

Preface

Origin of the Book

In 2009, during the 18th International Soil Tillage Research Organization (ISTRO) conference in Izmir, Mekhlis Suleimenov from Kazakhstan and Lothar Mueller from Germany came into contact and had their first few talks about soil and water conservation and the situation of agriculture in their countries. They found some common areas of interest, and it seemed to be worthwhile and challenging to explore opportunities for a more intensive exchange of ideas. Abdulla Saparov, Director of the Uspanov Institute for Soil Science in Almaty, and Gunnar Lischeid, Head of the Institute of Landscape Hydrology at the Leibniz Centre for Agricultural Landscape Research in Muencheberg, were very responsive to the suggestion of starting to cooperate and encouraged, inspired and headed this project. A research funding initiative by the German Federal Ministry of Education and Research (BMBF) provided the framework, and our submission was confirmed. In September 2010, the project KAZ 10/001 “Novel Measurement and Assessment Tools for the Monitoring and Management of Water and Soil Resources in Agricultural Landscapes of Central Asia” got started. The International Bureau of the BMBF escorted and administered the project. Over a period of two years, funding has been provided to support short visits by experts, exchanges by young scientists, a workshop in Almaty and the publication of this book. The duration of the project was not enough for extended joint experiments but was sufficient to gain an impression and basic understanding of the status and achievements of research, and of the great potential benefits that longer lasting cooperation would have.

Purpose of the Book

This book is intended to be a source of information for all those dealing with its subject: methods for the characterisation and wise utilisation of water and land resources in Central Asia. There are indications that existing methodologies do not

meet international standards and current resource use is not sustainable. The book is to help improve this situation and initiate sustainable developments in Central Asia.

We advocate the role of science and technology in improving our understanding of ecosystem processes and creating monitoring and controlling mechanisms. Reliable data based on advanced, internationally proven and acknowledged methods are required. This implies the exchange of knowledge and the transfer and joint advancement of methods in the scientific community.

The main intended innovation of the book is its focus on methodologies, not on results and facts. Scientific tools will be proposed for measuring, evaluating, modelling and controlling processes in agricultural landscapes. Their application will create a knowledge shift and synergetic effects leading to practical results and conclusions. The book shall act both as a milestone by offering novel tools and ideas, and as a cornerstone by creating lasting research cooperation between scientists and institutes of Eurasia.

Our addressees are people dealing with the development and conservation of land and water in a vast region, where these valuable resources have often been handled wastefully in the recent past. The book mainly addresses scientists, planners, teachers, students and decision makers. It is intended to be a source of information and inspiration for all readers who feel responsible for initiating the sustainable use of resources in Central Asia. This shall help to prepare a secure and better future for the young generation growing up, by preserving the capacities of terrestrial and aquatic ecosystems.

Content and Structure of the Book

The book offers a broad array of methods to measure, assess, forecast, utilise and control land and water resources: laboratory and field measurement methods, methods of resource evaluation, functional mapping and risk assessment and remote sensing methods for monitoring and modelling large areas. It contains methods for data analysis and ecosystem modelling, methods for the bioremediation of soil and water and the field monitoring of soils and methods and technologies for optimising land use systems.

The book has 43 individual chapters in three sections and eight thematic clusters. In order to focus on the scientific value of individual chapters and the expertise of their authors, the editors have decided to keep the structure on a flat level of hierarchy and to allocate the chapters to three parts only. Part I, *Environmental and Societal Framework for the Monitoring and Management of Land and Water Resources*, shall provide an overview of issues related to land and water in Central Asia and prepare the reader for an understanding of the methodological chapters presented in the subsequent two sections. Part I contains 6 chapters analysing the current status and trends. Part II, entitled *Novel Methodologies for the Measurement of Processes and Assessment of Resources* and

Part III, *Applications and Case Studies*, shall provide information about novel methods and give examples of their practical use. Methods that are not yet well known in Central Asia but may have a particular novelty and potential importance are presented in Part II, whilst other new methods and solutions are given in part III. A fourth section, *Executive Summary and Conclusions*, allocates all individual chapters to thematic clusters, reviews them and makes proposals for how they can be applied.

Authors, Readers and their Responsibilities

The authors are inventors and activists behind novel methods, as well as being innovative and experienced scientists. Most of them come from Kazakhstan, Germany, Uzbekistan and Russia, others from different regions of the globe. Not all the authors took part in the project. Many of them were invited to contribute an article afterwards because of the relevance and novelty of their approaches.

Possible divergences between the findings, conclusions and statements of some individual authors are natural. They do not necessarily need to coincide with the particular opinion of the editors. The authors are free to highlight and point out aspects of their study from their typical, individual perspective. The transliteration of local names for rivers, cities or other geographical items or units may also differ from chapter to chapter. All statistical data given in the various chapters of this book may include slight uncertainties, biases and inconsistencies. The editors have made no attempt to harmonize them because this is natural and reflects the different sources and local and temporal scales of the data.

The editors are hopeful that readers will gain sufficient information and inspiration for their own work from this book. However, it is not a cookbook with clear recipes. Readers will become aware of the inconsistencies and deficiencies of some approaches when it comes to measuring and assessing processes in complex ecosystems. They are encouraged to find their individual optimum when drawing conclusions and acting imaginatively.

In some chapters, trade names are used to provide specific information. Mentioning a trade name does not constitute a guarantee of the product by the authors or editors. Neither does it imply an endorsement by the authors or editors of comparable products that are not named.

One brief remark on the book's language. Our aim of providing standard scientific English throughout the book could not be ensured for some chapters. Some constraints restricted this. Despite those deficits we decided to include these chapters because of their relevance and novelty. Though the English is imperfect, in our opinion the content is a valuable contribution to the book. We believe it is preferential and more useful to reach out to some important potential readers in the region by also providing the titles, summaries, figure captions and table headers in



Painting Teris-Asjibulak

Teris-Asjibulak is a small village and correspondent water reservoir (Терс-Ашибулакское водохранилище) about 50 km SW of Taras, Kazakhstan. It was built mainly for irrigation purposes in 1962. The view is from the outlet of the reservoir in south direction towards the Alatau mountain range in Kyrgyzstan where the water comes from. The painting shows a midsummer scene in a typical medium-term dry period. Water shortage occurs since some years. Dry agricultural lands and semi-aquatic vegetation which grew up in the former aquatic area form red-brown belts. Painter: Ute Moritz, 2012. She dedicated the painting to this book edition. Material is oil on canvas. Original size 70*50 cm.

Russian. This information will be available as extra material. Readers feel free to contact the chapter authors or the editors.

Müncheberg and Almaty, May 2013

Lothar Mueller
Abdulla Saparov
Gunnar Lischeid

Novel Measurement and Assessment Tools for
Monitoring and Management of Land and Water
Resources in Agricultural Landscapes of Central Asia

Müller, L.; Saparov, A.; Lischeid, G. (Eds.)

2014, XXIII, 716 p. 309 illus., 255 illus. in color.,

Hardcover

ISBN: 978-3-319-01016-8