young Arvana dromedary *(Camelus dromedarius)* in Karakum, Turkmenistan.

Bactrian camels *(Camelus bactrianus)* in Moyunkum desert, Kazakhstan.

The Stalin collectivization and forced settlement of nomads in the 1930s catastrophically and abruptly stopped nomadic movement between different ecological zones, thus altering totally the livestock systems in Uzbekistan and neighbouring middle Asian countries.

With the influx of Russian colonization and the planned socialist system forcibly implemented through sovkhozes (state farms) and kolkhozes (collective farms) in new areas of the Uzbek desert, production of Karakul sheep increased because of high pelt values. This was achieved by improving fertility and breeding of the Karakul sheep, and by intensive feeding systems.

Slowly the new livestock system managed to get back into equilibrium after a radical decrease in animal numbers. Gradually, the need for a better use of rangeland resources in different ecological zones prevailed. Some of the flock movements and long migrations were recognized as being beneficial and were re-established by the allocation of appropriate grazing land to sovkhozes and kolkhozes in different ecological zones.

These rangeland areas remained a priority issue in Uzbekistan up to the late 1980s because of the growing demand for livestock products and Karakul wool and pelts by the rapidly growing population, and the increasing allocation of land, capital and water to cotton production.