

沙漠学



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主编

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内 容 简 介

《沙漠学》是国内外第一本研究、开发沙漠的专著。它是几代中外科学家长期与沙漠抗争、对话的智慧结晶。沙漠、沙地、沙漠化是涉及当今世界人口、环境、资源的重要内容之一。本书荟萃当代高科技手段下全球沙漠治理的最新科学成果，以“沙漠是块宝地”的全新思想，昭示人们要重新认识沙漠，保护环境，开发和利用好沙漠诸多的宝贵资源。本书顾问权威，结构体系新颖，内容翔实浩瀚，学术性、趣味性兼备，既是大中专院校有关专业的教科书，也是治理环境等机构和风沙第一线工程技术人员的参考书，就是对于关心沙漠、爱好沙漠的读者来说，也是开卷有益的。

SUMMARY

《Eremology》is the first monograph on studying and exploring desert in the world, and a Crystallization of wisdom that a Few generations of Scientists contest with desert both domestic and abroad for a long time. Desert, sandy lands and desertization involve major matters of populations, environments and resources at present world. This book assembles the new scientific and technical achievements of desert treatment by the means of resent high technique over the world, and puts forward a quite new thought "Desert is a treasured place", desert should be recognized again, giving protection and rational uses. The book is directed by academic authorities, new and original structural systems, contents of accurate and abundant, academic and interest styles. It can be used as the textbook for universities and colleges, and the reference of combatting sand for engineering technicians and environmental improvement, also, it is a beneficial book for those who are concerned with and interested in desert.

序

土地沙漠化所造成的环境退化和经济贫困,已经成为威胁人类生存的十大环境问题之首。国际有关组织对此频频发出警告,各国也纷纷研究对策,争相出台政策和采取行动。为了防治土地沙漠化的扩大,中国已作了40多年的研究和防治工作,取得了举世瞩目的成绩。但是目前我国仍然是世界上沙漠面积较大、分布较广、沙漠化危害严重的国家之一,防沙治沙的形势依然十分严峻。

中国的沙漠和沙漠化土地面积约153.3万平方千米,占国土总面积的15.9%。其中,沙漠戈壁116.2万平方千米,沙漠化土地33.4万平方千米,风沙化土地3.7万平方千米,分布在27个省、区、市,有近1/3的国土面积受到风沙威胁。尤其是北方12个省、区、市面积最大,受害最重。五六十年代,沙漠化土地平均每年扩大1560平方千米,进入80年代,平均每年扩大2100平方千米,进入90年代,平均每年扩大2460平方千米。目前,我国沙漠的推进和沙漠化土地的扩展仍在继续。预计今后10年,若不采取有效措施,沙漠化土地面积还将以1.32%的速度发展。土地沙漠化造成的生态环境危机,不但严重地制约着国民经济发展,而且也威胁着中华民族的生存。

党中央、国务院对我国防沙治沙事业十分重视,1991年7月,国务院召开了全国治沙工作会议,并向全国人民发出了“向沙漠进军”的伟大号召。之后国务院又批复了《1991~2000年治沙工程规划要点》,颁布了《关于治沙工作若干政策措施的意见》,批准成立了中国治沙暨沙业学会,召开了全国防沙治沙工程建设工作会议。所以近几年来,全国治理沙漠、沙漠化土地、风沙化土地面积年年超额完成任务,创建国以来的最好水平。

防沙治沙是一项改造大自然的生态工程,沙区自然条件差,建设范围广,涉及学科多,要达到预期目的,必须依靠科学和技术的进步。关于沙漠学,老一辈科学家竺可桢、侯仁之、江福利等先生都有过一些精辟的论述,当代沙漠专家朱震达、吴正、寿伟权等同志也有许多专门的阐释。现在,由内蒙古林学院、内蒙古林科院、内蒙古林业勘察设计院等单位的专家教授编著的《沙漠学》终于问世了,我向编著者表示热情的祝贺。由于时间关系,我没有阅读全书,但从《沙漠学》的编写大纲中,我能体会到这部专著的理论价值和应用价值。相信它是一部跨世纪的、指导我国治理沙漠的重要论著。愿《沙漠学》能为改善我国沙区的生态环境,促进沙区国民经济发展发挥它应有的作用。

内蒙古自治区政府副主席 李士杰

1998年7月10日

PREFACE

Land desertization causes globe environmental degradation, having been regarded as the first of ten problems threatening human survival on worldwide scale. The related international organizations have given the world repeated cautions, each country is seriously seeking countermeasures, including policies and projects, to combat land desertization. China has made remarked progress in forty-years work. However, China is one of the countries that are seriously harmed by desertization, desert area is large and is widely distributed. The tasks of controlling desert is still arduous.

In China, deserts and desertized lands are about 1533 thousand km^2 , occupying 15.9% of the national area, in which, desert and gobi are 1162 thousand km^2 , desertized lands are 334 thousand km^2 , and wind blown sandy lands are 37 thousand km^2 . Nearly one-third of the total land area, belonged to 27 provinces, are affected by blown sand, especially the 12 provinces in north, are more seriously harmed. Deserts and desertized lands are rapidly expanding for decades, desertized lands increased 1560 km^2 annually from 1950s to 1960s, it is entered 1980s that annual increment has been up to 2100 km^2 , and it is 2460 km^2 in 1990s. It is estimated that desertized lands will develop by 1.32% in 10 years if no effective measures are taken promptly. Eco-environmental problems caused by land desertization not only hinder national economic development but directly threaten the survival of Chinese people.

The Party Central Committee and the State Council have attached great importance to desert control. In July of 1991, the State Council convened National Working Conference on Sand Control, issuing the whole nation a call "to harness the deserts", then, officially replying "Main Points of 1991~2000 Sand-control Plan", issuing "Suggestions for Policies and Measures on Sand-Control Work", ratifying to establish China Society of Sand Control and Deserticulture, Convening national working conferences on Sand Control engineering construction. As a result, we have overfulfilled planned targets year after year of harnessing deserts, desertized lands and sand blown Lands, achieving all-time high since the founding of our people's Republic.

Sand control is an integrated ecologic engineering of transforming nature. Eremology, was expounded by the scientists of the old generation, such as Zhu Kezhen, Hou Renzhi, Jiang Fuli and so on; the present experts including Zhu Zhengda, Wu Zheng and Shou wei-quan have also presented special elaborations in their works. Now comes out is *《Eremology》* compiled and writed by the experts and professors of Inner Mongolia Forestry College, Inner Mongolia Forestry Institute and Inner Mongolia Forestry Survey and Design Institute. Warm Congratulations to the writers! Although I don't have enough time to enjoy the whole work, I have realized its theoretical and practical values from the writer's outline. I believe it is an

great work in guiding the desert control work in China. I wish 《Eremology》 would play the part in the practice of improving ecological environment and regional economy for desert areas of Inner Mongolia.

Vice-Governor of Inner Mongolia
Autonomous Region
Fu Shouzheng
July 10, 1998

前 言

我国的大规模治沙始于中华人民共和国成立后。50年代初期,围绕着村舍、农田进行植树造林的同时,总结、推广了不少群众治沙经验;后期,连续召开两次全国治沙工作会议,成立了860多人的中国科学院治沙队,重点沙漠设立了定位、半定位的观测站,有关省区成立了治沙科研机构。60年代,伴随着大农业、大开荒,开展了以群众治沙为主的大面积植树造林运动,摸清了我国所有沙漠、沙地的成因、分布、规律和一些基本特征,进行了多学科、多层次的定位、半定位研究,总结出大量的群众治沙造林的先进技术;围绕着国家经济建设,在铁路、公路、工矿企业、城镇建设的防沙治沙方面,取得了成功的典型经验。70年代后期,从生态学角度提出了综合治沙和沙漠化的概念并进行了研究。80年代,结合沙漠化和生态理论,提出了中国以沙漠、沙漠化为核心的环境问题。90年代,认识了沙漠沙地独特的资源优势、经济潜力,在人沙和谐的思想下,引入和应用了景观生态学、区域经济理论、可持续发展原则,重视了优化生态环境的研究和建设。

在国外,涉及到沙漠、荒漠化的100多个国家,不论发达国家或发展中国家,以30年代拜格诺发表的《风沙和荒漠沙丘物理学》论著为契点,结合经济需要,几十年来掀起了一浪高过一浪的研究沙漠、开发沙漠的热潮。围绕着沙漠干旱区建立了很多研究机构,从事沙漠研究的科学家、工程技术人员达数百万之众。

国内外对沙漠、荒漠化的研究取得了积聚如山的成果,产生了浩如烟海的文献。所有这些智慧的结晶都为《沙漠学》的产生奠定了雄厚的科学基础。我们编著《沙漠学》的想法产生于10年之前,只是到了今岁,经过10年培养和孕育,《沙漠学》才瓜熟蒂落、呱呱坠地。这也是社会进步、开拓沙漠生存空间的必然结果。

各位作者(以姓氏笔画为序)编写内容如下:马玉明,绪论、1.3、1.4;马世威,1.1、1.6、1.7(除1.7.6)、4.1、4.2;马燕春,1.6、9.1、9.2、9.3;方天纵,9.4、9.9、11.2、11.3、11.4;王林和,10.5、10.6;王燕茹,5.6、5.7;史绣华,1.7.6;孙祥,3.1、3.2;刘果厚,7.1~7.4;白晓昭,1.5;李玉灵,5.1;汪季,1.8(除1.8.4);李钢铁,2.2、2.3;何绍芬、刘新前、阿腾格,9.5~9.8、10.1~10.4;张文军,5.4;张伟华,6.1~6.3;张连第,4.5;张志红,4.2;张武文,5.3;张明如,3.4、3.5;张称意,3.3;陈志荣、侯拴明,1.2;杨文斌,

4.3; 杨俊平, 12.1~12.4; 孟和, 4.4、4.6; 姚云峰、李钢铁, 1.8.4、2.4; 姚洪林, 8.1~8.6; 俞晓诺, 5.2; 高永, 11.1、13.1~13.5; 高科, 1.9; 桂呈森, 5.6; 康世勇, 2.1。全书由马世威、马玉明、任居平、高永统稿, 外文由高科、张明如、李玉宝翻译。

《沙漠学》是“沙漠丛书”的第一部专著, 我们计划的丛书还将有《绿洲学》、《沙区资源学》、《沙漠工程学》、《沙漠微生物学》、《荒漠景观生态学》陆续面世。

《沙漠学》在编著、出版过程中, 得到内蒙古新闻出版局、内蒙古人民出版社、内蒙古林学院、内蒙古林业科学研究院、内蒙古林业勘察设计院、内蒙古大学、内蒙古师范大学、林业部重点开放性实验室——沙地生物资源保护和培育实验室及内蒙古自治区政府等单位的支持; 全体顾问的指导和帮助, 在此一并表示谢意。

由于时间仓促, 水平有限, 错误之处, 在所难免, 谨祈读者批评指正。

编著者

1998年8月1日

INTRODUCTION

Large scale sand-controlling has been started in our country since establishing state. At the beginning of 1950's, afforestation was taken around villages and farmlands, at the same time a lot of mass experience was extended, later, two national conferences of sand-controlling were held, setting up a team of 860 members in the Academy of Science of China, founding fixed and semi-fixed observation stations in major deserts, and setting up science research Institutions in some provinces and autonomous regions. In 1960's, with the mass reclaiming wasteland, extensive treeplanting was developed, ascertaining the formation, distribution law and basic characters of deserts, sandy lands in our country, making the fixed and semi-fixed post research in polyscience and various levels, summarizing a great deal of advanced technique of mass tree-planting and sand-controlling. The typical experience had been aquired on preventing and controlling sand for railway, highway, industrial and mining enterprises, city and town construction. The later stage of 1970's, scientists put forward comprehensive control and based on ecology, and the concept of desertization and studied them. In 1980's, combined desertization and ecological theory, environmental problems were put forward in the core of desert and desertization of China. In 1990's, recognizing the special resource superiorities and economical potentials in desert and sandy land, Landscape Ecology, Regional Economical Theory, Principle of Continuous Development were introduced and applied by the thought of human and sand harmony, attaching importance to the research and construction of refining ecological environment.

Over one hundred countries and regions in abroad, no matter developed or developing, relating desert and desertization, raise wave upon wave upsurge of studying and exploring desert for several decades. Based on *《The Physics of Blown Sand and Desert Dunes》* written by R. A. Bagnold in 1930's, according to economical necessary. Now there are many institutions, organizations, millions of scientists and engineering technicians who are going in desert research.

A lot of achievements have been aquired and literatures of science and technology published on desert and desertification research both domestic and abroad, all of them, which are crystallizations of wisdom, are the scientific basis of *《Eremology》*. We intended to compile the book tenyears ago, only by this time it is born through our great efforts. This also is an inevitable outcome of society progress and exploiting vivosphere in desert and sandy land.

The names of authors and their articles are as follows (in the order of the number of strokes of the surnames): Ma Yuming (preamble, 1. 3, 1. 4), Ma Shiwei (1. 1, 1. 6, 1. 7 except for 1. 7. 6, 4. 1, 4. 2), Ma yanchun (1. 6, 9. 1, 9. 2, 9. 3), Fang Tianzong (9. 4, 9. 9, 11. 2, 11. 3, 11. 4), Wang Linhe (10. 5, 10. 6), Wang Yanru (5. 6, 5. 7), Shi Xiuhua (1. 7. 6),

Sun Xiang (3. 1, 3. 2), Liu Guohou (7. 1~7. 4), Bai Xiaozhao (1. 5), Li Yuling (5. 1), Wang Ji (1. 8 except for 1. 8. 4), Li Gangtie (2. 2, 2. 3), He Shaofen, Liu Xinqian, A Tengge. (9. 5~9. 8, 10. 1~10. 4), Zhang Wenjun (5. 4), Zhang Weihua (6. 1~6. 3), Zhang Liandi (4. 5), Zhang Zhihong (4. 2), Zhang Wuwen (5. 3), Zhang Minru (3. 4, 3. 5), Zhang Chengyi (3. 3), Chen Zhirong, Hou Shuanming (1. 2), Yang Wenbin (4. 3), Yang Junpin (12. 1~12. 4), Meng He (4. 4, 4. 6), Yao Yunfeng and Li Gangtie (1. 8. 4, 2. 4), Yao Honglin (8. 1~8. 6), Yu Xiaonuo (5. 2), Gao Yong (11. 1, 13. 1~13. 5), Gao Ke (1. 9), Gui Chengsheng (5. 6), Kang Shiyong (2. 1). All manuscripts are gone over by Ma Shiwei, Ma Yuming, Ren Juping and Gao Yong. English in the book is translated by Gao Ke, Zhang Mingru and Li Yubao.

《Eremology》is the first of monographs that we plan to compile, From this time on, we'll continue to compile《The Oasis》,《Resources in Sand Region》,《Desert Engineering》,《Desert Microbiology》《Ecology in Desert Landscape》.

We have got great supports from Inner Mongolia News Press, The People' Press of Inner Mongolia, Inner Mongolia Forestry College, Forestry Academy of Science of Inner Mongolia, Forestry Survey and Designing Institute of Inner Mongolia, Inner Mongolia University, Inner Mongolia Teacher's University, Open Lab. of Forestry Ministry——Lab. for biological resource protection and planting in sand land, Inner Mongolian Autonomous Region Government, etc. and the direction of all advisers during our compiling and publishing the book. We express our heartfelt thanks to all above-mentioned.

Because of time and knowlege limit, the errors might exist in the book, Critcize please.

Compiler
Aug. 1, 1998

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