



Chinese National Committee on Irrigation and Drainage

(CNCID)

Irrigation and Drainage in China

China WaterPower Press

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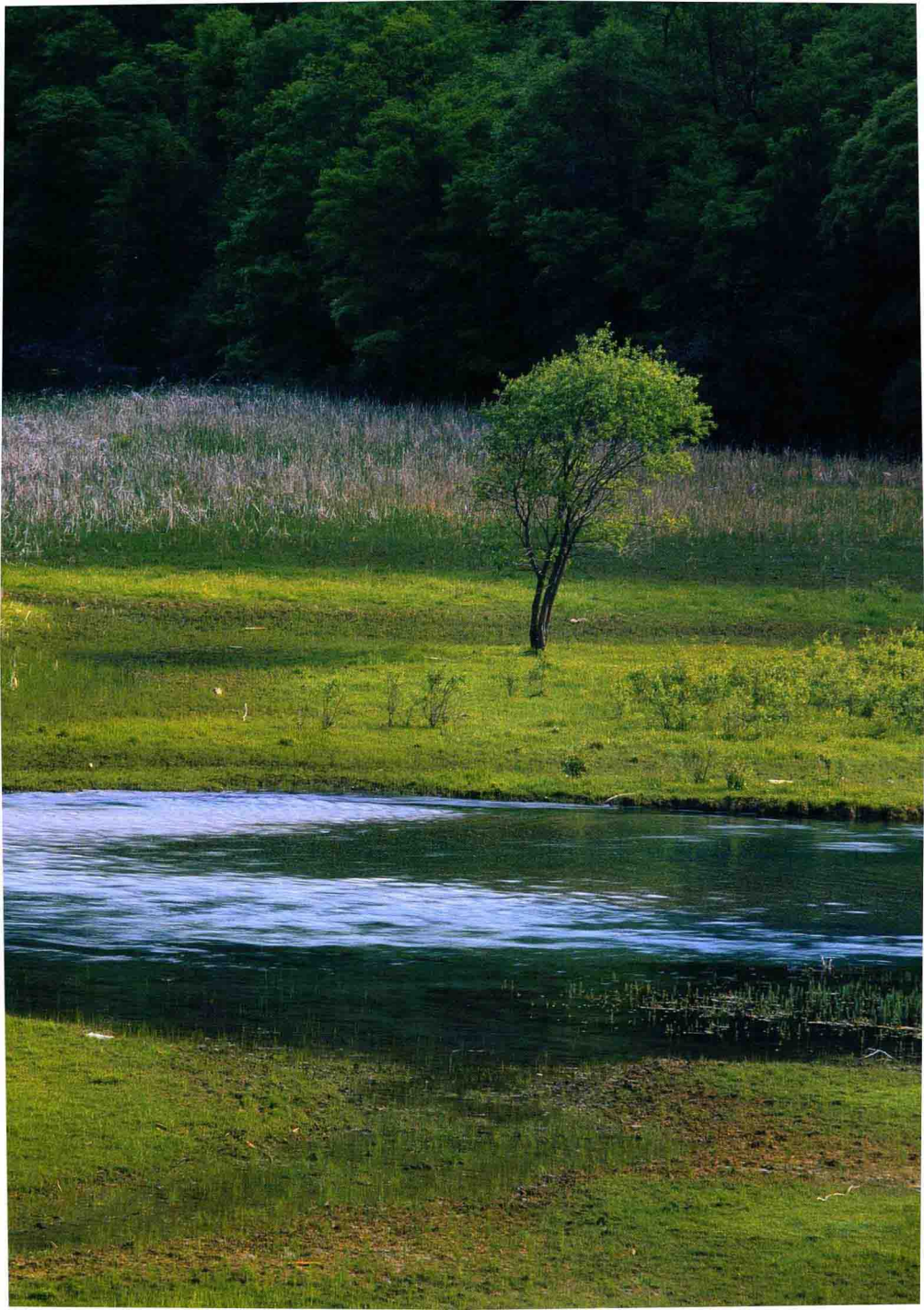
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PREFACE

China is among the countries in most severe shortage of water resources with per capita water resources being no more than 2,220 cubic/meters. Although a climate featuring simultaneous arrival of rainfall and heat creates favorable conditions for agricultural development, China has always suffered from frequent floods and draughts due to concentration of precipitation, uneven temporal and spatial distribution of water resources plus non-matching between population, arable land and water resources. Historical records indicate that during the 2,155 years from 206 BC to AD 1949, China was caught in 1,092 major floods and 1,056 severe draughts. Particular national conditions determine the extremely important role and status of flood control, irrigation and drainage in Chinese socioeconomic development and eco-environmental protection.

China has a long history of water training. Da Yu's Water Training is a legend handed down for more than 4,000 years. 2,200 years ago, Li Bing and his son built Dujiang Weir enabling the Chengdu Plain to become "a land of plenty" where "floods and draught are subject to human will and hunger unknown". Thanks to effective maintenance through the ages, Dujiang Weir still yields huge returns and is known to the world as a cultural heritage.

The Chinese government attaches high attention to water conservancy. Regarding water resources as an important strategic resource for sustainable development of China, the government has adopted a series of policies and measures to promote the development of flood control, irrigation and drainage in China. Over the past five decades, China has completed 278,000 kilometers river dikes and 85,000 reservoirs, bringing regular floods along major rivers under preliminary control. For the same period, China has expanded the area of irrigated farmland from 1,500 hectares to 5,600 hectare with annual grain and cash-crop outputs from such farmland reaching 3/4 and 90% respectively of national aggregates. It is such enormous achievements of irrigation and drainage that have enabled China to feed and clothe 22% of the world population with 6% of the world's renewable water resources and 9% of the world's arable land and has safeguarded agricultural production, grain security and stable socioeconomic development in China.

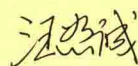
From a long-term perspective, shortage of water remains a serious constraint to Chinese agricultural development. Floods and draughts in China still exhibit an intensifying trend while decline in grain output as a result of such disasters takes up 8% of national grain output during the same period. Growth in urban and industrial water consumption plus severe water pollution intensifies shortage of water for irrigation purpose. The challenges are overwhelming. Our efforts exerted over the recent years in line with requirements of



sustainable development and the concrete achievements thereof, however, have built up our confidence. We believe that so long as we uphold the scientific development concept, insist upon harmonious coexistence between humans and nature, persevere with the principles of comprehensive planning, overall consideration, addressing problems from both the root causes and symptoms and implementing integrated control, and vigorously promote the construction of a water-saving society, we are sure to produce effective solutions to the Chinese issues of water resources, guarantee water-supply security, flood-control security, grain security, and eco-environmental security in China and realize coordinated development of water resources, the economy, the society and the environment.

To help more people understand the history, experiences, achievements and challenges of flood control, irrigation and drainage in China, the Chinese National Committee on Irrigation and Drainage (CNCID) has compiled and published the Chinese and English versions of the collection of books including *Irrigation and Drainage in China*, *Flood Control and Management in China*, and *History of Irrigation and Flood Control in China* on the occasion of convening the 19th International Congress on Irrigation and Drainage and the 56th IEC Meeting of the International Commission on Irrigation and Drainage (ICID) in Beijing. The collection reflects the rich connotation and development process of Chinese water conservancy from a variety of perspectives. I am confident that publication of the collection will not only help Chinese readers gain an understanding of water conservancy in China but also bridge China and the world by playing its due role in promoting exchanges and cooperation between China and other countries of the world in the field of water conservancy.

Wang Shucheng



August 2005

FOREWORD

Water is the source of life for our civilizations, acting as the lifeblood for our economies and social development. Possessing contradictory natures, water can both encourage life or be inimical to life. To meet the needs for our lives and development, we take various measures to prevent and control floods, manage drought disasters as well as exploit, utilize, and protect our water resources.

Irrigation and drainage, being crucial components of the water sector, mainly represents the artificial practices that are taken to overcome adverse impacts on agriculture due to shortages or surpluses in precipitation. In addition, irrigation and drainage help to regulate the allocation of regional water resources and soil moisture regime, and help to prevent and control droughts, waterlogging, salinity...etc. disasters to promote high quality and yields in agriculture. Influenced by a monsoon climate, China frequently suffers from floods and droughts. Consequently, irrigation and drainage is of great significance, and plays an important role in agricultural and rural economies.

Since the 1950s, greater importance has been attached to irrigation and drainage in China as seen in the improvements made in agricultural production, farmers' living conditions, and rural ecology. This includes strengthening the capacities of agriculture to fight and withstand natural calamities. Substantial contributions have been made to tens of millions of farmers to alleviate poverty, stabilizing the food security situation for farmers so they could support not only themselves but also earn a sustainable income, which have cohesively contributed to sustainable socio-economic developments.

The Chinese government has put forward an ambitious target, which is to build a well-to-do society and, attain standards of living, as well as economic and social development, comparable to medium developed countries of the world by the middle of the 21st Century. As infrastructure for agriculture and rural areas, irrigation and drainage are expected to guarantee the smooth achievement of this target. Under the circumstances of increasing populations, less arable land and scarce water resources, irrigation and drainage are now being confronted with great challenges and favorable opportunities. They will be responsible for guaranteeing billions of people's food security, as well as providing technical support towards adjusting agricultural structures, increasing farmers' income, modernizing rural areas, and protecting and improving the ecological environment.

This book provides a brief introduction on the evolution, practices, effects, technological diffusion, international technical collaboration and exchange, management system reforms performed in recent years with regard to irrigation and drainage in China. The objectives of this book are an attempt to present a concise, and clear understanding of irrigation and drainage in China.

Editors
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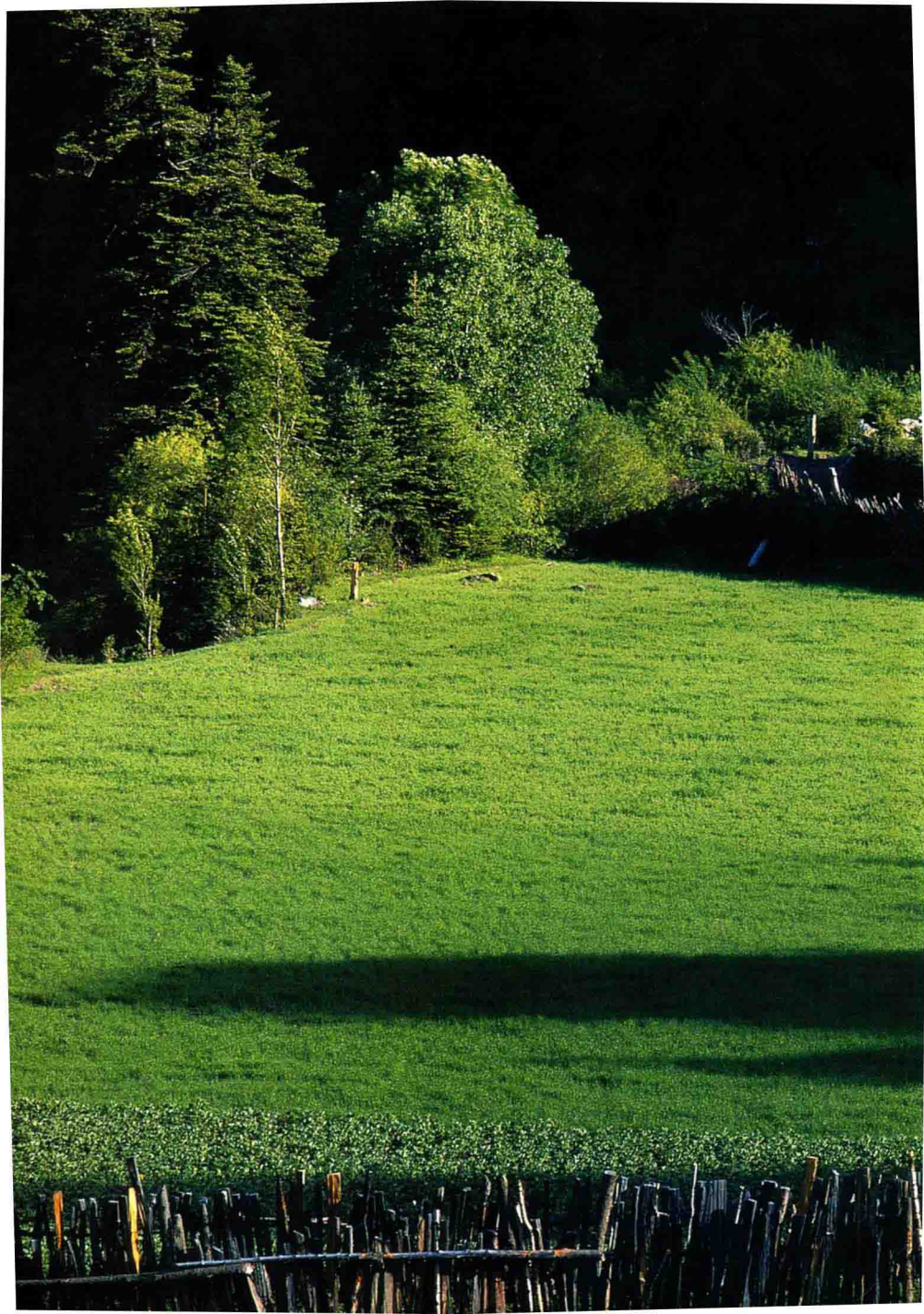


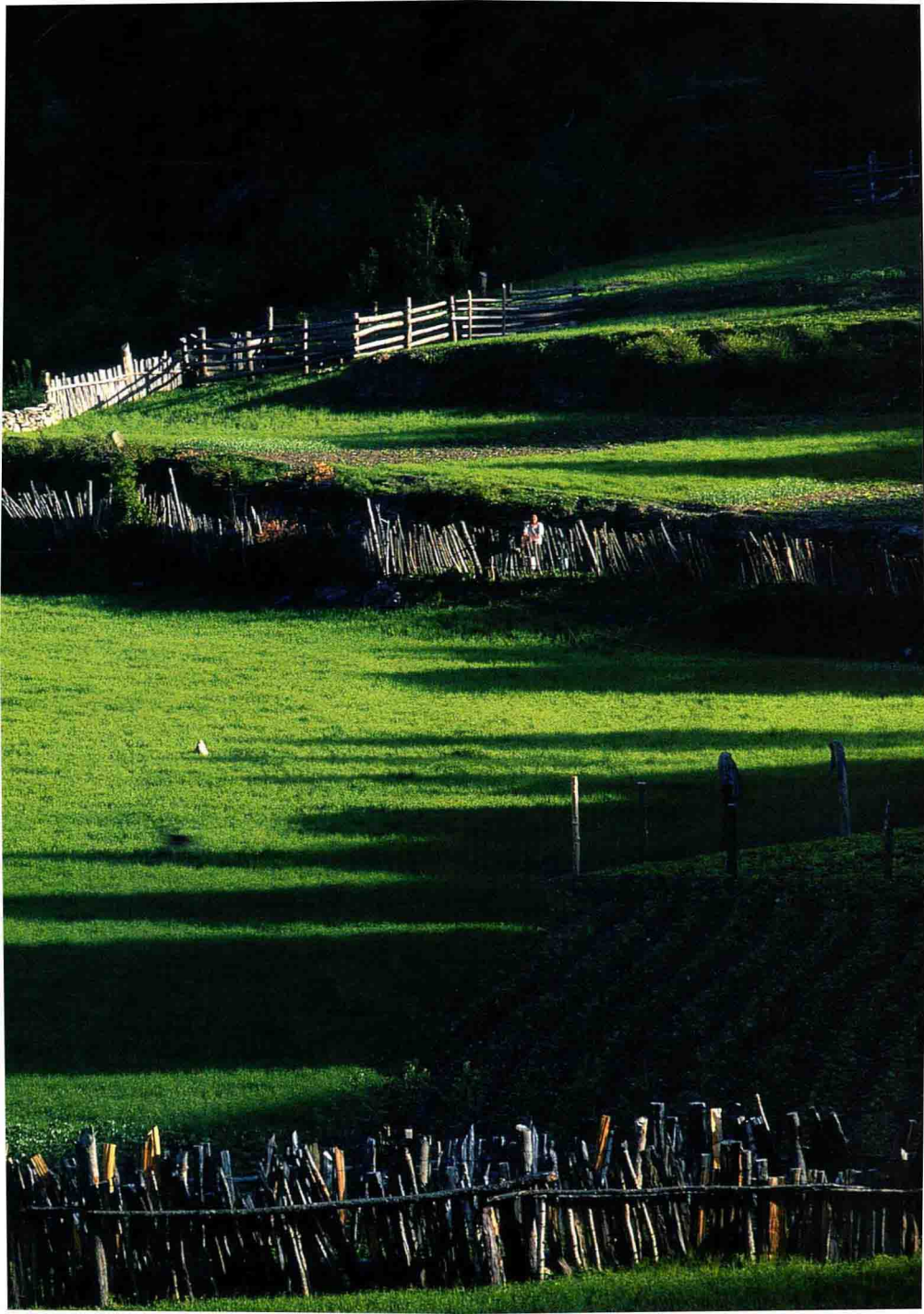
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Chapter 1 Overview

China occupies a vast territory situated at the eastern part of Eurasia on the Northern Hemisphere, bordering the Pacific Ocean in the east, and stretching into the hinterlands of Asia in the west...(See Table 1.1)

Table 1.1 Survey of China's Territory

Item	Unit	Amount	Item	Unit	Amount
Territorial area	10 ⁴ km ²	960	Sea area	10 ⁴ km ²	473
Arable land area	10 ⁴ hm ²	13004	Continental coastline length	10 ⁴ km ²	1.8
Pasture area	10 ⁴ hm ²	40000	Total inland water area	10 ⁴ km ²	1747
Forest area	10 ⁴ hm ²	15894	Forest cover	%	16.55

1.1 Physical Geography

1.1.1 Topography and Geomorphology

China has a varied topography characterized by higher elevations in the west and lower altitudes in the east. To the southwest of China is the Qinghai-Tibet Plateau with an altitude of over 4000 meters; to the north and to the east of the Qinghai-Tibetan Plateau are Yunnan-Guizhou Plateau, Sichuan Basin, Loess Plateau and Inner Mongolia Plateau with elevations ranging from 1,000 meters to 2,000 meters, respectively. Further east are rolling areas that are no more than 500 meters above sea level, these areas include the Middle and Lower Yangtze Plain, Huang-Huai-Hai Plain, and Songhuajiang-Nenjiang Plain. Geographically diverse, China's latitude incorporates the tropical zone, sub-tropical zone, and temperate zone from south to north. The area of arid and semi-arid land amounts to over one half of that of the national land. Agricultural cultivation is mainly concentrated in relatively flat plains and gently rolling regions. Irrigation and drainage infrastructures in plain areas are relatively complete where canals, ditches, roads and forest belts are basically developed into networks. However, the construction of irrigation and drainage infrastructures in rolling and mountainous areas is relatively weak and vulnerable to mountain torrents, mud-rock flows, and droughts. Consequently, the agricultural production in rolling and mountainous areas is low and unstable(See Figure 1.1 & Figure 1.2).