中国黄土高原 ZHONGGUO HUANGTUGAOYUAN

土地资源 TUDIZIYUAN

LAND RESOURCES IN THE
LOESS PLATEAU OF CHINA

Edited by The Northwest Institute of Soil
and Water Conservation, Academia Sinica
Chief Editor: Professor Zhu Xianmo (S.M. Chu)

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LAND RESOURCES IN THE LOESS PLATEAU OF CHINA

中国科学院西北水土保持研究所 编
Edited by The Northwest Insititue of soil and Water Conservation, Academia Sinica

主编 朱显谟研究员
Chief Editor: Professor Zhu Xianmo (S. M. Chu)

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黄土高原地区土地资源略图　Sketch map of land resources in loess pl

比例尺　1:4000000

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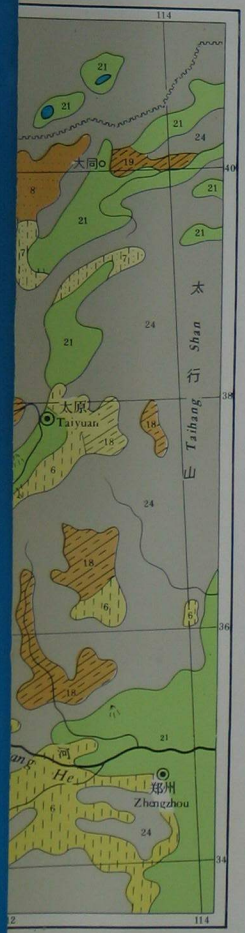

图　　例　　Legend

I 黄土塬 Loess yuan land

- 黑垆土、黄绵土塬地 Heilu soil /Huangmian soil yuan land
- 黄绵土、黑垆土破碎塬地（含梁塬） Huangmian soil /Heilu soil broken yuan land (including liang yuan)
- 黄绵土、黑垆土残存塬地 Huangmian soil /Heilu soil residual yuan land
- 黄绵土、灰钙土残存塬地 Huangmian soil /Sierozem residual yuan land
- 楼土、黄绵土台塬地 Lou soil /Huangmian soil taiyuan land
- 黄绵土、楼土破碎台塬地 Huangmian soil /Lou soil broken taiyuan land
- 黄绵土、黑垆土破碎台塬地 Huangmian soil /Heilu soil broken taiyuan land

II 黄土丘陵 Loess hilly land

- 沙化黄绵土丘陵地 Sandification huangmian soil hilly land
- 黄绵土、黑垆土宽谷低丘地 Huangmian soil /Heilu soil broad valley low hilly land
- 黄绵土宽谷丘陵地 Huangmian soil broad valley hilly land
- 黄绵土梁状丘陵地 Huangmian soil liang (elongated mound) land
- 黄绵土梁塔状丘陵地 Huangmian soil liang da (round mound) land
- 黄绵土塔状丘陵地 Huangmian soil da land
- 黄绵土、黑壮土梁状丘陵地 Huangmian soil / Heizhuang soil liang land
- 黄麻土、黑麻土冷凉高丘地 Huangma soil /Heima soil cool high hilly land
- 黄绵土、黄麻土高丘地 Huangmian soil /Huangma soil high hilly land
- 黄绵土、灰钙土高丘地 Huangmian soil /Sierozem high hilly land
- 黄垆土、黑垆土盆谷丘陵地 Huanglu soil /Heilu soil broken valley basin step land
- 栗钙土盆谷谷地 Chestnut soil valley basin plain land
- 草原土盆谷丘陵地 Steppe soil broken valley basin step land

III 川台平原 River plain and terrace

- 淤黄土川台地 Alluvial loessal soil river plain and terrace land
- 灌淤土、水稻土冲积洪积平原 Irrigated warping soil /paddy soil in the alluvial and pluvial plain

IV 其他 Others

- 风沙高原 Desert and wind abrasion plateau
- 石质山地 Rocky mountain
- 滨河沙地 River sand dune
- 石窝地（泥石流） Mud — rock flow land (piedmont)
- 洞掌地 Ravine floor plain

绪　言

中国黄土高原是地球上黄土分布面积最广、堆积最厚、古土壤发育最为系统和完整的地区，一直为国内外地质、地理和土壤学界所重视。

黄土高原是中华民族的摇篮和农业发祥地。相传后稷教民稼穑的遗址即在陕西武功漆水河之滨；“人文初始”的轩辕黄帝陵尚矗立于陕北桥山之巅。夏朝改制九州贡法，根据土情来比较肥力，同时注意土地利用与管理的关系而厘定赋贡。《禹贡》所说九州中的雍州，即指目前的黄土高原及其临近地区。“厥土惟黄壤”（《禹贡》），系指黄土而言，因其主要是黄色壤土。这是对黄土性质及分布所做的首次文字记载。齐桓公（距今2,630 多年）时，管子所著《地员篇》，对土地高下与水泉深浅的联系，土壤分类及土地利用等记载较为详细，将黄土高原的土地和土壤分别作了叙述，并把其东南部塬地和台塬地上土性刚强的土壤另名为“垆土”。班固所著《汉书》（距今约2,020 年）中曾有黄土通过风力从西搬运到黄土高原的记载。郦道元在《水经注》中对黄土作了论述。八百年前沈括也曾在《梦溪笔谈》中明确指出了水蚀在黄土地貌形成中的作用。

自十九世纪后叶始，国外学者R·庞培莱（美，1866），F· Von，李希霍芬（德，1868），B·A·奥布鲁切夫（俄，1892），J·梭颇（美，1935）等，曾先后到我国西北考察，主要对黄土成因作了概念性的论述。1920年以后，我国地质工作者杨钟健、李学清等，对黄土高原黄土的成因、物质组成和地层等进行了多方面的研究，并将全区第四纪地层划分为Q_{I}—Q_{II}，提出Q_{II}为红色土，Q_{III}才是黄土的说法。同期土壤学家侯光炯、马溶之、李连捷、熊毅、李庆逵、陆发熹等，也曾先后到黄土高原进行土壤调查研究，对于土壤侵蚀和黄土性质给予了极大地注意。

解放以来，由于黄河开发治理工作的紧迫和黄土高原地区工农业建设发展的需要，对黄土高原地区黄土的研究更加广泛和深入。中国科学院、黄河水利委员会等曾以黄河治理和水土保持工作为中心，先后组织了大规模的科学考察队，进行综合考察，对黄土的成因、地层划分和物质组成及其结构特征、物理力学性质、基础地貌与当前黄土地貌等；进行了全面研究，尤其对黄土沉积环境及其变迁、黄土肥力的演变与土地利用的关系及其机理、土地整治途径及其战略要求等，进行了比较深入的研究。

本图册所谓的黄土高原地区，是以黄河中游黄土高原为主体，并涉及边缘或近邻山地、河谷盆地等具有黄土和黄土状沉积物的地区。该图册以土地整治、防治水土流失，充分发挥黄土的生产潜力，根治黄河水患，发展经济为中心，系统地反映黄土高原地区土地资源的有关情况。主要介绍黄土高原的基本情况、土地资源遭受破坏的原因及动力、土地类型及其演变规律、以及整治途径等四个方面。

Introduction

The Loess Plateau in China is the most widely distributed region of loess on the earth, where the loess is most thickly deposited and the paleosol is most systematically and completly developed. It has attracted for along time the attention of geologists, geographers and pedologists both at home and abroad.

The Loess Plateau was the cradle of the Chinese culture and Chinese agriculture. The legend says that the relics where Houji (an official in charge of agriculture) taught the people to grow crops are on the banks of the Qishui River in wugong, Shaanxi Province. Xuan—Yuan Huangdi's (the great Emperor who was considered the symbolic ancestor of the Chinese) Mausolum is on the top of the Qiaoshan Mountain in the northern part of Shaanxi Province. Xia Dynasty remade the land taxation for 'The Nine States' according to the soil fertilities and stressed the relationship between utilization and management of land in determining taxes. The 'Yun State', one of 'the Nine States' in 'Yugong' (an ancient geography book) designated the present loess plateau and its surrounding areas. 'The soils are yellow loams' ('Yugong') is referring to the loess soils because they were loams of yellowish color. This was the first written record about the properties and distributions of the loess.

In time of Prince Huan of Qi State (more than 2630 years ago), Guan Zhong wrote 'Di Yuan Chapter', in which he analysed the relationship between the relative highness of the land and the depth of the springs, in addition to soil classification and land use in details. Also, he described the land and soil on the Loess Plateau, and named the clayey and compact soils of the 'Yuan' (high flat table-land) and 'Taiyuan' (table terrace) land in the southeastern part of the plateau as 'Lu Soil' (Reddish Clayey Soil.)

About 2020 years ago, Ban Gu, an ancient Chinese historian, had recorded the phenomenon about the loess carried by wind from west to the loess plateau in his well-know works—'The History of Han Dynasty'. More than 1400 years ago. another famous scholar Li Daoyuan had also depicted loess in his book—'Commentary on the Waterways Classic. And about 800 years ago, Shen Kuo in his famous book—'Study Notes of Dreaming Stream Garden' definitely indicated the effect of water erosion on the formation of loess landforms.

Beginning from late 19th century, a number of foreign scientists including R.

Pumpelly (American, 1866), F. Von Richithofen (German, 1868), B. A. Obruchev (Russion, 1892), J. Thorp (American, 1935) and others came to northwest China to make investigations and mainly gave general discussions on genesisofloess. Since 1920, the Chinese geologists Yang Zhongjian, Li Xueqing ,et al. have studied the origin, composition, stratigraphical division and other aspects of the loess on the loess plateau. Also, they have divided the stratigraphy of the Quaternary period into QI–QIII and indicated QII as the reddish clay and QIII as the typical loess. In the same time , soil scientists Hou Guangjun, Ma Yunzhi, Li Lianjie, Xong Yi, Li Qinkui, Lu Faxi ,et al. carried out soil surveys successively on the loess plateau. They have given great attention to soil erosion and properties of loess .

Since the liberation of China ,as a result of the top priority being given to the control of the Huanghe River and the development of industry and agriculture in the loess region, researches on loess have been more intensive and extensive. In order to control the Huanghe River and conserve water and soil, Academia Sinica and Water Conservancy Commission of Huanghe River have successively organized largenumber of scientists to carry out the comprehensive study tours. Investigations have been conducted on the origin of loess, its stratigraphical division, composition ,structure characteristics, mechanical properties, basic geomorphological features and the present geomorphology of loess. Special emphases have been given to research on the environment of loess deposits and its variations, the relationship between the evolution of loess fertility and land use and their mechanism and approaches of land realignment and its strategical requirements. This album systematically reflects the informations of the land resources with emphasis on land realignment, soil and water conservation, bringing the potential production of loess soils into full play, permanent control of Huanghe River and development of economy.

The So-called Loess Plateau in this album mainly involves the typical Loess Plateau in the middle reaches of Huanghe River and its fringe, the surrounding mountain areas and the river basins with loess and loess-like sediments. The pictures in this book include four parts the basic situation of the loess Plateau, the impetus of destruction of land resou ces, the land types and their evolution, and the approaches to realignment of land.

编辑与摄影

朱显谟　彭祥林　蒋定生
米登山　唐克丽　黄义端
窦葆璋　张淑光　卢宗凡
李银锄　周佩华　赵润青

参加本图册工作的人员

仲世奇　赵永安　梁一民
田虎祺　李智明　刘元宝
宋慧贤　王斌科　谢永生

提供照片的人员

陈永宗　陈宝生　黄继贤
石　丁　贾恒义　邹厚远
从新海　刘向东　李生才

支持和领导本图册工作的单位

国家计划委员会国土局
陕西省科学技术委员会
中国科学院西安分院

支持和协助工作的人员

蒋德麒　陕西省水土保持局总工程师
刘东生　中国科学院地质研究所研究员
王永焱　西北大学地质系教授
张宗祜　地质部水文地质工程地质研究所总工程师
蒋国祥　中国科学院南京土壤研究所
赵平安　宝鸡峡工程管理局

Editors and Photographers

Zhu Xianmo	Peng Xianglin	Jiang Dingsheng
Mi Dengshan	Tang Keli	Huang Yiduan
Dou Baozhang	Zhang Shuguang	Lu Zongfan
Li Yinchu	Zhou Peihua	Zhao Runqing

Contributors to the work of this album

Zhong shiqi	Zhao Yongan	Liang Yimin
Tian Huqi	Li Zhiming	Liu Yuanbao
Song Huixian	Wang Binke	Xie Yongsheng

Contributors to photographs

Chen Yongzong	Chen Baosheng	Huang Jixian
Shi Ding	Jia Hengyi	Zou Houyuan
Cong Xinhai	Liu Xiangdong	Li Sheng Cai

ORGANIZATIONS WHICH SUPPORTED AND GAVE DIRECTIONS TO THE PREPARATION

Land Realignment Bureau of state Planning Commission, PRC.
Shaanxi Provincial Scientific and Technological Commission
Xian Branch of Academia Sinica

MEMBERS WHO SUPPORTED OR GAVE ASSISTANCE TO THE PREPARATION

Jiang Deqi	Chief Engineer of Shaanxi Provincial Soil and Water Conservation service
Liu Dongsheng	Professor of Institute of Geology, Aeademia Sinica
Wang Yongyan	Professor of Department of Geology, Northwest University
Zhang Zonghu	Chief Engineer of Institute of Hydrogeology and Eengineering Geology, Ministry of Geology
Jiang Guoxiang	Institute of Soil Science, Academia Sinica
Zhao Ping-an	Administration of Bao jixia Conservancy Project

目　录

I

黄土高原的基本情况

Basic Facts of the Loess Plateau

I

我国陕、甘、青、宁、晋、豫、内蒙等省（区）的广大地面上沉积有厚层黄土的高地，通称黄土高原。它位于西起龙羊峡、东抵桃花峡之间的黄河中游地区。其界线为北起长城，南达秦岭，西接祁连山，东迄太行山脉，全区地跨 8 个纬度（北纬34°～ 41°）和13个经度（东经102°～114°），面积53万余平方公里，人口6，000 余万。黄土沉积前的基础地貌可大别为三：东部山西地台的五台、吕梁、中条古陆屡经造山、剥蚀、沉积过程和北部岩浆喷发等作用，形成太行、吕梁两条平行褶皱山系和一系列盆地。黄土主要分布在1，500 米以下的坡麓和盆谷等地形部位，其厚度，除了台塬、盆地和宽谷等处较厚外，其它通常不足30米。中部是鄂尔多斯地台，屡遭剥蚀、割切而形成的高平原和起伏的平岗。地台上升虽极平缓，但受燕山运动的影响，地台内部也发生平缓的褶皱；又受喜马拉雅造山运动的影响，在其边缘造成断裂和地堑等。普盖厚层黄土形成的高平原，即典型的黄土高原，面积近30万平方公里，海拔约1，000 ～ 1，400 米，黄土层厚达百米。地堑、河谷盆地海拔仅400 ～ 500米，塬梁侵蚀切割强裂，常呈梁塬、梁塔和塔状丘陵。西部六盘山和祁连山间的陇西盆地，常受南山运动以来升降、剥蚀、堆积等影响，形成一系列的长岗、尖顶山、低缓丘陵和山前平原。海拔2，000 米以上尚有黄土覆盖，其厚度除兰州——榆中——定西——会宁 一 线两侧较厚，可达百米以上外，一般均在50米以下。此外，汾渭地堑及黄河干支流谷地和其它山间谷地，其土状物堆积的厚度更为悬殊，可自数米至千余米，但黄土状物质或次生黄土的堆积，一般在一级阶地以下阶面厚仅数十厘米至 2 ～ 3 米，二级阶面常以20～30米为限，三级以上阶面常以百米为限。

各期黄土堆积期间，新构造上升运动仍在进行。因此，其堆积也常伴着一定的侵蚀。本区黄土主要是通过风力搬运而来，历时约长达三百万年，在这一漫长的时期内，本区和黄土给源区的自然条件均有周期性的变迁。所以黄土沉积也有周期性的间歇，并在此间歇期形成反映当初地表面貌和生物气候的古土壤剖面。

厚层黄土普盖着本区，形成区内塬地平广，丘陵顶平坡缓，沟谷开阔，川、坪、涧、掌、塄地完整平坦的物质基础。加之黄土松软透水，保蓄水分性能很强，可在一定程度上调节、缓和降水年际和季节变异大的矛盾，有利于植物的生长繁殖和土壤肥力的不断提高。区内存在着丰富的土壤及土地资源，是综合发展农、林、牧业的良好基础。

I

The vast upland in Shaanxi, Gansu, Qinghai, Ningxia, Shanxi, Henan and Inner mogolia Provinces (autonomous region) in China deposited with thick loess is generally called the loess plateau. It is located in the middle reaches of the Huanghe River between Longyang Gorge in the west and Taohuayu in the east and bordered by the Great Wall in the north, extending southward to the Qingling Mountain, and by Qilian Mountain in the west, stretching eastward to Taihang Mountain . The whole loess region covers 8 latitudes (35°-41° N) and 13 longitudes (102-114°E) with an area of more than 530,000km^2 and a population of more than 60,000,000.

The basic landforms before loess deposition might be grouped roughly into three types: In the east, the Wutai, Luliang and Zhongtiao old upland in Shanxi Province being repeatedly under the process of orogeny, denudation, deposition and the effect of magmatic explosion in the north had formed the two parallel folded mountain series of Taihang and Luliang Mountain and a series of basins. Here, the loess is mostly found in piedmonts, basins and valleys below the altitude of 1,500m. The thickness of loess deposit is generally less than 30m, except in the 'Taiyuan' basins and wide valleys where it is thicker. In the middle, the high plain and the rolling flat mound were formed through the

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successive cutting and denudation of the Ordos platform. Though the platform has risen gradually and evenly, the gentle folds within the platforms have been formed under the influence of Yanshan Movement and the grabens and faults have been formed at the edge of the platform due to the influence of Himalayan Orogeny. The high plain formed after the vast areas being covered with thick loess deposits is the typical loess plateau, with an area of about 300,000km^2, an altitude of 1,000-1,400m. and a loess layer of about 100m. thick. The grabens and valley basins are at the altitude of 400-500m. only, 'Yuan' and 'Liang' (Elongated loess mound) have been so seriously eroded and cut that they often appear to be 'Liang-yuan', 'Liang-ta' (ta = round loess mound) and 'Ta' like hills. In the west, Longxi Basin between the Liupan Mountain and the Qilian Mountain have frequently been subjected to the influence of denudation, accumulation, rising and falling since the Nanshan Movement and has formed a series of long mounds, pointed mountains, low gentle hills and the piedmont plains. The loess cover can be as high as more than 2,000m above the sea level, and its thickness is generally less than 50m while on both sides along the line of Lanzhou-Yuzhong Dinxi-Hueining it is thicker and may be more than 100m. In addition, the thickness of earthy deposits in the grabens of Fenhe River and Weihe River, the valley lands of the Huanghe River, its tributaries and the other intermountain

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valleys varies widely from several to over thousand meters .But the thickness of the loess-like or secondary loess deposits is only from several cm. to 2-3 m. at T_1 , in the range of 20-30 m. at T_2 and less than 100 m at T_3 in general.

During depositation of loess in different periods, the neotectonic rising movement was still going on. Hence , its deposition was often accompanied by erosion. Loess in this region has been mostly transported by wind for about three million years.Natural conditions of this region and the original region of loess have gone through many periodical changes in the very long time. Accordingly, loess deposition has had also priodical intermittence and during the intermittent periods paleosol profiles reflecting the initial landscape and biometeorology have been formed.

The thick loess covering the region has been the material base for forming the various types of land forms in flat, gentle, integrate and wide-open state.In addition, loess is loose, permeable and with a high water holding capacity, so it can regulate and mitigate the wide yearly and seasonal variation of rainfall and is favourable for plant growth and improvement of soil fertility to some extent . The various and plentiful types of soil and land resources existing in this region are exactly the good basis for the comprehensive development of agriculture forestry and animal husbandry.

地理位置

Geographic Location

·西起祁连山·

Connecting Qilian Mt . in the West