

DEVELOPMENT  
OF  
CHINESE  
AGRICULTURAL  
SCIENCES  
IN  
THE  
20TH  
CENTURY

胡跃高 主编

20世纪  
中国农业科学  
进展

山东教育出版社



### 图书在版编目(CIP)数据

20世纪中国农业科学进展/胡跃高主编. —济南:山东教育出版社,2003

ISBN 7-5328-4114-6

I. 2... II. 胡... III. 农业科学-进展-中国-20世纪-普及读物 IV. S-12

中国版本图书馆 CIP 数据核字(2003)第 102452 号

## 20 世纪中国农业科学进展

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出版者: 山东教育出版社

(济南市纬一路 321 号 邮编: 250001)

电 话: (0531)2092663 传真: (0531)2092661

网 址: <http://www.sjs.com.cn>

发行者: 山东教育出版社

印 刷: 山东人民印刷厂

版 次: 2004 年 6 月第 1 版

2004 年 6 月第 1 次印刷

规 格: 787mm × 1092mm 16 开本

印 张: 43.5 印张

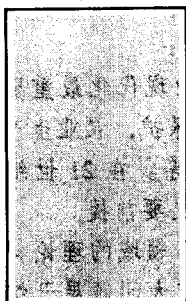
插 页: 6 插页

字 数: 992 千字

书 号: ISBN 7-5328-4114-6

定 价: 70.00 元

(如印装质量有问题, 请与印刷厂联系调换)



# 序

中国自古以农立国。从春秋时期传统农业形成一直到 18 世纪,我国农业始终居世界领先地位。这构成了我国农业向现代农业发展的根本基础。

19 世纪中叶,西方现代农业科学思想开始传入中国,但我国现代农业科学萌芽却始于 20 世纪初。

20 世纪上半叶,我国一大批知识分子抱着科学救国的志向,在极端艰苦的条件下,积极引入西方现代农业科学技术,并初步建立了一些现代农业科学研究及教育机构,涌现出了一批具有现代科学思想与开拓精神的著名农业科学家。这是我国现代农业科学发展的基本开端。

20 世纪下半叶,是我国农业科学迅速发展的时期。与 20 世纪上半叶相比,这一时期伴随着社会生产力的解放和农业生产的迅速发展,建立了由中央到地方一系列农业科研院所、农业院校和农业技术推广站,造就了一大批农业科技人才,创新性农业科技成果大量涌现。该时期,中国农业科学与技术在总结传统农业经验与农业考古、育种、农田灌溉、农业机械、耕作栽培技术(施肥、病虫害防治、生长发育的化学调控……)等方面的科研与应用都有突出的成就,在真菌与藻类生产方面居世界领先水平,为推进中国农业现代化做出了贡献。

追溯 20 世纪中国农业科学技术发展历程，虽说是波涛起伏，道路蜿蜒曲折，但始终是在向前发展的，尤其是在 1978 年以后，更有了长足的进步，它为中国农业科学在 21 世纪的发展进一步奠定了坚实的基础。但是，我们也要看到，目前中国农业劳动生产率低，光、热、水、土、肥、生物等自然资源的利用率不高，与农业现代化的标准还相距甚远。中国农业科学工作者任重道远。因此，无论是总结 20 世纪中国农业科学的进展，还是为 21 世纪适应中国农业发展的需求，必须注意以下几点：

1. 农业科学研究应密切结合中国农业现代化的实际需要。农业现代化最重要的标志是农业劳动生产率的极大提高，农业自然资源的合理利用与环境保护，农业生产与产前、产后的紧紧结合，从体力劳动向以脑力劳动为主的转化，等等。在 21 世纪上半叶，传统的小农经济必将得到彻底的改造，为实现农业现代化创造必要前提。

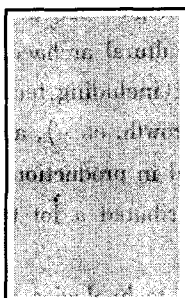
2. 现代农业科学应更加注意引入现代物理学、化学、生物学等领域的理论与技术成就；相互渗透和交融，组织多学科研究队伍针对农业发展中的重大问题展开综合研究；为适应 21 世纪现代农业的发展，亦应在现代化农业体制和管理方面加强研究；此外，还应重视新兴学科，如农业环境科学、农业信息科学、太空与海洋农业科学等新学科的兴起与发展。

3. 未来中国农业科学除了在技术领域内继续发展，尤其要注意农业科学中的基础理论研究工作。没有理论研究，科学技术的进步就要受到限制，而且在科学技术应用于实践时，也就难免具有盲目性。

在我提笔为胡跃高同志主编的《20 世纪中国农业科学进展》作序时，征求了多方面专家的意见。本书尝试对 20 世纪中国农业科学技术的发展历程进行全面总结，较全面地展示出农业科学技术发展的全貌，是一项很有意义的工作。本书组织了相关学科 212 位农业科学工作者，历时 3 年，五易其稿，终于付梓。全书共分 4 篇 19 章 149 个专题，内容丰富、翔实，基本反映了 20 世纪中国农业科学之发展历程。值此新世纪我国农业科技大发展之时，推荐给读者。书中尚有部分专题阙如，有待编者与读者今后努力完善，以飨后人。

姜成石

2001 年 4 月



## Foreword

序

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China depended on agriculture from the ancient. From the forming of traditional agriculture in Chunqiu Period to the 18th century, Chinese agriculture had always been in the leading position of the world, which had also set the foundation for the development of Chinese agriculture into a modern one.

In the middle of the 19th century, thoughts of modern agriculture from western countries were introduced into China. However, our modern agriculture began to develop at the beginning of the 20th century.

During the first half of the 20th century, regardless of extremely tough conditions and with an ambition of saving China by sciences, many Chinese scholars were active in bringing modern agricultural sciences and technologies from western countries into China. They had also preliminarily set up some modern research and educational institutions of modern agricultural sciences. A number of famous agricultural scientists appeared during this period. This was the elementary beginning of the development of Chinese modern agriculture.

During the second half of the 20th century, Chinese agricultural sciences developed rapidly. Compared with the first half of that century, many achievements had been gained during this

period. With the liberation of social productivity and the rapid development of agricultural production, a series of agricultural research institutions, colleges and professional extending stations had been set up by the central and the local governments. In the meantime, a bunch of experts on agricultural technology had been trained, and plenty of creative achievements had been gained. During this period, Chinese agricultural sciences and technologies had got outstanding success in summarizing traditional agricultural experiences, agricultural archaeology, breeding, irrigation, agricultural mechanism and techniques on cultivating (including fertilization, control of diseases, pests and weeds, chemical regulation of plant growth, etc. ), and so on. Also worthy to be mentioned is that China had the most advanced level in production field of fungi and algae in the world. All of these accomplishments had contributed a lot to the modernization of Chinese agriculture.

The course of the development of Chinese agricultural sciences and technologies in the 20th century had been in constant progress, particularly since 1978, although accompanied with up and downs. This course have established a firm foundation for the further development of Chinese agricultural sciences in the 21st century. However, we should face the fact that our current productivity is far behind the object of agricultural modernization, with a low efficiency of using the natural resources such as light, heat, water, soil, fertilizer and bio-resources. There is still a long way to go for Chinese agricultural scientists and professionals. We have to pay attention to the following items not only for summarizing the progress of Chinese agriculture in the 20th century, but also for meeting the requirements of Chinese agricultural development in the 21st century:

1. Research of the agricultural sciences should be linked closely with the real requirements of Chinese agricultural modernization. The most important symbols of agricultural modernization are: great enhancement of agricultural productivity; reasonable utilization of natural agricultural resources and environment protection; close combination between agricultural production and pre-production and after-production; focus changing from physical work to mental work, and so on. In the first half of the 21st century, traditional smallholder economy will completely be reformed in order to provide prerequisites for agricultural modernization.

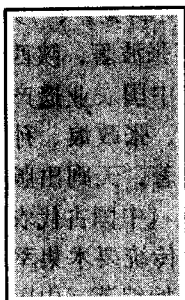
2. Modern agricultural sciences should apply the theories and technologies in the fields such as modern physics, chemistry and biology. We need to combine various knowledge together and organize research teams of various fields to hold comprehensive study aiming at the essentials in agricultural development. In order to adapt to the modern agricultural development in the 21st century, we should increase the research work in the investigation of modern agricultural system and administration. Furthermore, more emphasis should be attached on the rise and development of new scientific knowledge such as in the fields of agricultural environment, agricultural information, outer space and ocean agriculture.

3. Besides further study on the technologies of Chinese agricultural sciences, more attention should be paid to the research of fundamental agricultural theories. Otherwise, the progress of scientific technologies will be restricted, and there will be unavoidable blindness

while applying scientific technologies.

Before writing this foreward for *Review of Agricultural Sciences in China in the 20th Century* by Mr Hu Yuegao, I had requested many experts' opinions. It was meaningful to try to make an overall summary of the development of Chinese agricultural sciences and technologies in the 20th century, and to exhibit the panorama of this developing process. It took 212 related agricultural scientists and professionals 3 years to finish this book, with 5 times of revision. It consisted of 4 sections, 19 chapters, 149 topics with rich and realistic contents. We recommend it to readers as a reference at this great time of the new century for the agricultural development. There are still some topics which need to be improved to fulfil the readers' satisfaction.

Lou Chenghou  
Apr. 2001



# 前言

自古盛世修史。中国是世界农业史籍最丰富的国家，从周代初期以来就有文字记载，延续至今。经过数千年历史发展，农业文献或有散失，但综观历史，依然墨迹可见，昭示出宏大的中华农业历史的发展脉络，成为中华民族最珍贵的历史遗产。20 世纪之前我国农书中以农业为主题而写史的情况甚少。农业史往往被割裂成单一技术性、局部区域技术性、无必然时代连续性文献，存在于大量政论、诏文、诗赋、史集之中。如何积零为整，形成完整的、可读的中国农业发展史，是未来我国农史建设的重要任务。

在 20 世纪，伴随着中国农业现代化进程，有关中国农业史的研究工作取得了重要进展。1934 年冯柳堂著，商务印书馆出版《中国历代民食政策史》；中国农科院、南京农学院中国农业遗产研究室在 1957—1962 年编辑出版《中国农学遗产选集》，涉及稻、麦、豆类、棉、麻类、柑橘等内容；1958 年王毓瑚编辑，科学出版社出版《中国畜牧史资料》；1962 年辛树帜编辑，中国农业出版社出版《我国果树历史的研究》；1957 年周尧著，科学出版社出版《中国早期昆虫学研究史(初稿)》；1963 年《学术月刊》第 4 期刊载胡道静著《我国古代农学发展概况和若干古农学资料概



述》；1959年中国农科院、南京农学院中国农业遗产研究室编辑出版《中国农学史(初稿)》；1966年寺地遵在《史学研究》第95号上发表《中国农史观的历史变迁——以〈齐民要术〉和陈甫〈农书〉为中心》。1978年以后，有关研究进入快速发展阶段。1984年中国农科院、南京农学院中国农业遗产研究室编辑，科学出版社出版《中国农学史》。1986年张仲葛、朱先煌主编，科学出版社出版《中国畜牧史料集》；1989年梁加勉主编，中国农业出版社出版《中国农业科学技术史稿》；同年张波著，陕西科学技术出版社出版《西北农牧史》；1990年中国农科院、南京农学院中国农业遗产研究室编著，中国农业出版社出版《太湖地区农业史稿》；同年杨向奎、张政烺、孙言诚著，中国农业出版社出版《中国屯垦史》(上册)；1991年李长年编著，天则出版社出版《中国农业发展史纲要》；同年陈文华编著，中国农业出版社出版《中国古代农业科技史图谱》；1998年彭世奖编著，中国农业出版社出版《中国农业传统要术集萃》。国际上有关研究也屡有进展。英国科学家李约瑟从20世纪50年代开始编著《中国科学技术史》，到1986年已出版15册，其相关内容涉及我国农业史沿革；1975年日本学者田野元之助编辑出版《中国古农书考》；1986年罗伯特·K·G·坦普尔出版《China: Land of Invention and Discovery》，该书1995年在中国翻译出版，等等。同一时期，有关近代农业史的研究著作大量问世。1989年郭文韬、曹隆纂主编，中国农业科技出版社出版《中国近代农业科技史》；1992年中国畜牧兽医学会编辑，中国农业出版社出版了《中国近代畜牧兽医史料集》，等等。

上述情况说明，中国农业史总结工作与其技术、方法和经验总结已经积累了一定基础。本书正是在此基础上对20世纪我国农业科学技术工作进行总结尝试。按照学科内容，全书分为四篇。第一篇，农业公共基础科学与学科；第二篇，植物产业；第三篇，动物产业；第四篇，农业教育与图书馆基础建设。与以往的总结工作相比，本书具有如下特点：第一，这是一种以世纪为时段范围的总结工作尝试。这种方式对于国家农业史的纵向比较、国际农业史的横向比较具有参考意义。第二，本书在结构上分为两个基本部分，其一为农业生产技术发展演进，其二为农业学科与科学知识的发展积累轨迹总结。这对于相对全面地反映农业科学全貌是必要的。第三，本书为多学科作者共同完成的合著。作者大都亲身经历或从事有关农业领域的科学技术工作，具有大量相对系统的第一手资料，内容丰富。虽然如此，由于本书成书时间较短(1998—2000)、总体篇幅限制等原因，在农业科学技术总结的系统性、全面性和详尽性等方面仍存在不足。从这个意义上讲，本书只是我国20世纪农业科学技术全面总结工作的开始。

温故以知新。我国农业正处于新的历史发展时期，世界农业也同样处于大变革前夜。世界现代农业科学化已然有300~400年的历史。这样的积累就技术性而言，已经解决了历史上长期存在的农业生产绝对性不足、生产水平波动性大等问题。从未来中长期来看，社会农产品基本需求大于农业总生产能力的难题，将得到解决。与传统认识相反，农业现代化的紧迫问题已经转变为由于现代农业发展而导致的大量问题，以及由此引发的继发性问题。这类问题的爆发或趋势性预见已经成为近20年来“持续农业思潮”的渊源。事物的发展总是螺旋式上升、波浪式前进的。旧的矛盾解决了，新的矛盾就必然出现。农业现代化过程也必将如此。传统农业历经2000余年的考验，因不能满足社会基本需要，引发了近代以来向现代农业的演替。与传统农业相比，现代农业的发

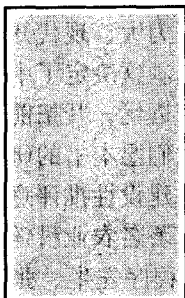
展历史还相当短促，在未来发展中，其符合历史发展需要的精华部分将被保留下来，其不符合历史发展需要的部分必遭淘汰。这将成为现代农业科学化的基本过程。人类经营农业的基本目的是提供社会农产品，由此而引发的问题属于次要问题。但如果长期忽视次要矛盾问题，有时次要矛盾也会上升为主要矛盾。持续农业问题就是这种性质的问题，它是现阶段的重要问题，但不是惟一重要的问题。

与世界农业平均状况相比，中国农业具有发展历史悠久、人口压力大、现代知识化与经济基础水平低、农业现代化历史较短但近期推进速度迅猛等特点。这决定了中国农业现代化道路的曲折性、复杂性与艰难性。只有深谋远虑，才能除却近忧，开拓前进。研究与学习世界农业和农业历史，特别是农业近代史是基本出路。我们愿本书的研究与讨论成为中国农业科学化建设的一部分，也愿更多的读者对本书提出建设性批评意见。

在本书的编辑过程中，我们得到了众多农业专家的支持与鼓励。著名农业科学家沈其益先生、刘仪先生对本书给予关注，刘巽浩先生、董恺忱先生、程序先生、张理先生、朱文珊先生在百忙中给予指导，在此深表谢意。著名农业科学家娄成后先生为本书作序。先辈们的谆谆教诲，语重心长，将激励我们献身农业科学事业。

胡跃高

2000年12月31日



## Preface

People in prosperous times like to write history since the ancient. China has the richest collection of agricultural history in the world. She has written records since the beginning of the Zhou Dynasty. Although some agricultural records were missing in the past thousands of years, some traces can still be found, which display the past agricultural history in China and has become the most precious heritage. Before 20th century, subjects in agricultural books were mostly about agriculture but not history. The history of agriculture was always split into documents about single techniques, local area techniques, and was lack of documents about continuous ages. Plenty of such records were found in political addresses, rescripts, poems and historical corpora. How to unite these pieces into an integrated, readable history is an essential mission in the building of agricultural history in the future.

In the 20th century, research on the history of Chinese agriculture had begun with the modernization of Chinese agriculture. In 1934, Commercial Press published *History of Policies on Common People's Foodstuff of Every Past Dynasty in China* written by Feng Liutang. From 1957 to

1962, China Academy of Agricultural Sciences, Laboratory of Chinese Agricultural Heritage of Nanjing Agricultural College published *Selection of Chinese Agricultural Heritage*, regarding rice, wheat, legume, cotton, hemp and orange, etc. In 1958, Scientific Press published *Data on the History of Chinese Farming* edited by Wang Yuhu. In 1962, Agricultural Press published *Study on the History of Chinese Pomology* edited by Xin Shuzhi. In 1957, Scientific Press published *History of Early Study on Chinese Entomology* (First Draft), written by Zhou Yao. In 1963, *Academic Monthly* No. 4 published *Panorama of Ancient Chinese Agronomy and Summarization of some Ancient Agricultural Data* written by Hu Daojing. In 1959, China Academy of Agricultural Sciences, Laboratory of Chinese Agricultural Heritage of Nanjing Agricultural College published *History of Chinese Agronomy* (First Draft). In 1966, Si Dizun published *Historical Flux of Chinese Agricultural History: Focus on Qi Min Yao Shu and Nong Shu* by Chen Fu in *Historical Research* No. 95. After 1978, study related began to develop rapidly. In 1984, Scientific Press published *History of Chinese Agronomy* edited by China Academy of Agricultural Sciences, Laboratory of Chinese Agricultural Heritage of Nanjing Agricultural College. In 1986, Scientific Press published *Collection of Chinese Farming History* compiled by Zhang Zhongge and Zhu Xianhuang. In 1989, Agricultural Press published *Manuscripts of Chinese Agricultural Techniques* compiled by Liang Jiamian. In the same year, Science and Technology Press of Shanxi Province published *History of Agriculture and Farming in Northwest China* written by Zhang Bo. In 1990, Agricultural Press published *Manuscripts of Agricultural History in Tai Lake Area* edited by China Academy of Agricultural Sciences, Laboratory of Chinese Agricultural Heritage of Nanjing Agricultural College. In the same year, Agricultural Press published *History of Chinese Agricultural Cultivation* (Volume I) written by Yang Xiangkui, Zhang Zhengliang and Sun Yancheng. In 1991, Tianze Press published *Summary of History of Chinese Agriculture* edited by Li Changnian. In the same year, Agricultural Press published *Atlas of Agricultural Sciences and Technologies in Ancient China* edited by Chen Wenhua. And in 1998, Agricultural Press published *Elite of Traditional Essentials in China* compiled by Peng Shijiang. During the same period, study of Chinese agriculture also made great progress around the world. British scientist Joseph Lee has been engaged in studying and writing on *History of Chinese Agricultural Sciences and Technologies* since the 1950's. He had published 15 volumes by 1986, which involved the evolution of Chinese agriculture. In 1975, Japanese scholar Tano Gennosuke published his *Study on Ancient Chinese Agricultural Literature*. In 1986, Robert K. G. Temple published his *China: Land of Invention and Discovery*, which was translated and published in 1995 in China. A number of literatures on Chinese agricultural history in modern times had been published during the same period. For instance, China Agricultural Science and Technology Press published *History of Agricultural Technologies in Modern China* compiled by Guo Wentao and Cao Longqi in 1989. In 1992, Agricultural Press published *Collection of Farming and Veterinary in Modern Chinese History* edited by China Association of Farming and Veterinary.

All of the above show that China has found a way of summarizing the skills, methods and

experiences in Chinese agricultural history. It was on this basis that this book tried to summarize Chinese agricultural sciences and technologies in the 20th century. The book is divided into four sections according to the contents: Section I, Basic Science and Public Subjects of Agriculture; Section II, Plant Industry; Section III, Animal Industry; Section IV, Agricultural Education and Elementary Construction of Libraries. It has following characteristics compared with former relevant reference books: Firstly, it attempts to summarize in terms of a century, which will serve as a reference for the comparison between different times of a country and between different countries. Secondly, this book is divided into two basic parts: one is the evolution of agricultural production technologies, and the other is the summarization of the development of agricultural sciences. This division is necessary for reflecting the agricultural sciences as a whole. Thirdly, scholars in many fields attended the editing of this book. Most of these writers have personal experiences in the agricultural sciences and technologies and have rich systematic first-hand materials. However, due to the limit of time and length, there will be unavoidable deficiencies in this book. So, we just consider it as the beginning of the summarization of Chinese agricultural sciences and technologies in the 20th century.

Writing about history aims to get rid of the stale and bring forth the fresh. And reading history aims to gain new insights through reviewing old materials. Chinese agriculture is now in a pivotal period in the history, and world agriculture is on the eve of a revolution. Modern agriculture worldwide has a history of about three or four hundred years. Such kind of accumulation has already helped to solve the problem of deficiency in agricultural production and fluctuation of the production level in history. In a long run, it will not be a difficulty to have agricultural productivity being higher than the requirements of the society. Contrary to the traditional views, the hottest problem in agricultural modernization is that plenty of problems accumulate with the development of agriculture and these problems led to some other difficulties. The breakout or foresight of this kind of problems has been the source of the "thoughts of continuable agriculture" within the past 20 years. All things develop in a spiral process, going forward with fluctuation. New contradictions will necessarily appear when the old ones are settled. The modernization of agriculture will surely be no exception. Traditional agriculture had experienced the test of more than 2,000 years, then changed to modern agriculture because of its incapability to satisfy the requirements of the society. Compared with traditional agriculture, modern agriculture has a rather short history. Primes which are in accordance with the history will be retained, and dregs which are not in accordance with the history will surely be washed out. This will be the basic modernization process of agricultural sciences. The essential purpose of agriculture is to provide products, and problems caused by this are in the secondary position. If these secondary problems are neglected for a long period, they may become major problems sometimes. Agricultural continuance is just such an important but not the only important problem at this moment.

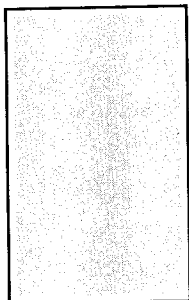
In comparison with the average agriculture level worldwide, agriculture in China is characterized by long history, heavy pressure of population, low level of modern sciences and econ-



omy, and rapid progress within short period of modernization, etc., which determine the sinuation, complexity, and hardness of our agricultural modernization. We will eliminate the near worry only if we have foresights. The way out is to learn agriculture of other countries, and history of agriculture, especially agriculture in modern times. We hope the study in this book could be a part of Chinese agricultural modernization. And we also hope more people will give us constructive advice.

Finally, we would like to express our thanks to the following individuals: Mr. Shen Qiyi and Mr. Liu Yi, who paid much attention to this book; Mr. Liu Xunhao, Mr. Dong Kaichen, Mr. Cheng Xu, Mr. Zhang Li and Mr. Zhu Wenshan, who offered valuable guidance during the course of edition, and especially to the famous agricultural scientist. Mr. Lou Chenghou, who wrote the foreword for this book. We shall never forget those experts' inculcation which will encourage us to devote ourselves to the development of agricultural sciences.

Hu Yuegao  
Dec. 31, 2000



# 目 录

## 第 1 篇 农业公共基础科学与学科

### 第 1 章 中国农业现代化发展历程/3

### 第 2 章 农业史/12

#### §1.2.1 农业科技史/12

#### §1.2.2 农业古籍整理研究/17

#### §1.2.3 世界农业研究/21

### 第 3 章 农业气象环境科学/28

#### §1.3.1 农业气象学/28

#### §1.3.2 森林气象学/32

#### §1.3.3 农业环境科学/34

### 第 4 章 农业应用数学物理化学/40

#### §1.4.1 农业应用数学/40

#### §1.4.2 农业计算机应用/44

#### §1.4.3 农药学/50

#### §1.4.4 农业生物物理学/54

### 第 5 章 农业经济学与法律/59

#### §1.5.1 农业经济学/59

#### §1.5.2 农业技术经济学/63

#### §1.5.3 农村发展经济学/65

#### §1.5.4 土地经济学/67

§1.5.5 农业法学/72

第6章 农业资源调查与农业区划/77

## 第2篇 植物产业

### 第1章 作物生产科学/83

§2.1.1 水稻/83

§2.1.2 小麦/88

§2.1.3 玉米/92

§2.1.4 高粱/95

§2.1.5 大麦/99

§2.1.6 谷子/105

§2.1.7 青稞/109

§2.1.8 甘薯/113

§2.1.9 马铃薯/118

§2.1.10 木薯/125

§2.1.11 大豆/128

§2.1.12 食用豆类/132

§2.1.13 油菜/140

§2.1.14 花生/144

§2.1.15 芝麻/148

§2.1.16 向日葵/152

§2.1.17 甘蔗/155

§2.1.18 甜菜/163

§2.1.19 烟草/168

§2.1.20 棉花/171

§2.1.21 麻类作物/176

§2.1.22 白菜类蔬菜/180

§2.1.23 茄果类蔬菜/189

§2.1.24 瓜类蔬菜/194

§2.1.25 豆类蔬菜/197

§2.1.26 根菜类蔬菜/199

§2.1.27 葱蒜类蔬菜/203

§2.1.28 西瓜、甜瓜/207

§2.1.29 豆科牧草/211

§2.1.30 禾本科牧草/215

§2.1.31 仁果类果树/218

§2.1.32 核果类果树/222

§2.1.33 干果类果树/225

§2.1.34 柑橘/229

§2. 1. 35	浆果类果树/232
§2. 1. 36	草坪与地被植物/236
§2. 1. 37	热带香料作物/240
§2. 1. 38	花椒/245
§2. 1. 39	漆树/249
§2. 1. 40	蚕业/252
§2. 1. 41	茶/258
§2. 1. 42	天然橡胶/262
§2. 1. 43	风景园林植物/265
§2. 1. 44	作物化学控制技术/270
第2章	作物科学/282
§2. 2. 1	树木生理学/282
§2. 2. 2	作物遗传育种学/285
§2. 2. 3	林木遗传育种学/290
§2. 2. 4	果树栽培学/292
§2. 2. 5	耕作学/296
§2. 2. 6	草地管理学/300
§2. 2. 7	牧草种子学/304
§2. 2. 8	作物种质资源学/307
§2. 2. 9	森林生态学/311
第3章	土壤科学/317
§2. 3. 1	土壤物理学/317
§2. 3. 2	土壤化学/320
§2. 3. 3	土壤地理学/325
§2. 3. 4	土壤生物学与生态学/331
§2. 3. 5	土壤耕作学/333
§2. 3. 6	植物营养学/336
第4章	植物保护科学/343
§2. 4. 1	植物病理学/343
§2. 4. 2	农业昆虫学/348
§2. 4. 3	植物免疫学/353
§2. 4. 4	植物病毒学/360
§2. 4. 5	森林植物保护学/363
§2. 4. 6	植物病害流行学/369
§2. 4. 7	植物病虫害预测预报/373
§2. 4. 8	植物检疫学/377
§2. 4. 9	化学防治/382
§2. 4. 10	生物防治/386
§2. 4. 11	杂草科学/390