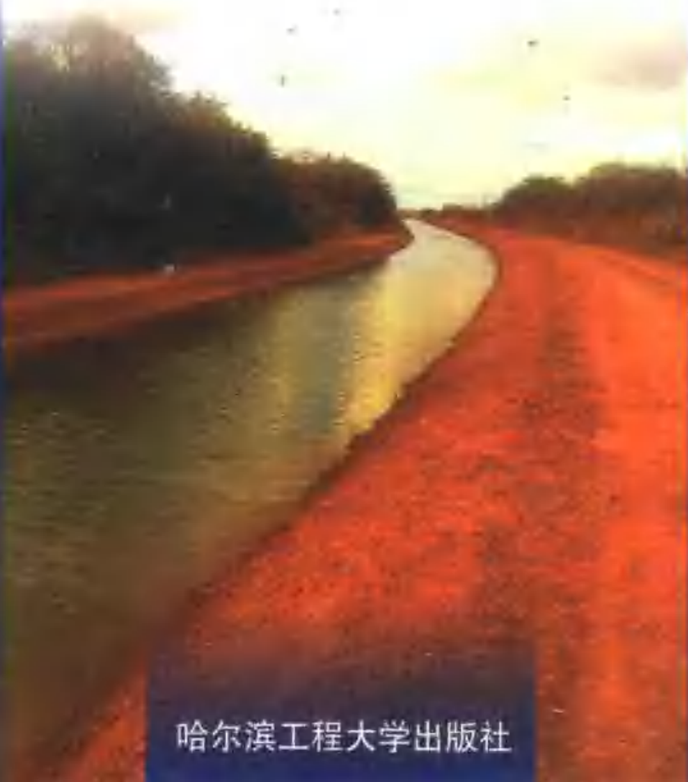
21世纪农业科学专业英语

总主审 李庆章
总主编 胡家英

农业水土工程英语

English Course for Agricultural Water and Soil Engineering

杨雅珠 付强 杨帆 卢铁光 编著



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内 容 简 介

本书前半部分以水利专业各个学科及研究方向为主,后半部分侧重于农业水土工程领域的最新动态及相关研究成果。主要内容包括水文、水资源、水利工程施工与规划、水利工程经济、水工建筑物、水力发电、水土保持、水利机械、水环境、建筑材料与灌溉排水工程。本书可用作水利以及相关专业大学生的英语教材,也可作为相关科技工作者和管理人员学习参考。

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前　　言

在21世纪初期，中国刚刚加入WTO组织并和国际接轨的新时期，国家教育部颁布的"大学英语教学大纲"把专业英语阅读列为必修课而纳入英语教学计划，强调通过大学四年不间断的英语教学使学生达到顺利阅读专业刊物的目的。根据这个精神，按照教育部新的学科和专业调整的目录，参考国内同类院校目前使用的部分专业英语教材，由东北农业大学人文学院英语系和水利与建筑学院联合编写了《农业水土工程英语》教材，以满足部分高等院校本专业及相关专业（水利水电工程、农业水利工程、水文水资源等）英语教学需要，以及供从事该专业的工程技术人员和管理人员学习专业英语参考。

本书内容涉及较为广泛，前半部分基本以水利专业各个学科及研究方向为主，属于基本知识部分；后半部分侧重与农业水土工程领域的最新研究动态及相关研究成果。主要内容包括：水文、水资源、水利工程施工与规划、水利工程经济、水工建筑物、水力发电、水土保持、水力机械、水环境、建筑材料与灌溉排水工程。

本书共分18个单元，每个单元由精读和泛读两篇文章组成。内容由浅入深，先广泛了解水利专业的基本情况，然后深入到农业水土工程领域的研究中。对于非本专业的人员也会有所帮助。为了加深对专业课文的理解，本书除了将所有精读课文作出了参考译文，及相应的专业词汇外，还对所有课文辅以习题。读者也可根据需要选择相关的文章进行阅读和训练。

全书由付强博士、卢铁光博士负责选编及翻译，杨雅琢、杨帆负责练习编排工作。承蒙黑龙江水利水电勘测设计研究院戴春盛教授审阅书稿；同时，东北农业大学水利与建筑学院的硕士研究生

邢贞相、李慧娟、丁国荣、姜宁、郭龙珠以及王秋梅、贾艳红老师参加了本书的部分工作，在此表示感谢！

由于编者水平有限，时间紧，任务重，书中难免存在不足和错误，恳请广大读者批评指正。

杨雅珠

2002 年 3 月

Preface

At the beginning of 21st century, China has just entered WTO, and the Educational Ministry has issued College English Teaching Program, in which academic English Reading is listed into English Teaching Plan, and emphasizes that students should learn English during the four-year college study without stopping in order to read academic magazines and materials. According to this program and the catalogue issued by Educational Ministry, English Department and Water Conservancy and Architecture College compile a book *English Course* for Agricultural Water and Soil Engineering in order to meet the demand of professional teaching in some colleges and technicians in the fields concerned.

The content of this book is very wide, including hydrology, water resource, construction and planning of hydraulic engineering works, hydroeconomics, hydraulic structure, hydropower, soil water conservation, hydraulic machinery, water environment, construction, material, irrigation and drainage engineering.

The book is composed of 18 units, and each unit has intensive reading and extensive reading. The content is arranged according to the difficulty, from the basic condition of hydrology to the research of water and soil engineering field. We provide translations to every intensive reading, and all the texts are accompanied by vocabularies and exercises.

Professor Dai Chunsheng offer a lot of help to this book. Besides, Xing Zhenxiang, Li Huijuan, Yu Guorong, Jiang Ning, Guo

Longzhu, Wang Qiumei, post graduates from NEAU offer a lot for this book, here, we want to show our gratitude to them.

Because of the limitation of our knowledge and time, there must be some inadequacies and mistakes in this book, we hope the readers can offer help and criticize us.

YaLi Yang

Contents

Unit 1

Part A

Water resources of the world

It is hardly necessary to state that water is one of the most important minerals and vital for all life. It has played an important role in the past and in the future it will play the central role in the well-being and development of our society. This most precious resource is sometimes scarce, sometimes plentiful and always very unevenly distributed, both in space and time.

Towards the end of the last glacial period, about 18000 years ago, the ocean level has been estimated to have been some 105-120m lower than at present. The difference is equivalent to $40 \times 10^5 km^3$ of water. If this water was stored in the form of ice then the total water equivalent of the polar caps and glaciers must have been about three times that at present. During the last century there appears to have been a puzzling increase in the total water equivalent in oceans and as ice.[1] Measurements indicate an average rise of ocean level of 1.2 mm per annum or about 430 km^3/year; some estimates of this increase are even as high as 1750 km^3/year. An explanation is that this water comes from exploitation of groundwater in excess of recharging, but 430 km^3/year averaged over the total land area of $134 \times 10^6 km^2$, not covered by water, means a lowering of the groundwater table by 3.2 mm/year, or a third of a metre in the century and there is little evidence to support this on world wide scale.[2] Indeed, changes in the sea level could more readily be ascribed to changes in the volume of the oceans, caused by continental drifts and warping of land masses. According to Fairbrige(1961), variations of ± 100m with respect to present level have occurred in the last 300000 years.

Table 1 Quantity and Distribution of Water

	Are covered $10^6 km^2$	Volume in $10^3 km^3$	% of total volume
Ocean	360	1370323	93.93
Total groundwater, incl. Zones of active water exchange		64000	4.39
		(4000)	(0.27)
Polar ice and galciers	16	24000	1.65
Lakes		230	0.016
Soil moisture		75	0.005
Atmosphere water	510	14	0.001
River		1.2	0.0001
		1458643	100

The total fresh water amounts to $88.32 \times 10^3 m^3$ or less than 6% and only 0.5% is readily available in lakes and rivers. The atmospheric water content is equivalent to less than 3 cm of water and the total amount of water in growing matter (the biomass) is less than $10 km^3$. A more illuminating picture is obtained when the water masses involved in the processes of the hydrosphere—as the global circulation is referred to—are associated with their turnover times.

Table 2 Fresh Water Resources of Continents, after Lvovich(1973)

	Area $10^6 km^2$	Precipitation		Runoff				Evaporation	
				Total		Subsurface			
		mm	km^3	mm	km^3	mm	km^3	mm	km^3
Europe[1]	9.8	734	7165	319	3110	109	1065	415	4055
Asia	45.0	726	32690	293	13190	76	3410	433	19500

Africa	30.3	686	20780	139	4225	48	1465	547	16555
Nth America[2]	20.7	670	13910	287	5960	84	1740	383	7950
Sth America	17.8	1648	29355	583	10380	210	3740	1065	18975
Australia[3]	8.7	736	6405	226	1965	54	465	510	4440
USSR	22.4	500	10960	198	4350	46	1020	300	6610
Total land[4]	132.3	834	110305	294	38830	90	11885	540	71468
Australia	7.7	440	3390	47	362	7	54	393	3028
New Zealand	0.265	2059	546	1481	387			599	159

1. Incl. Iceland.

2. Excl. Canadian Archipelago and including Central America.

3. Incl. Tasmania, New Guinea and New Zealand. For New Guinea et al. (1972) estimate precipitation at 3150 mm and total runoff at 2110 mm.

4. Excl. Antarctica, Greenland and Canadian Archipelago.

Table 3 Freshwater Runoff per Capita, after Lvovich(1973)

	Population (1969 in 10^6)	Ann. Runoff km^3 Total	Ann. Runoff km^3 Stable Portion	m^3/Head	Stable Portion
Europe	642	3100	1325	4850	2100
Asia, incl. Japan & Philippines	2040	13190	4005	6465	1960
Africa incl. Madagascar	345	4225	1905	12250	5500
North & Central America	334	5960	2380	17844	7125
South America	188	10380	3900	55213	20745
Australia, New Guinea, New Zealand	18	1965	495	10900	27500
Australia	12.45	362		2980	
New Zealand	3	387	150	129000	56000
All land areas	3567	38830	14010	10886	3928

The fresh water resources of Continents are shown in Table 2 and the per capita volume of runoff in streams and rivers is shown in Table 3. It is useful to reflect that Europe and Asia together accommodate about 76% of the world population but have only 27% of the total fresh water runoff. About two-third of the Earth's surface is arid or semi-arid where the extent of agricultural and industrial development depends primarily on the availability of water. Of the total land surface of $140 \times 10^6 km^2$, only about 10% is arable and of this about $10^6 km^2$ is at present irrigated. Few people realize that $1m^3$ of water is required to grow 1 to 3.5kg of dry matter by agricultural cropping, or to make about 14 kg of paper, 36kg of steel, etc. If we allow for a total consumptive use of water for all purposes of $1000m^3$ per head per year then Table 1 shows that Europe and Asia are close to the population limit set by availability of fresh water[③]. In order, however, to make use of all the available water it must be stored and distributed. For example, the Indian subcontinent is at present not short of water, which is if the water was distributed evenly throughout the year over the entire continent. But to achieve this redistribution we should require storage and distribution systems on a scale not yet known to man. Another example is the basin of the river Rhine. The annual runoff is about $69km^3$/year and the population is about 50 million, which is $1400m^3$/year per capita. The total use of water is approaching $25km^3$/year or about 30% of the total runoff and this is about the fraction of the runoff that can be controlled at reasonable cost.

However, it is not only the quantity but also the quality of water that is important. The quality aspect in a narrow sense refers to the pollution of fresh water by domestic, industrial and agricultural wastes. Not only may water returned to a river be unfit for use but a much greater volume of the river flow is made unfit for other uses. Mineral oils, for example, make water unfit for drinking in a ratio of $1:10^6$, one gram of radioactive strontium-90 spoils a reservoir, i.e. $1:10^{15}$. The sewage discharge annually is of the order of 430 km^3 and it spoils about 5 500 km^3. This is more than 30% of the total runoff of rivers. But water quality is also important for recreational use, for maintenance of the ecological balance, etc. Indeed, water quality today is a subject of its own right and for this reason will not be further discussed here.

Technical Terms

mineral [ˈminərəl] *n*. 矿物;无机物
vital [ˈvaitl] *a*. 必需的,不可缺少的
well-being [ˈwelˈbiːiŋ] *n*. 繁荣;福利
precious [ˈpreʃəs] *a*. 宝贵的;重要的
scarce [ˈskeəs] *a*. 缺乏的;不足的;稀少的
plentiful [ˈplentifəl] *a*. 大量的;丰富的
unevenly [ʌnˈiːvənli] *ad*. 不均匀的;不平的
distribute [diˈstribjuːt] *vt*. 分布;配给
glacial [ˈgleʃəl] *a*. 冰河(川)时代的;冰河(川)的
polar [ˈpəulə] *a*. (南北)极的;(近)极地的 *n*. 极线;极面;极性
glacier [ˈgleʃə] *n*. 冰川(河)
puzzling [ˈpʌzliŋ] *a*. 费解的;弄不懂的
equivalent [iˈkwivələnt] *n*. 相等;等效 *a*. 相等的,等效的
average [ˈævəridʒ] *n*. 平均数 *vt*. 平均是;均分
annum *n*. 年
exploitation [ˌeksplɔiˈteiʃən] *n*. 开发,发掘;利用
excess [ikˈses] *n*. 过分;超过;剩余(物) *a*. 过分的
recharge [riˈtʃɑːdʒ] *vt*. 补充;再装;回灌
evidence [ˈevədəns] *n*. 证据;资料;数据
ascribe [əˈskraib] *vt*. 把……归于;认为……;属于……
continental [ˌkɔntiˈnentl] *a*. 大陆(性)的
drift [drift] *n*. 漂移;漂(流)物
warp [wɔːp] *vt*. 翘;曲;曲折;变形
variation [ˌveriˈeiʃən] *n*. 变化;改变
respect [riˈspekt] *n*. 关系;方面
biomass *n*. 生物量;生物总量
illuminate [iˈluːmineit] *vt*. 阐明;启发

hydrosphere *n*.水界;水圈;地球水面
global [ˈgləubəl] *a*.全球的,全世界的
turnover [ˈtəːnˌəuvə] *n*.回转;循环;倒置
arid [ˈærid] *a*.干旱的;干燥的
semi-arid [ˈsemiˈærid] *a*.半干旱的
availability [əˌveiləˈbiliti] *n*.可得到的东西;可用性
arable [ˈærəbl] *a*.适于耕(的); *n*.耕地;可开垦地
cropping [ˈkrɔpiŋ] *n*.种植;收获量
consumptive [kənˈsʌmptiv] *a*.消费的,消耗(性)的
subcontinent [sʌbˈkɔntinənt] *n*.次大陆,次洲
evenly [ˈiːvənli] *ad*.平地(坦,静);均匀地
redistribution [ˌriːdistriˈbjuːʃən] *n*.再分配;分布
annual [ˈænjuəl] *a*.每年的
approach [əˈprəutʃ] *vt*.接近;处理 *n*.方法
reasonable [ˈriznəbl] *a*.合理的;适当的
unfit [ʌnˈfit] *a*.不适当的;不宜的
radioactive [ˌreidiəuˈæktiv] *a*.放射性的
strontium [ˈstrɔntiəm] *n*.锶
spoil [spɔil] *vt*.损坏;分解;变坏
sewage [ˈsjuidʒ] *n*.污水;下水道(系统)
maintenance [ˈmeintinəns] *n*.维持;保养;运转
ecological [ˌiːkəˈlɔdʒikəl] *a*.生态(学)的
km^3 = cubic kilometer 立方千米
mm = millimeter 毫米
km^2 = square kilometer 平方千米
polar cap 极冠,极地
in excess of…… 超过……
averaged over…… 平均分摊在……
continental drifts 大陆漂移
with respect to…… 关于……;对于……
water content 含水量
cm = centimeter 厘米

water mass 水体
per capita 每人
allow for… 考虑(到)……;估计(到)……
per head 每人
distribution system 配水系统
refer to… 涉及……;关于……
be of the order of… 约为……
terrestrial water 陆地上的水
Faribrige 费尔布里奇
Lvovich 里沃维奇
Rhine 莱茵河
Europe 欧洲
Indian 印度(的);印度人(的)
Africa 非洲
Nth America 北美洲
Sth America 南美洲
USSR = Union of Soviet Socialist Republics 苏联
New Zealand 新西兰
Iceland 冰岛
Canadian Archipelago 加拿大列岛
Central America 中美洲
Tasmania 塔斯马尼亚
New Guinea 新几内亚
Aitken 艾肯
Greenland 格陵兰
Japan 日本
Philippines 菲律宾
Madagascar 马达加斯加