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Country Report 2

Reference Soil Profiles of the People's Republic of China

Field and Analytical Data

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International Soil Reference and Information Centre

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Compiled by Gong Zitong, Luo Guobao and Zhang Ganlin (ISSAS) and
O.C. Spaargaren and J.H. Kauffman (ISRIC)

Based upon fieldwork of

Huang Biao
Huang Xiaqing
Luo Guobao
Shi Xuezheng
Wang Minzhu
Zhang Bin
Zhang Ganlin

(ISSAS)

J.A.K. Boerma
V.W.P. van Engelen
J.H. Kauffman
O.C. Spaargaren
A.W. Vogel

(ISRIC)

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FOREWORD

National Soil Reference Collection and Database of the People's Republic of China

The objective of this Country Report is to provide comprehensive field and analytical data of a number of reference soils representative for the major soils of China. The soils were carefully selected, described and sampled by ISSAS and ISRIC, and analyzed in their respective laboratories. Additional information on some reference soils is provided in a series of Soil Briefs which give more details on the environment, on the characterization and classification of the soils, and on the evaluation of soil/land qualities and fertilizer recommendation for some relevant crops.

The soils described are located throughout the country. The sites were selected on a number of criteria, such as major soil type representative for one of China's major ecological zones, production potential, a high water table, high salt content, and advanced stage of weathering.

It is realized that the set of reference soils in this Country Report does not provide a full overview of China's vast soil resources. Important regions such as the Loess Plateau, the Huabei and Chianjiang Plains, and the Qinghai-Xizang Plateau are not yet represented. It is hoped that in the future the present collection of reference soils will be supplemented by samples from these regions.

Presently the collection comprises 51 reference soil profiles. From each reference soil two undisturbed columns were taken, and specially preserved and prepared into monoliths, ready for exposition. The Chinese monolith exposition is housed in the Institute of Soil Science in Nanjing. Duplicate monoliths are included in ISRIC's world soil collection in the Netherlands. It is the ISSAS' intention that the collection will initiate the establishment of a China Soil Reference and Information Centre.

A national collection existed already a long time. It needed, however, to be upgraded and updated. This was realized in a series of cooperative projects of ISSAS and ISRIC in the period 1983 to 1993. These projects were subsequently funded by the Academia Sinica, the Royal Dutch Academy of Arts and Sciences, the European Community through their "Life Sciences and Technology for Developing Countries Programme", in cooperation with ORSTOM (France) and the Universities of Giessen and Kiel (Federal Republic of Germany), the National Natural Science Foundation of China, and the Netherlands Directorate General for International Cooperation as part of ISRIC's programme on the establishment of National Soil Reference Collections (NASREC).

The establishment of the soil reference collection, comprising exposition, database and accompanying documentation has been made possible with the support of many persons, some are mentioned here: Dr. W.G. Sombroek (former director of ISRIC), Dr. L.R. Oldeman (director ISRIC), Ir. J.H. Kauffman (coordinator NASREC programme), the late Prof. Hseung Yi, Prof. Li Chingkwei, Prof. Zhao Qiguo and Prof. Gong Zitong of ISSAS, the staff of ISSAS and ISRIC, and many institutions throughout the country which supported the fieldwork.

Zhao Qiguo, Director ISSAS
Gong Zitong, Head of Department of Soil Geography ISSAS

前 言

这份国家报告的目的是提供有代表性的中国主要参比土壤的野外及分析数据的综合资料。这些土壤都是经过中国科学院南京土壤所和荷兰国际土壤信息中心仔细选择、描述和采样，并在各自的实验室进行分析的。而有关环境、土壤性质和分类、土地质量评价和施肥建议的详细信息罗列在系列的′土壤简讯′之中。

文中描述的土壤剖面分布于全国各地，剖面地点的选择均有一定的标准，比如能代表中国主要的生态区，生产潜力大，高水位，盐分含量高和高风化的土壤类型。

目前，已采集了51个土壤参比剖面，每个参比剖面均取两个未被干扰的土柱。这些土柱制成土壤整段标本用以陈列，分别保存在中国科学院南京土壤所和荷兰国际土壤信息中心。正是这些土壤构成了′中国土壤剖面信息中心′。

全国性的土壤剖面采集工作已进行了很长时间。这项工作还需要更新和提高。在1983-1993期间，中国科学院南京土壤所和荷兰国际土壤信息中心一系列的合作项目使得这项工作得以实施。这些合作项目得到中国科学院，中国国家自然科学基金委员会，荷兰皇家科学院和欧洲共同体STD2项目的资助，合作单位还有法国海外技术合作局，德国吉森大学，德国基尔大学和荷兰国际指导委员会。它是荷兰国际土壤信息中心全球参比土壤采集项目的一部分。

之所以中国土壤参比剖面的采集、制作、陈列和相关数据库的建立成为可能，它与许多人的支持分不开的。这里要提到的是：荷兰国际土壤信息中心的 W.G. *Sombroek* 博士，L.R. *Oldeman* 博士，J.H. *Kauffman* 博士，中国科学院南京土壤所的熊毅教授（已故），李庆逵教授，赵其国教授，龚子同教授，以及中国科学院南京土壤所和荷兰国际土壤信息中心的其他全体同仁和全国各地给予野外工作提供帮助的单位和个人。

International Soil Reference Collection and Database

The International Soil Reference and Information Centre (ISRIC), founded in 1966 as an initiative of the International Society of Soil Science (ISSS) has a mandate to collect and disseminate scientific knowledge about soils for the purpose of a better understanding of their formation, characterization, classification, distribution and capability for sustained land use at local, national, and global scales. One of ISRIC's main objectives is to assemble soil profiles, soil samples and associated information to illustrate the units of the FAO-Unesco Soil Map of the World. To date, the world soil collection consists of over 800 reference soils from 60 countries, accompanied by soil and environmental data. The collection is supported by a soil map collection, soil reports library, a thin section collection and a slide collection.

The National Soil Reference Collection Programme (NASREC), supported by the Directorate General for International Cooperation of the Netherlands within the Action Plan of National Soil Policies of UNEP, and through ISRIC's own budget has been instrumental to achieve this objective. ISRIC greatly appreciates the cooperation of ISSAS in their efforts to bring together a Soil Reference Collection of China.

The collected information of the reference soil profiles is stored in the "ISRIC Soil Information System" (ISIS), a database management system for storing and retrieving data on geology, geomorphology, hydrology, soil morphology, soil chemical and physical characteristics, and climate.

To disseminate its data, ISRIC has combined the different types of information into two publication series, Country Reports and Soil Briefs. Each series aims to address the varying needs of those working in one of many fields of research using soils data and soil-related data.

Country Reports, containing all ISRIC-held data on soils and associated information of a specific country are generated by ISIS. Additional information on literature references, small scale maps, and a list of slides available in the ISRIC Slide Database is included. The Country Reports are jointly published by the national institution involved in the collection and ISRIC. A list of Country Reports (published and in press) is given on the back cover of this report.

Soil Briefs describe in more detail one or more reference soils in relation to their environment, genesis, actual and potential use and their constraints. A list of Soil Briefs published on Chinese reference soils is given on the back cover of this report.

Any comments on the Country Report or Soil Brief series in general or on the presentation of the data in particular is highly appreciated and may be communicated to the directors of either ISSAS or ISRIC.

L.R. Oldeman, Director ISRIC

Country Reports and Soil Briefs may be purchased through ISRIC or the national institution of the country concerned. Publications based on the Country Reports should explicitly indicate the information source. To order Country Reports or Soil Briefs please contact:

ISRIC
PO Box 353
6700 AJ Wageningen
The Netherlands

Telephone +31.8370.71711
(from 10.10.1995 +31.317.471711)
Fax +31.8370.24460
(from 10.10.1995 +31.317.471700)
E-mail ISRIC@RCL.WAU.NL

or

ISSAS
PO Box 821
Nanjing
People's Republic of China

Telephone +86.25.3361704
Fax +86.25.3353590
Cable 1099

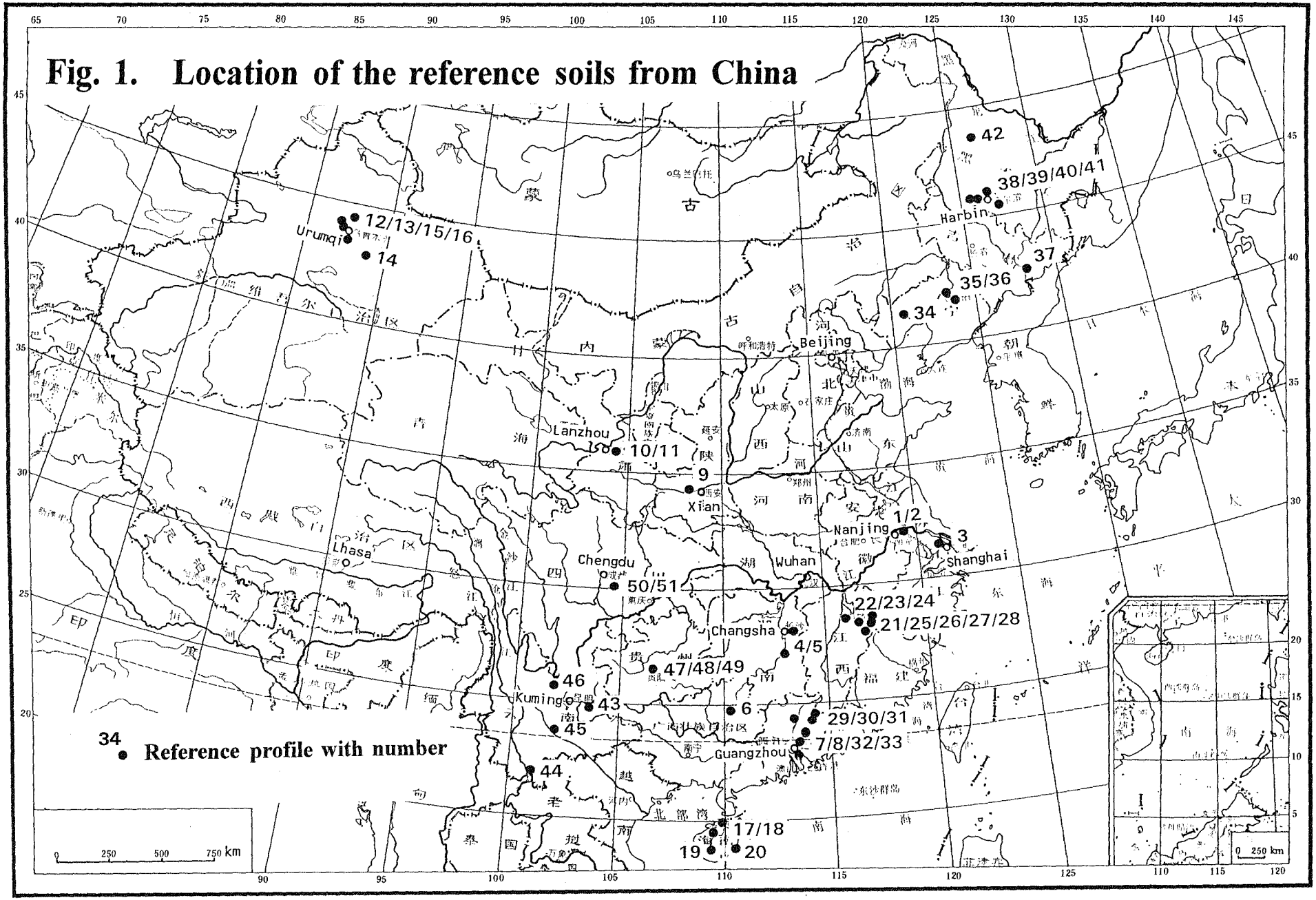

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Table 1 Summarized information on the reference soils CN 01 to CN 51

RS no.[1]	FAO (1988)	FAO (1974)	USDA Soil Taxonomy (1992)	Parent material
CN 01	Silti-Chromic Luvisol	Chromic Luvisol	Typic Hapludalf	loess
CN 02	Gleyi-Calcaric Cambisol	Gleyic Cambisol	Oxyaquic Eutrochrept	alluvium
CN 03	Fluvi-Stagnic Luvisol	Gleyic Luvisol	Aquic Hapludalf	alluvium
CN 04	Alumi-Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	alluvium
CN 05	Silti-Calcaric Cambisol	Chromic Cambisol	Typic Eutrochrept	shale
CN 06	Chromi-Vertic Luvisol	Eutric Nitosol	Vertic Paleudalf	residual material
CN 07	Alumi-Ferralic Cambisol	Orthic Ferralsol	Inceptic Eutrudox	residual material
CN 08	Alumi-Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	residual material
CN 09	Silti-Fimic Anthrosol	Calcaric Regosol	Plaggept	loess
CN 10	Sodi-Calcaric Cambisol	Haplic Xerosol	Natric Cambiorthid	loess
CN 11	Aridi-Calcaric Regosol	Calcaric Regosol	Fluventic Camborthid	loess
CN 12	Nudiyermi-Calcaric Regosol	Haplic Xerosol	Typic Torriorthent	loess
CN 13	Silti-Cumulic Anthrosol	Calcaric Regosol	Anthropic Torrifluvent	man-made
CN 14	Petri-Sodic Solonchak	Orthic Solonchak	Aquollic Salorthid	colluvium
CN 15	Orthi-Haplic Arenosol	Eutric Regosol	Typic Torripsamment	eolian sand
CN 16	Yermi-Calcaric Regosol	Calcaric Regosol	Typic Torripsamment	colluvium
CN 17	Acri-Haplic Ferralsol	Ferric Acrisol	Typic Kandiudult	residual material
CN 18	Rhodi-Geric Ferralsol	Acric Ferralsol	Anionic Acrudox	residual material
CN 19	Veti-Haplic Acrisol	Ferric Acrisol	Typic Kanduiudult	residual material
CN 20	Veti-Ferralic Cambisol	Orthic Ferralsol	Typic Hapludox	residual material
CN 21	Alumi-Haplic Acrisol	Orthic Acrisol	Udic Kandiustult	residual material
CN 22	Alumi-Ferric Alisol	Ferric Acrisol	Typic Paleustult	residual material
CN 23	Alumi-Dystric Cambisol	Dystric Cambisol	Dystric Ustochrept	residual material
CN 24	Orthi-Ferric Alisol	Ferric Acrisol	Anthraquic Hapludalf	residual material
CN 25	Niti-Haplic Acrisol	Ferric Acrisol	Typic Paleudult	unconsolidated
CN 26	Humi-Dystric Cambisol	Dystric Cambisol	Typic Dystrochrept	residual material
CN 27	Alumi-Dystric Cambisol	Dystric Cambisol	Typic Dystrochrept	residual material
CN 28	Alumi-Haplic Alisol	Ferric Acrisol	Typic Hapludult	colluvium
CN 29	Alumi-Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	colluvium
CN 30	Alumi-Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	unconsolidated
CN 31	Eutri-Haplic Nitisol	Chromic Luvisol	Typic Hapludalf	residual material
CN 32	Alumi-Ferralic Cambisol	Orthic Ferralsol	Typic Hapludox	residual material
CN 33	Proto-Thionic Fluvisol	Thionic Fluvisol	Typic Sulfaquent	alluvium
CN 34	Silti-Chromic Cambisol	Chromic Cambisol	Typic Ustochrept	slope wash
CN 35	Orthi-Haplic Phaeozem	Haplic Phaeozem	Cumulic Hapludoll	alluvium
CN 36	Silti-Chromic Luvisol	Chromic Luvisol	Udic Haplustalf	lacustrine sediments
CN 37	Hypoglossi-Albic Luvisol	Albic Luvisol	Eutric Glossoboralf	loess
CN 38	Silti-Stagnic Solonetz	Orthic Solonetz	Natriboralf	lacustrine sediments
CN 39	Haplic Chernozem	Haplic Chernozem	Pachic Haploboroll	loess
CN 40	Haplic Greyzem	Orthic Greyzem	Boralfic Argiboroll	alluvium
CN 41	Fluvi-Haplic Phaeozem	Haplic Phaeozem	Pachic Udic Haploboroll	loess
CN 42	Epiandi-Eutric Leptosol	Eutric Regosol	Typic Ustorthent	volcanic ejecta
CN 43	Pachi-Haplic Acrisol	Ferric Acrisol	Typic Kandiudult	alluvium
CN 44	Alumi-Ferralic Cambisol	Ferralic Cambisol	Fluventic Umbric Dystrochrept	alluvium
CN 45	Rupti-Ferralic Cambisol	Ferralic Cambisol	Dystric Eutrochrept	residual material
CN 46	Chromi-Stagnic Luvisol	Chromic Luvisol	Aquic Haplustalf	residual material
CN 47	Alumi-Haplic Acrisol	Ferric Acrisol	Typic Hapludult	residual material
CN 48	Alumi-Ferralic Cambisol	Ferralic Cambisol	Fluventic Dystrochrept	alluvium
CN 49	Chromi-Luvic Phaeozem	Luvic Phaeozem	Typic Argiudoll	residual material
CN 50	Silti-Calcaric Cambisol	Calcic Cambisol	Lithic Eutrochrept	solid rock
CN 51	Silti-Calcaric Cambisol	Calcic Cambisol	Oxyaquic Eutrochrept	alluvium

[1] RS no. = reference soil number

Table 1. *(continued)*

Clim[2]	Regional landform	Land utilization type	Vegetation	Drainage	Alt.[3]
Cfa	low hill	medium level arable farming		moderately well	25
Cfa	valley	arable farming		poor	20
Cfa	alluvial plain	arable farming		poor	4
Cfa	alluvial plain	afforestation		well	40
Cfa	low hill	(semi-) natural vegetation	grassland	moderately well	40
Cfa	plain	(semi-) natural vegetation	grassland	moderately well	150
Cwa	hill	(semi-) natural vegetation		well	45
Cwa	mountain	(semi-) natural vegetation	shrub	well	650
Cwa	alluvial terrace	medium level arable farming		well	520
Dw	plain	(semi-) natural vegetation	grassland	well	1950
Dw	plain	arable farming		well	1900
BSk	piedmont	grazing	grassland	well	550
BSk	piedmont	arable farming		well	600
BWk	intermontane basin	grazing	grassland	imperfectly	-80
BSk	dune field		grassland	somewhat excessive	500
Dfa	piedmont	(semi-) natural vegetation	grassland	excessive	750
Am	plain	plantation	evergreen forest	well	140
Am	peneplain	plantation		well	105
Am	mountain	(semi-) natural vegetation	semi-deciduous forest	moderately well/well	770
Am	plain	fallow		well	40
Cwa	intermontane basin	fallow		well	45
Cwa	intermontane basin	fallow		moderately well/well	40
Cwa	plain	fallow		moderately well/well	50
Cwa	plain	arable farming		imperf./moderately well	40
Cwa	plain	low level arable farming		moderately well	30
Cw	mountain	(semi-) natural vegetation	semi-deciduous forest	well	1800
Cw	mountain	(semi-) natural vegetation	evergreen forest	well	700
Cw	mountain	low level arable farming	shrub	well	250
Cw	mountain	(semi-) natural vegetation	semi-deciduous woodland	well	600
Cw	intermontane basin	afforestation	evergreen woodland	well	150
Cw	mountain	(semi-) natural vegetation	evergreen shrub	well	250
Cw	hill	(semi-) natural vegetation	evergreen forest	well	250
Cw	alluvial plain	medium level arable farming		poor	1
Dwx	hill	low level arable farming		well	200
Dwx	alluvial plain	medium level arable farming		well	50
Dwx	pediplain	low level arable farming		moderately well	80
Dbw	plateau	(semi-) natural vegetation	closed forest	imperf./moderately well	750
Dwx	lacustrine plain	semi-natural grassland, grazed	short grassland	poor	150
Dwx	plain	low level arable farming		well	150
Dwx	alluvial terrace	low level arable farming		moderately well	200
Dwx	alluvial terrace	low level arable farming		well	150
Dwx	volcano	(semi-) natural vegetation	deciduous woodland	excessive	400
Cwa	basin	medium level arable farming		moderately well/well	1800
Cwa	valley	woodland, grazed	evergreen woodland	well	580
Cwa	valley	medium level arable farming		well	380
Cwa	badlands	afforestation		moderately well	1150
Cwa	low hill	low level arable farming		well	1230
Cwa	low hill	low level mixed farming		well	1260
Cwa	hill	non-agricultural land	short grassland	(somewhat) excessive	1290
Cwa	low hill	low level arable farming		somewhat excessive	415
Cwa	valley	low level arable farming		very poor/poor	392

[2] Clim = climate according to Köppen. [3] Alt. = altitude in m a.s.l.

SOILS OF CHINA

The soil orders

The new Chinese Soil Taxonomic Classification System (CSTC, 1st proposal, 1991) distinguishes 13 soil orders, viz. Primarosols, Vertisols, Aridisols, Isohumisols, Spodisols, Siallisols, Ferrallisols, Fersiallisols, Aquisols, Halosols, Histosols, Anthrosols and Andisols. The orders are sudivided into suborders, soil groups and subgroups.

The ***Primarosols*** are soils without any diagnostic horizons or diagnostic features. They are widespread in the country, especially in the desert region, the Loess Plateau, the river basins and strongly eroded areas. They cover about 4% of total land area of China. ***Vertisols*** are soils with vertic features and are mainly found on the watersheds of the Huaihe River and in some areas of South and Southwest China, where soils are derived from basalt, limestone and shales. They account for some 1% of total land area. ***Aridisols*** have an aridic epipedon or an aridic soil moisture regime and often contain carbonates and gypsum. They cover a total land area of about 24%, mainly in Northwest China and are found in the deserts and desert pastures of Xinjiang, Qinhai, Gansu and Nei Mongolia. The ***Isohumisols***, i.e. soils enriched in organic matter evenly distributed in the profile (isohumic epipedon) are mainly located in Nei Mongolia and the adjacent pastoral regions. Here the depth of the calcic horizon increases and the amount of organic matter decreases from east to west as the climate becomes dryer. They account for some 22% of the total land area.

The ***Siallisols***, defined by having sialic properties ($SiO_2/Al_2O_3 > 2.4$ in the clay fraction and a CEC/clay > 0.24) mainly include Brown and Cinnamon Soils (Drab Soils) in the Shandong and Liaodong peninsulas as well as hilly areas of North China. They cover about 10% of the land area. The ***Ferrallisols*** (soils with ferrallic properties, i.e. $SiO_2/Al_2O_3 < 2.4$ in the clay fraction and a CEC/clay < 0.24) mainly includes Latosols, Latored Soils and Red Soils of (sub)tropical China. These soils occupy about 11% of the total land area. ***Fersiallisols*** are similar to Siallisols except for the ratio of free iron to total iron (> 0.4). They include mainly the Yellow Brown Soils, Yellow Drab Soils and Limestone Soils south of the Changjiang River and in the limestone region of Southwest China. They account for about 9% of the total land area. ***Spodisols*** (soils with a spodic horizon) are very rare and found only in some forest regions of the south slope of the Qinzhang plateau and the Daxinanlin Mountains.

Aquisols are soils with an aquic soil moisture regime and oxidation-reduction features. They include Gley Soils, Peat Soils and Chao Soils mostly in the plains of North China. They cover about 6% of the land area. ***Halosols*** are soils with a salic or natric horizon resulting from groundwater influences. They are mainly distributed in the inland part of Northwest China and in coastal regions. They include Solonchaks and Solonetz and account for 2% of the total land area. The ***Histosols*** are characterized by a histic epipedon and occur mainly in the Sanjiang Plain of Northeast China and Ruoergai grasslands of Sichuan Province. They occupy about 1% of the China's land area.

Anthrosols have man-made epipedons and include Paddy Soils, Warpic Soils, Cumulated Soils and Fimic Soils. These soils are mostly found in the river delta regions such as the Changjiang and Zhujiang deltas as well as in the Chendu Plain and on the Loess Plateau. In total they cover an area of about 4% in the country. Finally, ***Andisols***, i.e. soils with andic properties, occur in the Heilongjiang, Jinlin, Yunnan and Hainan provinces over rather limited areas.

The distribution of the soil orders over the country is shown in figure 2. Table 2 shows the area percentage of the different soil orders to the total land in China. Table 3 provides a correlation between the FAO-Unesco Soil Map of the World Legend (1974) and the soil types of the traditional soil classification system in China (1978). Table 4 presents an overview of the recently developed Chinese Soil Taxonomic Classification System (CSTC, 1991) showing the soil orders, soil suborders, soil groups and soil subgroups, while in Table 5 an approximate correlation is given between the new Chinese Soil Taxonomic Classification (CSTC, 1991) and the soil units of the FAO-Unesco Revised Legend (FAO, 1988).

Soil distribution

From South to North the distribution pattern shows a transition from Ferrallisols through Fersiallisols to Siallisols and a change in soil groups from Latosols through Latored and Red Soils to Yellow Brown, Brown and, ultimately, Dark Brown Soils (Fig. 2). From East to West, soil orders change from Siallisols through Isohumisols to Aridisols and in the soil groups from Brown and Black Soils through Chernozems and Chestnut Soils to Gray Desert and Brown Desert Soils.

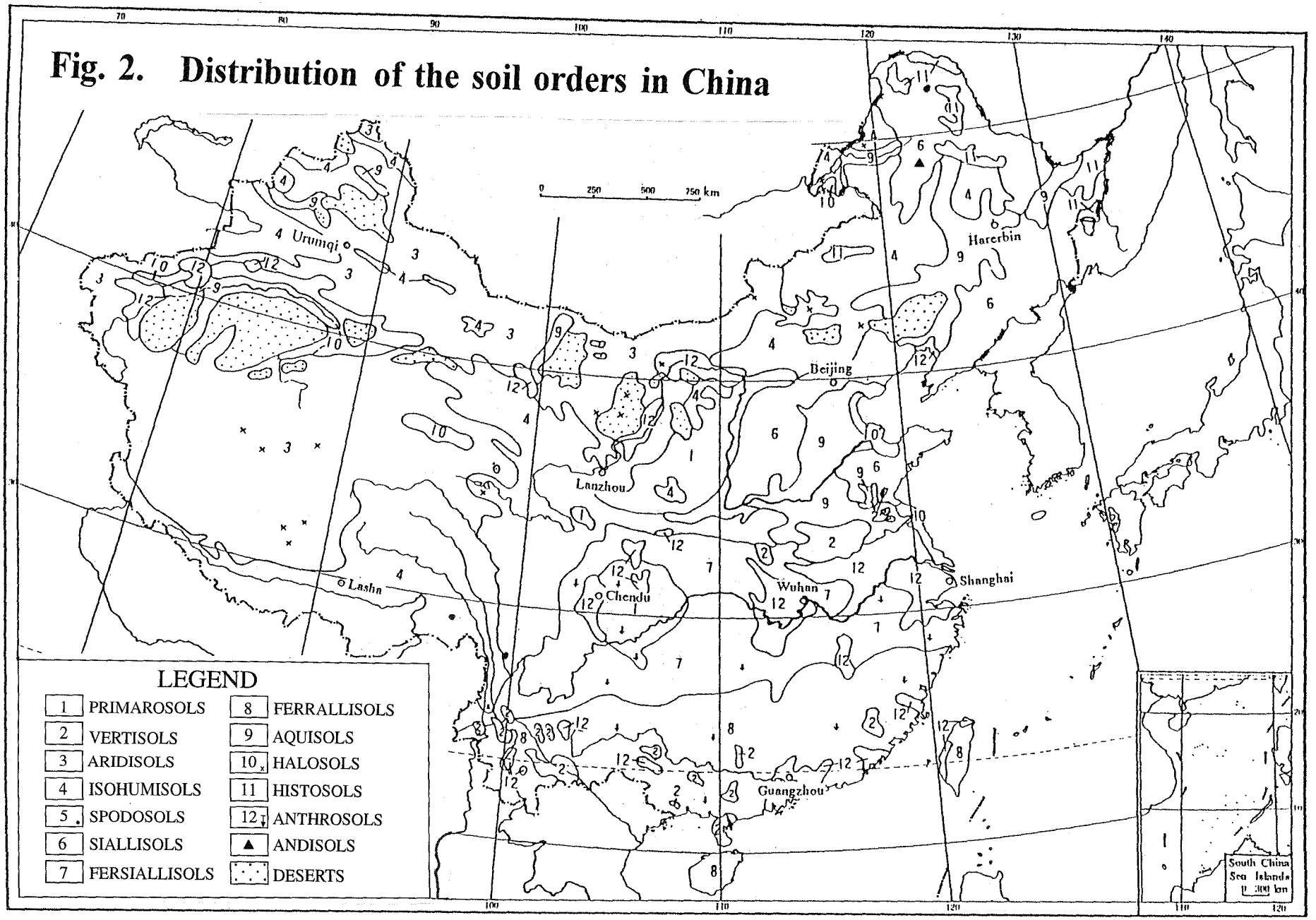


Fig. 2. Distribution of the soil orders in China
0 250 500 750 km
Urumqi
Harerbin
Beijing
Lanzhou
Lashn
Chendu
Wuhan
Shanghai
Guangzhou
South China Sea Islands
LEGEND
1 PRIMAROSOLS
2 VERTISOLS
3 ARIDISOLS
4 ISOHUMISOLS
5 SPODOSOLS
6 SIALLISOLS
7 FERSIALLISOLS
8 FERRALLISOLS
9 AQUISOLS
10 HALOSOLS
11 HISTOSOLS
12 ANTHROSOLS
ANDISOLS
DESERTS

Vertically the distribution pattern varies with the regions. A catena from low to high altitude on the slope of the Qinzhang Plateau, for example, shows a sequence of Yellow Red Soils - Yellow Brown Soils - Brown Soils - Spodisols - (sub)Alpine Meadow Soils - Frozen Soils - ice cap.

Table 2. Area percentage of the soil orders in China

Soil order	%
Primarosols	4
Vertisols	1
Aridisols	24
Isohumisols	22
Siallisols	10
Ferrallisols	9
Fersiallisols	11
Spodisols	tr
Aquisols	6
Halosols	2
Histosols	1
Anthrosols	5
Andosols	tr
Deserts	.5

Soil resources

Due to China's variety in topography and climatic conditions and its long cultivation history, many soil types can be found in the country, some of which are unique in the world. Its soil resources vary from soils which are cultivated for more than 1000 years, soils developed under extremely drought conditions, soils formed under a humid tropical monsoon climate and soils which lie at very high altitude such as those on "the roof of the world". Mountainous and hillside soils constitute a high percentage of China's soil coverage (65%). About 50% of the soils occur at an elevation of 1000 m or more above sea level and 20% of the soils are above 3000 m a.s.l.

The amount of cultivated land is limited. Presently, 99.3 million ha is used which amounts to about 10.4% of the country's total land area, or only 0.1 ha per capita. The soil resource is also unevenly distributed. 90% of cultivated land and forest land occurs in Eastern China with its monsoon climate. Here lives 95% of the agricultural population. The arid region has 10% of cultivated land but supports only 4.5% of agricultural population, although the arid land area takes up nearly one third of the country. On the Qinzhang plateau only 0.26% cultivated land is found with only 0.5% of the Chinese population inhabiting this vast region.

Table 3. Correlation of soil types between China's traditional soil classification system (1978) and the FAO-Unesco Soil Map of the World (1974) (after Zhao Songqiao, 1986)

FAO soil units	Soil groups of China's traditional classification system
Fluvisols	Chou Tu (wet soil), Meadow Soil
Gleysols	Meadow Soil, Bog Soil, Paddy Soil, Irrigated Oases Soil, Alpine Meadow Soil
Regosols	Alpine Frozen Soil, Aeolian Sandy Soil, Purple Soil, Saga Soil (Alpine Steppe Soil)
Lithosols	Soils of mountainous areas
Rendzinas	Limestone Soil, Phosphocalcic Soil
Rankers	Alpine Meadow Soil, Subalpine Meadow Soil
Vertisols	Shachiang Soil, Paddy Soil
Solonchaks	Solonchak
Solonetz	Solonetz
Yermosols	Grey Desert Soil, Grey-Brown Desert Soil, Brown Desert Soil, Takyric Soil, Alpine Desert Soil
Xerosols	Sierozem, Semidesert Brown Soil, Irrigated Oases Soil
Kastanozems	Chestnut Soil
Chernozems	Chernozem
Phaeozems	Black Earth
Greyzems	Grey forest soil
Cambisols	Burozem, Drab Soil, Grey Drab Forest Soil, Mein Tu (cultivated loess), Lou Tu (stratified old manual loess), Heilu Tu (dark loess), Subalpine Meadow Soil
Luvisols	Dark-Brown Forest Soil, Burozem, Yellow-Brown Earth, Heilu Tu, Limestone Soil, Dry Red Earth
Podzoluvisols	Bleached Grey Soil
Planosols	Baijiang Tu, Yellow-Brown Earth, Burozem
Acrisols	Lateritic Soil, Red Earth, Yellow Earth
Nitosols	Laterite, Red Earth, Dry Red Earth
Ferralsols	Laterite
Histosols	Peat Soil, Bog Soil

Table 4. Chinese Soil Taxonomic Classification System (CSTC, 1991)

Soil order	Soil suborder	Soil group	Soil subgroup[1]
Histosols	Geli-histosols	Geli-peat soils	Haplic geli-peat soils
			Fibric geli-peat soils
	Orthic-histosols	Peat soils	Haplic peat soils
			Fibric peat soils
Anthrosols	Hydragric anthrosols	Paddy soils	Haplic paddy soils
			Hydragric paddy soils
			Percogenic paddy soils
			Albic paddy soils
			Gleyic paddy soils
			Recalcaric paddy soils
			Halic paddy soils
			Acid-sulphatic paddy soils
	Dryagric anthrosols	Cumulated soils	Haplic cumulated soils
			Calcaric cumulated soils
			Dystric cumulated soils
		Lou soils	***Haplic Lou soils***
			Aquic Lou soils
		Irrigation-warping soils	Haplic irrigation-warping soils
			Medihumic irrigation-warping soils
			Salific irrigation-warping soils
			Aquic irrigation-warping soils
		Mellow soils	Haplic mellow soils
			Calcaric mellow soils
			Dystric mellow soils
Andisols			Haplic andisols
			Dystric andisols
			(Cinderic andisols)
Spodosols	Orthic spodosols	Podzols	Haplic podzols
			Peatic podzols
Vertisols	Aquic vertisols	Black clay soils	Haplic black clay soils
			Calcaric black clay soils
			Recalcaric black clay soils
			Calcic black clay soils
			Leptic black clay soils
	Udic vertisols	Pell clay soil	Haplic pell clay soils
			Dystric pell clay soils
			Leptic pell clay soils
Vertisols *(cont'd)*	Udic vertisols	Chrom clay soils	Haplic chrom vertisols
			Calcaric chrom clay soils
			Dystric chrom clay soils
			Leptic chrom clay soils
Halosols	Alkalic halosols	Solonetzes	***Haplic solonetzes***
			Aquic solonetzes
			Takyric solonetzes
	Salic halosols	Solonchaks	Haplic solonchaks
			Umbrihumic solonchaks
			Gleyic solonchaks
			Alkalic solonchaks
			Hyposalic solonchaks
			Crustic solonchaks
			Coastic solonchaks
			Acid-sulphatic solonchaks
		Arid solonchaks	Haplic arid solonchaks
			Gypsic arid solonchaks
			Hypersalic arid solonchaks
			Gypsic-hypersalic arid solonchaks
			Gypsic-salipanic arid solonchaks
			Diluvic arid solonchaks
Aridisols	Altocryic aridisols	Frost desert soils	Haplic frost desert soils
			Stone-polygonic frost desert soils
		Cold desert soils	***Haplic cold desert soils***
			Medihumic cold desert soils
		Frost-calc soils	Haplic frost-calc soils
			Medihumic frost-calc soils
			Clayific frost-calc soils
		Cryo-calc soils	Haplic cryo-calc soils
			Clayific cryo-calc soils
			Medihumic cryo-calc soils
	Calcic aridisols	Brown calc soils	Haplic brown calc soils
			Umbrihumic brown calc soils
			Clayific brown calc soils
			Alkalic brown calc soils
			Gypsic brown calc soils
			Hypercalcic brown calc soils
			Limepanic brown calc soils
			Aquic brown calc soils
			Warpic brown calc soils

[1] Soil subgroups in bold italics are represented in this country report.

Soil order	Soil suborder	Soil group	Soil subgroup
Aridisols *(cont'd)*	Calcic aridisols	Sierozems	Haplic sierozems
			Umbrihumic sierozems
			Gypsic sierozems
			Aquic sierozems
	Gypsic-salic aridisols	Brown desert soils	Haplic brown desert soils
			Hypergypsic brown desert soils
			Gypsipanic brown desert soils
			Salipanic brown desert soils
			Gypsic-salipanic brown desert soils
			Gypsic-hypersalic-salipanic brown desert soils
		Grey desert soils	***Haplic grey desert soils***
			Alkalic grey desert soils
			Aquic grey desert soils
			Warpic grey desert soils
	Orthic aridisols	Takyr soils	Haplic takyr soils
			Alkalic takyr soils
			Salic takyr soils
		Haplo-calc soils	Haplic haplo-calc soils
			Medihumic haplo-calc soils
			Alkalic haplo-calc soils
			Warpic haplo-calc soils
			Altocryic haplo-calc soils
		Haplo-desert soils	Haplic haplo-desert soils
			Medihumic haplo-desert soils
			Alkalic haplo-desert soils
			Warpic haplo-desert soils
			Altocryic haplo-desert soils
Aquisols	Gelic aquisols	Geli-gley soils	Haplic geli-gley soils
			Histic geli-gley soils
	Peric aquisols	Gley soils	Haplic gley soils
			Aquic gley soils
			Histic gley soils
			Salic gley soils
			Sulfuric gley soils
	Orthic Aquisols	Chao soils	Haplic Chao soils
			Medihumic Chao soils
			Salific Chao soils
			Salinic Chao soils
			Alkalic Chao sils
			Gleyic Chao soils
		Umbrihumic Chao soils	Haplic umbrihumic Chao soils
			Albic umbrihumic Chao soils
			Gleyic Chao soils

Soil order	Soil suborder	Soil group	Soil subgroup
Aquisols *(cont'd)*	Orthic aquisols	Shajiang black soils	Haplic Shajiang black soils
			Albic Shajiang black soils
			Salic Shajiang black soils
			Alkalic Shajiang black soils
			Vertic Shajiang black soils
		Foliaged-Chao soils	Haplic foliaged-Chao soils
			Medihumic foliaged-Chao soils
			Salic foliaged-Chao soils
			Alkalic-salic foliaged-Chao soils
Isohumisols	Alto-cryic isohumisols	Cryo-black soils	Haplic cryo-black soils
			Calcic cryo-black soils
			Clayific cryo-blac soils
		Frost-sod soils	Haplic frost-sod soils
			Calcic frost-sod soils
		Cryo-sod soils	Haplic cryo-sod soils
			Calcic cryo-sod soils
			Clayific cryo-sod soils
	Lithomorphic isohumisols	Phospho-calc soils	Haplic phospho-calc soils
			Panic phospho-calc soils
			Gleyic phospho-calc soils
		Rendzinas	Haplic rendzinas
			Calcic rendzinas
	Udic isohumisols	Black soils	Haplic black soils
			Argillic black soils
			Aquic black soils
		Thermo-black soils	***Haplic thermo-black soils***
			Luvic thermo-black soils
	Ustic isohumisols	Greyzems	Haplic greyzems
			Umbrihumic greyzems
			Argillic greyzems
		Grey-cimmanon soils	Haplic grey-cinnamon soils
			Calcic grey-cinnamon soils
			Luvic grey-cinnamon soils
		Chernozems	***Haplic chernozems***
			Calcic chernozems
			Luvic chernozems
			Alkalic chernozems
			Aquic chernozems
		Chestnut soils	Haplic chestnut soils
			Umbrihumic chestnut soils
			Calcic chestnut soils
			Alkalic chestnut soils
			Aquic chestnut soils

Soil order	Soil suborder	Soil group	Soil subgroup
Isohumisols *(cont'd)*	Ustic isohumisols	Heilu soils	Haplic Heilu soils
			Umbrihumic Heilu soils
			Cumulic Heilu soils
Ferrallisols	Perudic ferrallisols	Lato-yellow soils	Haplic lato-yellow soils
			Truncatic lato-yellow soils
		Latored-yellow soils	***Haplic latored-yellow soils***
			Humic latored-yellow soils
			Truncatic latored-yellow soils
		Yellow soils	***Haplic yellow soils***
			Humic yellow soils
			Argillic yellow soils
			Truncatic yellow soils
			Agric yellow soils
	Ustic ferrallisols	Dry red soils	***Haplic dry red soils***
			Argillic dry red soils
			Truncatic dry red soils
	Udic ferrallisols	Latosols	***Haplic latosols***
			Truncatic latosols
			Agric latosols
		Latored soils	***Haplic latored soils***
			Humic latored soils
			Argillic latored soils
			Eutrophic latored soils
			Truncatic latored soils
			Agric latored soils
		Red soils	***Haplic red soils***
			Humic red soils
			Argillic red soils
			Yellowic red soils
			Aquic red soils
			Truncatic red soils
			Agric red soils
Fersiallisols	Perudic fersiallisols	Yellow limestone soils	Haplic yellow limestone soils
			Humic yellow limestone soils
			Luvic yellow limestone soils
			Truncatic yellow limestone soils
		Grey yellow-brown soils	Haplic grey yellow-brown soils
			Humic grey yellow-brown soils
		Para-yellow soils	***Haplic para-yellow soils***
			Humic para-yellow soils
			Histic para-yellow soils

Soil order	Soil suborder	Soil group	Soil subgroup
Fersiallisols *(cont'd)*	Ustic fersiallisols	Yellow-cinnamon soils	Haplic yellow-cinnamon soils
			Albic yellow-cinnamon soils
		Red-cinnamon soils	***Haplic red-cinnamon soils***
			Truncatic red-cinnamon soils
	Udic fersiallisols	Brown limestone soils	***Haplic brown limestone soils***
			Humic brown limestone soils
			Luvic brown limestone soils
			Truncatic brown limestone soils
		Red limestone soils	Haplic red limestone soils
			Humic red limestone soils
			Luvic red limestone soils
			Truncatic red limestone soils
		Yellow brown soils	***Haplic yellow brown soils***
			Argillic yellow brown soils
			Panic yellow brown soils
			Albic yellow brown soils
			Dystrophic yellow brown soils
			Aquic yellow brown soils
			Agric yellow brown soils
		Brown-red soils	Haplic brown-red soils
			Argillic brown-red soils
			Eutrophic brown-red soils
			Aquic brown-red soils
			Water-perchic brown-red soils
			Agric brown-red soils
		Para-red soils	***Haplic para-red soils***
			Yellowic para-red soils
			Argillic para-red soils
			Aquic para-red soils
			Water-perchic para-red soils
			Truncatic para-red soils
			Agric para-red soils
Siallisols	Perchic siallisols	Albisols	Haplic albisols
			Gley albisols
			Umbrihumic albisols
	Perudic siallisols	Grey-brown soils	Haplic grey-brown soils
			Humilluvic grey-brown soils
			Spodic grey-brown soils
			Al-saturatic grey-brown soils
			Albic grey-brown soils
		Humus brownified soils	Haplic humus brownified soils
			Dystric humus brownified soils

Soil order	Soil suborder	Soil group	Soil subgroup
Siallisols *(cont'd)*	Ustic siallisols	Cinnamon soils	***Haplic cinnamon soils***
			Calcic cinnamon soils
			Luvic cinnamon soils
			Cumulic cinnamon soils
			Aquic cinnamon soils
	Udic siallisols	Brown soils	Haplic brown soils
			Albic brown soils
			Argillic brown soils
			Aquic brown soils
			Fersiallic brown soils
		Acid brown soils	Haplic acid brown soils
			Spodic acid brown soils
		Dark brown soils	***Haplic dark brown soils***
			Albic dark brown soils
			Epigleyic dark brown soils
			Aquic dark brown soils
		Cryo-brown soils	Haplic cryo-brown soils
			Epigleyic cryo-brown soils
			Spodic cryo-brown soils
Primarosols	Anthropic primarosols	Disturbance soils	Haplic disturbance soils
			Calcic disturbance soils
			Dystric disturbance soils
	Lithic primarosols	Leptisols	Haplic leptisols
			Calcic leptisols
			Dystric leptisols
			Purplish leptisols
			Rendzinic leptisols
			Umbrihumic leptisols

Soil order	Soil suborder	Soil group	Soil subgroup
Primarosols *(cont'd)*	Lithic primarosols	Skeletisols	***Haplic skeletisols***
			Calcaric skeletisols
			Dystric skeletisols
			Purpuric skeletisols
			Umbrihumic skeletisols
			Phosphic skeletisols
			Cinderic skeletisols
	Regosic primarosols	Red-bed soils	Haplic red-bed soils
			Salic red-bed soils
			Calcic red-bed soils
			Dystric red-bed soils
		Purple soils	Haplic purple soils
			Calcic purple soils
			Dystric purple soils
		Loessal soils	Haplic loessal soils
			Medihumic loessal soils
		Blown sand soils	***Haplic blown sand soils***
			Calcaric blown sand soils
			Dystric blown sand soils
			Aquic blown sand soils
		Alluvial soils	Haplic alluvial soils
			Salinic alluvial soils
			Calcaric alluvial soils
			Dystric alluvial soils

Table 5. Approximate correlation between the Chinese Soil Taxonomic Classification (CSTC, 1991) and the FAO-Unesco Revised Legend (FAO, 1988)

Soil Groups in CSTC (1991)	Soil Units (FAO, 1988)	Phase
Skeletisols	Regosols, Cambisols	
Leptisols	Leptosols, Regosols, Cambisols	
Alluvial soils	Fluvisols	
Blown sand soils	Arenosols	
Loessal soils	Calcaric Regosols	
Purple soils	Eutric Leptosols, Calcaric Regosols	
Red-bed soils	Calcaric Regosols	
Disturbance soils	Eutric Cambisols	
Takyr soils	Calcaric Regosols	Takyric, Yermic
Haplo-desert soils	Calcaric Cambisols	Yermic
Haplo-calc soils	Luvic Calcisols	Yermic
Brown desert soils	Haplic Gypsisols	Yermic
Grey desert soils	Calcaric Cambisols	Yermic
Brown calc soils	Haplic Calcisols	Yermic
Sierozems	Haplic Calcisols	Yermic
Frost desert soils	Gelic Leptosols, Gypsisols	Yermic
Cold desert soils	Gypsisols	Yermic
Frost calc soils	Calcisols	Yermic
Cryo-calc soils	Calcisols	Yermic
Heilu soils	Calcic Kastanozems	
Chestnut soils	Calcic Kastanozems	
Chernozems	Chernozems	
Greyzems	Greyzems	
Black soils	Phaeozems	
Thermo-black soils	Phaeozems	
Phospho-calc soils	Calcaric Regosols	
Rendzinas	Rendzic Leptosols, Calcaric Phaeozems	
Cryo-black soils	Phaeozems, Cambisols	
Frost sod soils	Gelic Cambisols	
Cryo-sod soils	Gelic Cambisols	
Podzols	Podzols, Podzoluvisols	
Cinnamon soils	Cambisols, Luvisols	
Brown soils	Luvisols, Cambisols	
Acid brown soils	Luvisols, Cambisols	
Dark brown soils	Cambisols, Mollic Planosols	
Cryo-brown soils	Gelic Cambisols	
Humus brownified soils	Humic Cambisols	

Table 5. *(continued)*

Soil Groups in CSTC (1991)	Soil Units (FAO, 1988)	Phase
Grey-brown soils	Cambisols, Podzoluvisols	
Albisols	Eutric Planosols, Albic Luvisols	
Yellow-cinnamon soils	Luvisols, Cambisols	
Red-cinnamon soils	Luvisols, Cambisols	
Yellow brown soils	Luvisols, Cambisols, Planosols	
Brown-red soils	Luvisols, Cambisols	
Para-red soils	Luvisols, Cambisols	
Red limestone soils	Ferric Luvisols, Rhodic Nitisols	
Brown limestone soils	Haplic Luvisols	
Grey-yellow-brown soils	Luvisols, Cambisols	
Para-yellow soils	Luvisols	
Yellow limestone soils	Luvisols, Calcaric Regosols	
Dry red soils	Lixisols, Alisols	
Red soils	Acrisols, Alisols, Plinthosols	
Latored soils	Acrisols	
Latosols	Acrisols, Ferralsols	
Yellow soils	Alisols	
Latored-yellow soils	Ferric Alisols	
Lato-yellow soils	Ferric Alisols	
Chao soils	Fluvisols, Cambisols	
Umbrihumus Chao soils	Humic Cambisols	
Shajiang black soils	Calcaric Fluvisols	
Foliaged Chao soils	Cambisols	
Gley soils	Gleysols	
Geli-gley soils	Gelic Gleysols	
Solonchaks	Solonchaks	
Solonetz	Solonetz	
Peat soils	Histosols	
Geli-peat soils	Gelic Histosols	
Ando soils	Andosols	
Black clay soils	Vertisols	
Pell clay soils	Vertisols	
Chrom clay soils	Vertisols	
Paddy soils	Fluvisols, Cambisols, Gleysols	Anthraquic
Cumulated soils	Cumulic Anthrosols	
Tier soils	Cumulic Anthrosols	
Irrigation-warping soils	Cumulic Anthrosols	
Fimus soils	Fimic Anthrosols	

MAJOR ECOLOGICAL REGIONS OF CHINA

China can be divided into six major ecological regions, based upon a broad climatical and physiographical zonation (Fig. 3):

1. The cool, subhumid Dongbei Plain (1a) in the Northeast and the humid temperate Huabei and Changjiang Plains (1b) in the East, comprising the Chinese lowlands;
2. The cool, subhumid Da Hinggan, Xiao Hinggan and Changbai Mountain ranges in the Northeast;
3. The semi-arid to arid Nei Mongol Plateau with the adjacent, partly dissected and subhumid Loess Plateau in the central northern part;
4. The arid Junggar and Tarim Basins and surrounding mountain ranges in the Northwest;
5. The cold Qinghai-Xizang Plateau (including the Qaidam basin) bordered by the Himalayan mountain range in the Southwest;
6. The temperate to subtropical Yunnan-Guizhou Plateau, the subtropical Sichuan Basin and the subtropical to tropical Dongnan Hills and Hainan Island in the South and Southeast.

A more detailed description of the various regions can be found in the *Physical Geography of China* (Zhao, 1986). Many of the climatic data given below as well as the length of growing season are derived from *Agroclimatological data. Part 1 (A-J). Asia* (FAO, 1987).

The Dongbei Plain (1a) consists of several low-lying plains rising from sea level in the South to about 300 m in the North near Nenjiang. Large parts are imperfectly to poorly drained due to impaired superficial drainage conditions. The natural vegetation is a forest-steppe or meadow-steppe.

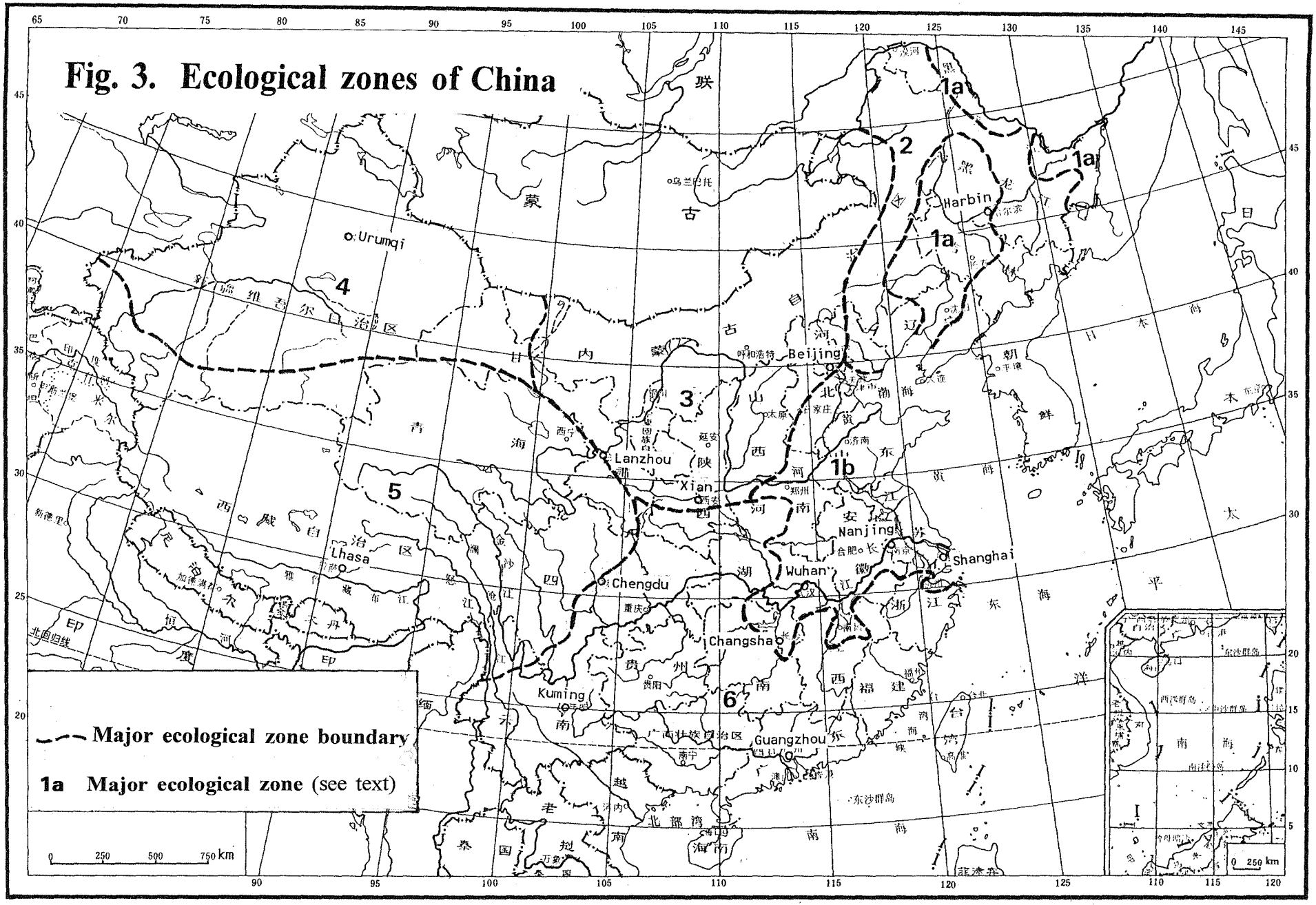
Annual precipitation is 400 to 600 mm, of which more than 70% falls from June to September. Mean annual temperature is 3-9°C, varying from about -17 to -24° in January to about +21 to 25° in July. Generally, it has a frost-free season of less than 150 days per year and the length of the growing season varies between 100 days in the western part to 160 days in the eastern and southern parts.

The Huabei and Changjiang Plains (1b) mainly comprise the large, low-lying alluvial plains in the lower reaches of the Huanghe and Changjiang Rivers. Elevation rarely exceeds 50 m, however, some associated inland areas (e.g. the Lianghu Plain between Wuhan and Changsha and the Poyang Lake Plain north of Nanchang) have somewhat higher elevations (up to 200 m). Natural vegetation is a summer-green, deciduous broad-leaved forest in the northern parts. The original natural vegetation in the southern part has largely disappeared due to the intensive cultivation of the plains. Locally on low mountains and hills patches of mixed evergreen and deciduous broad-leaved forests are still found.

Annual precipitation increases from about 500 to 800 mm in the northern Huabei plain to generally more than 1000 mm in the southern Changjiang Plain. More than 70% of the yearly rainfall occurs during the summer months (June to September). Mean annual temperatures increase from 11 in the North to 16°C in the South. Mean summer temperatures are high, varying from about 25°C in Beijing and Tjanjin, through 26-27°C in the Hefei - Nanjing - Shanghai region, to around 28-29°C in the Lianghu and Poyang Lake Plains. Absolute maxima may reach well over 40°C in the southern region. The mean winter temperature, below zero in the North (approximately -3°C for Beijing and -2.5°C for Tianjin), increases towards the South to about +5°C (Wuhan 5.7°C, Nanjing 3.4°C, Shanghai 4.7°C). The frost-free season in the North lasts between 170 and 220 days. The length of growing season varies between 100 days in the North to about 270-300 days in the South.

The Da Hinggan Mountains and the Xiao Hinggan and Changbai mountain ranges (2) surrounding the Dongbei Plain in the West, East and Southeast rise to altitudes of 1000 m and higher, culminating in Mount Baitou (2744 m), highest point of the Changbai Mountains. The natural vegetation on the Da Hinggan Mountains is a taiga forest, while in the Xiao Hinggan - Changbai Mountain system mixed needle- and broad-leaved forests prevail.

Annual precipitation is around 350-450 mm in the westernmost mountain range and varies from 450 mm in the Xiao Hinggan Mountains to more than 1300 mm in the Changbai Mountains. Mean annual temperatures are low, with a mean January temperature below about -20°C and a mean July temperature less than 19°C. The frost-free period is less than 90 days and permafrost is frequently found north of 51° latitude and at isolated spots south of this latitude.



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The Nei Mongol Plateau with the adjacent Loess Plateau in the central northern part of the country (3) comprises an undulating to hilly region which is steeply dissected at its southern edge. Elevation ranges from 1000 to 1600 m, with a few protruding mountain ranges. The natural vegetation is a forest-steppe in the south, gradually changing to a grassland steppe in the North and Northeast and a desert vegetation to the Northwest.

Rainfall decreases from South to North. The Loess Plateau generally receives between 350 to 650 mm annually, the Nei Mongol Plateau has an annual precipitation of about 400 to 450 mm in the East, 150 to 200 mm in its central part and about 60 mm in the West. 60 to 70% of the rainfall occurs during the summer months. It becomes more erratic, however, towards the more arid parts. Mean annual temperature varies from about -2°C in the extreme northern part of this region (Hailar area) to 1-4°C in the northeastern Nei Mongol Plateau and to 6-8°C in the western and southern parts. Summer temperatures are moderate, varying from about 18°C in the north to 25°C in the west and 20-22°C in the south. Mean winter temperatures are well below zero: in the north between -20 and -25°C, in the central and western parts between -10 and -20°C, and between -5 to -10°C in the South. The length of the growing period is, due to the extreme climatic conditions, rather short: 90 to 120 days in the eastern and southern parts, decreasing to zero in the West.

The Junggar and Tarim Basins and surrounding mountain ranges (4) in the Northwest comprise the major part of China's desert region. Generally, the ground surface in the basins is level to undulating, dominantly covered by coarse materials (mainly sand and gravel). The Junggar Basin ranges in elevation from 500 to 1000 m, with its lowest point at 189 m, that of the Tarim Basin is between 800 and 1300 m. The surrounding mountain ranges, of which the Altay and Tianshan Mountains are the most important, reach altitudes of more than 4000 and 7000 m, respectively.

Annual precipitation in the arid basins is very low and erratic. Most of the Junggar Basin records 100 to 200 mm, while rainfall in the Tarim Basin is generally less than 100 mm. Mean annual temperature ranges from 3 to 8°C in the Junggar Basin and from 10 to 13°C in the Tarim Basin. Mean summer temperatures in the two basins are 18-24°C and 23-25°C, respectively. The Junggar Basin experiences cold winters (mean winter temperatures vary from -8 to -17°C), the Tarim Basin is milder with mean winter temperatures between -1 to -5°C. The frost-free season in the Tarim Basin is 200 to 230 days, the Junggar Basin has a frost-free season of 150-200 days.

The Qinghai-Xizang Plateau (5) (including the Qaidam basin) in the Southwest has an average elevation of more than 4000 m. It is bordered by a series of mountain ranges, the Kunlun, Altun and Qilian Mountains in the North, the Hengduan Mountains and Himalayas in the Southeast and South, and the Karakorum in the West. Most parts have an alpine (arctic) vegetation, which in the warmer and more humid southeastern parts merges into needle-leaved forests.

Annual precipitation ranges considerably, from more than 1000 mm in the Southeast to less than 100 mm in the Northwest. Temperatures vary according to latitude, elevation and north-south exposition. For example, Lhasa (3650 m) has a mean annual temperature of about 7°C with a mean summer temperature of about 15°C and mean winter temperatures of -1°C, while for Naggu (4508 m) and Dulan (Qaidim Basin; 3192 m) these figures are -2 and +2.5, -13 and -9, and 8 and 13.5°C, respectively. The total length of the growing season ranges from zero in the arid northwestern parts through about 110 days near Lhasa to approximately 150 days in the Southeast.

The Yunnan-Guizhu Plateau, Sichuan Basin, Dongnan Hills and Hainan Island (6) in the South and Southeast comprise the part of China that traditionally is characterized by an evergreen broad-leaved forest vegetation and in which paddy rice is the main culture. It consists of mountain ranges, plateau-like parts, larger and smaller structural basins and low hills regions. It rises from sea level in the South and East to altitudes ranging from 1000-2000 m in the western Yunnan-Ghuizu Plateau to generally 2000-3000 m in the Qinling-Daba Mountains in the North. The Sichuan Basin, situated between the former two subregions has an elevation varying from 450 to 750 m. The Dongnan Hills subregion consists of a number of NE-SW trending ranges with elevations between 500 and 1000 m.

Annual rainfall varies from about 700-900 mm in the North through 1000-1200 mm in the Yunnan subregion and 1400-1700 mm in the Dongnan Hills to 1500-2500 mm in the extreme southern parts. About 60-70% of the rainfall occurs during the months of May to September. Mean annual temperature also increases southwards, from about 14°C in the North through 16-17°C in the Sichuan Basin and 15 to 18°C on the Yunnan-Guizhou Plateau to more than 22°C in the South and on Hainan Island. Mean annual temperatures in the Dongnan Hills subregion range from 17-22°C. Mean summer temperatures are well above 22°C throughout the region, except for the Yunnan-Guizhou Plateau, which experiences mild summers with mean temperatures between 20 and 22°C. Mean winter temperatures are above zero throughout, ranging from about 3°C in the northern parts through about 5-8°C on the Yunnan-Guizhou Plateau and in the Sichuan Basin

to 11-15°C in the Dongnan Hills and 14-18°C in the south. The length of the growing season increases gradually southwards from 240 days to more than 320 days.

The occurrence of the soil reference profiles (expressed as FAO (1988) Major Soil Grouping) in each major ecological zone is given in Table 6.

Table 6. Reference soil profiles as FAO's Major Soil Grouping according to ecological zone.

Soil	Ecological Region					
(FAO, 1988)	1	2	3	4	5	6
Acrisols						19,21,25, 46,47
Alisols						22,24,28
Andosols						
Anthrosols			9	13		
Arenosols				15		
Calcisols						
Cambisols	2	34	10			4,5,7,8,20,23, 26,27,29,30,32, 44,45,48,50,51
Chernozems	39					
Ferralsols						17,18
Fluvisols						33
Gleysols						
Greyzems	40					
Gypsisols						
Histosols						
Kastanozems						
Leptosols	42					
Lixisols						43
Luvisols	1,3,36	37				6,46
Nitisols						31
Phaeozems	35,41					49
Planosols						
Plinthosols						
Podzols						
Podzoluvisols						
Regosols			11	12,16		
Solonchaks				14		
Solonetz	38					
Vertisols						

SOIL INFORMATION SHEETS

Generated by the ISRIC Soil Information System (ISIS, version 4.0)

ISIS 4.0 data sheet of reference soil CN 01 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Silti-Chromic Luvisol (1974 : Chromic Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludalf, fine-silty, mixed, thermic (1975 : Typic Hapludalf)
CSTC (1991) : Argillic yellow brown soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Jiangsu Province, Huawa, Yanjiang Commune
Latitude : 32°15′ N Longitude : 118°42′ E Altitude : 25 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 07/83

GENERAL LANDFORM : low hill Topography : undulating
PHYSIOGRAPHIC UNIT : dissected loess region
SLOPE Gradient : 3% Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind : terracettes Pattern : isolated
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet
Slope stability : locally unstable

PARENT MATERIAL : loess
Texture : silty
Remarks : Xia Shu Loess

EFFECTIVE SOIL DEPTH : >180 cm

WATER TABLE : no groundwater table observed
DRAINAGE : moderately well
PERMEABILITY : moderate No slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 120 cm moist

LAND USE : medium level arable farming; Crops : soya bean; no irrigation; Rotation : continuous crop rotation
Land use/vegetation remarks : other crop: maize

ADDITIONAL REMARKS :
MESO- AND MICRORELIEF: slopes have some low (<1m), irregularly spaced escarpments. INFILTRATION: estimated at 1-10 cm/day. SURFACE CHARACTERISTICS: moderate sealing, thickness varies from 0.5 to 1 cm. SOIL FAUNA: ants, worms, beetles and other insects, all kinds of multipieds. LAND USE AND HUMAN INFLUENCES: ploughing with buffalo traction, weed control by hand, use of fertilizers (ammonia and phosphate); large areas of the loess are excavated for brick production. HYDROLOGY: surface drainage almost absent, groundwater level generally below 10 m depth. MICROMORPHOLOGICAL OBSERVATIONS: thin sections show between 15 and 100 cm depth approx. 1-5% oriented clay.

Slide nos. of the ISRIC collection: 5805-5816 and 5826-5829 (profile, details profile, landscape, crop).
Thin sections nos. of the ISRIC collection: 2675-2681.

CLIMATE : Köppen: Cfa
Station: NANJING 32 4 N/118 47 E 62 m a.s.l 22 km SSE of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		43	45	81	104	144	146	161	159	122	109	74	50	1238
precipitation	mm	25	39	56	74	82	93	118	152	164	64	47	38	52	979
no. of raindays			9	10	10	11	11	10	13	12	10	8	9	11	124
T mean	°C	16	2.2	4.0	8.8	15.0	20.5	24.7	28.0	28.0	23.3	17.5	11.2	4.9	15.7
T max	°C	27	6.1	7.8	12.8	18.9	25.6	28.3	31.1	31.1	26.7	21.7	15.0	8.9	19.4
T min	°C	27	-1.7	0.0	4.4	10.0	15.0	20.6	23.9	23.3	18.9	12.8	6.1	0.0	11.1
relative humidity	%		74	77	70	72	74	76	80	79	78	71	71	76	75
windspeed(at 2m)	m/s		4.5	4.9	5.4	5.2	4.8	4.7	4.8	4.5	4.0	4.2	4.5	4.5	4.7
bright sunshine	h/d		4.4	3.9	5.0	5.1	6.6	6.4	7.5	7.5	6.1	6.1	4.8	4.1	5.6

ISIS 4.0 data sheet of reference soil CN 01 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Very deep, moderately well drained, reddish brown silty clay loam derived from late Pleistocene loess. The thin topsoil has a very low organic carbon content and a weak to moderate subangular blocky structure. Upon drying a thick, slightly hard crust develops at the surface. The subsoil has moderate prismatic structures and shows common cutans of oriented clay. Most likely the soil has been truncated.

Ap	0 - 7 cm	Brown (7.5YR 4/4, moist) clay loam; weak medium to coarse subangular blocky structure; very friable; common very fine continuous exped and inped tubular pores; common very fine roots and common fine roots; pH(field): 5.0; abrupt smooth boundary to
AB	7 - 19 cm	Brown (7.5YR 4/4, moist) silty clay; moderate coarse to very coarse subangular blocky structure; friable; broken moderately thick clay and humus cutans; common very fine to fine continuous inped tubular pores; common very fine and fine roots; pH(field): 5.5; clear smooth boundary to
Bt1	19 - 38 cm	Brown (7.5YR 4/4, moist) silty clay; moderate fine prismatic structure; friable; continuous moderately thick clay and humus cutans; common very fine to fine continuous inped tubular pores; common very fine and few fine roots; pH(field): 5.5; gradual smooth boundary to
Bt2	38 - 73 cm	Dark yellowish brown (10YR 4/3.5, moist) clay; moderate medium prismatic structure; friable; continuous moderately thick clay and humus cutans; few to common, very fine to medium continuous exped and inped tubular pores; few very fine roots; pH(field): 5.5; gradual smooth boundary to
Bt3	73 - 104 cm	Dark yellowish brown (10YR 4/4, moist) silty clay; moderate coarse prismatic structure; friable; continuous moderately thick clay and humus cutans; few to common, very fine to medium continuous exped and inped tubular pores; few very fine and fine roots; pH(field): 6.0; diffuse wavy boundary to
BC	104 - 120 cm	Brown (7.5YR 4/4, moist) silty clay; weak coarse prismatic structure; firm; few coarse distinct clear yellowish brown (10YR 5/4) mottles; broken moderately thick clay and humus cutans; few to common, very fine to fine continuous inped tubular pores; few very fine and fine roots; pH(field): 6.0

ANALYTICAL DATA :

Hor.	Depth cm	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 7	-	0	0	0	0	1	2	32	35	67	31	-	1.56	38	37	36	33	30	29	25	21
AB	7 - 19	-	0	0	0	0	1	2	30	36	66	32	-	1.52	39	38	34	32	30	29	28	24
Bt1	19 - 38	-	0	0	0	0	2	2	31	34	65	33	-	1.60	37	37	35	33	32	31	30	26
Bt2	38 - 73	-	0	0	0	0	1	1	31	35	65	34	-	1.59	37	36	34	32	31	30	31	26
Bt3	73 - 104	-	0	0	0	0	1	1	29	36	65	34	-	1.66	35	35	34	32	31	31	33	28
Bt4	104 - 120	-	0	0	0	0	1	1	30	36	66	33	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al cmol(+)/kg	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
Ap	5.3	3.8	-	0.48	0.08	9.9	4.6	0.2	0.0	14.7	0.8	0.7	14.5	46	1.7	15.5	101	5	0.25
AB	6.1	4.2	-	0.23	0.05	10.8	5.7	0.3	0.0	16.8	-	-	13.8	43	0.8	16.8	122	-	0.13
Bt1	6.2	4.3	-	0.18	-	10.3	6.1	0.3	0.0	16.7	-	-	13.6	41	0.6	16.7	123	-	0.14
Bt2	6.4	4.4	-	0.18	-	10.3	6.3	0.3	0.0	16.9	-	-	13.8	41	0.6	16.9	122	-	0.16
Bt3	6.4	4.5	-	0.17	-	10.3	6.2	0.3	0.0	16.8	-	-	14.2	42	0.6	16.8	118	-	0.16
Bt4	6.8	4.5	-	0.15	-	10.3	6.2	0.3	0.2	17.0	-	-	13.8	42	0.5	17.0	123	-	0.10

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	VERM	KAOL	MIX	FELD	GOET	Fe(o)	Al(o)	Si(o)	Fe(d) - % -	Al(d)	Fe(p)	Al(p)
Ap	4	5	4	3	2	3	0.3	0.1	0.0	1.6	0.4	0.1	0.0
AB	4	5	4	3	2	3	0.3	0.1	0.1	1.7	0.4	0.1	0.0
Bt1	4	5	4	3	2	3	0.3	0.1	0.1	1.7	0.4	0.0	0.0
Bt2	4	5	4	3	2	3	0.3	0.1	0.0	1.7	0.4	0.0	0.0
Bt3	4	5	4	3	2	3	0.3	0.1	0.1	1.5	0.3	0.0	0.0
Bt4	4	5	4	3	2	3	0.2	0.1	0.1	1.6	0.3	0.0	0.0

Remarks: MIX = chlorite-vermiculite

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar, GOET goethite. Extr. Fe Al Si: weight %.

ISIS 4.0 data sheet of reference soil CN 02 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Gleyi-Calcaric Cambisol (Siltic), anthraquic phase
(1974) : Gleyic Cambisol, phreatric phase
USDA/SCS SOIL TAXONOMY (1992) : Oxyaquic Eutrochrept, fine-silty, mixed, thermic (1975 : Typic Eutrochrept)
CSTC (1991) : Haplic yellow brown soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; calcareous
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : aquic
Soil temperature regime : thermic

LOCATION : Jiangsu Province, Huoxitang, October Commune, 22 km E of Nanjing
Latitude : 32° 3' N Longitude : 119°20' E Altitude : 20 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 07/83

GENERAL LANDFORM : valley Topography : undulating
PHYSIOGRAPHIC UNIT : terraced valley bottom
SLOPE Gradient : < 0.5% Form : straight
POSITION OF SITE : flat
MICRO RELIEF Kind : artificial terracing Height : 10 - 15 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : alluvium derived from loess

EFFECTIVE SOIL DEPTH : > 120 cm

WATER TABLE : groundwater table Depth : 90 cm Estimated lowest level : > 120 cm
perched water table Estimated highest level : 0 cm Estimated lowest level : 17 cm
DRAINAGE : poor
PERMEABILITY : slow Slowly permeable layer : 0 to 17 cm
FLOODING Frequency : yearly, fresh water Run off : ponded
MOISTURE CONDITIONS PROFILE : 0 - 17 cm wet, 17 - 90 cm moist, 90 - >120 cm wet

LAND USE : arable farming; terracing
CROPS : paddy rice as part of a continuous rice-wheat rotation

ADDITIONAL REMARKS :
PHYSIOGRAPHY: site is surrounded by undulating hills. HYDROLOGY: surface drainage is controlled by ditches and sluices. LAND USE AND HUMAN INFLUENCES: puddling; submerging; weed control by hand; the surrounding hills are used for vegetable and tea production. MORPHOLOGY: throughout the profile small brick and pottery fragments occur. SOIL FAUNA: some worms.

Slide nos. of the ISRIC collection: 5817-5825 (profile, landscape, crop, soil pit).
Thin section nos. of the ISRIC collection: 2682-2686.

CLIMATE : Köppen: Cfa
Station: NANJING 32 4 N/118 47 E 62 m a.s.l. 55 km E of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		43	45	81	104	144	146	161	159	122	109	74	50	1238
precipitation	mm	25	39	56	74	82	93	118	152	164	64	47	38	52	979
no. of raindays			9	10	10	11	11	10	13	12	10	8	9	11	124
T mean	°C	16	2.2	4.0	8.8	15.0	20.5	24.7	28.0	28.0	23.3	17.5	11.2	4.9	15.7
T max	°C	27	6.1	7.8	12.8	18.9	25.6	28.3	31.1	31.1	26.7	21.7	15.0	8.9	19.4
T min	°C	27	-1.7	0.0	4.4	10.0	15.0	20.6	23.9	23.3	18.9	12.8	6.1	0.0	11.1
relative humidity	%		74	77	70	72	74	76	80	79	78	71	71	76	75
windspeed(at 2m)	m/s		4.5	4.9	5.4	5.2	4.8	4.7	4.8	4.5	4.0	4.2	4.5	4.5	4.7
bright sunshine	h/d		4.4	3.9	5.0	5.1	6.6	6.4	7.5	7.5	6.1	6.1	4.8	4.1	5.6

ISIS 4.0 data sheet of reference soil CN 02 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Very deep, poorly drained, strongly mottled yellowish brown silty clay loam in Holocene alluvial deposits derived from Pleistocene (Xia Shu) loess. The soil is artificially submerged. The topsoil is frequently puddled (a muddy layer 5-10cm thick occurs at the surface) and has a porous massive appearance. Organic carbon content is low. The subsoil has weak to moderate subangular blocky, locally prismatic structures. The overall soil reaction is slightly alkaline.

Apg 0 - 17 cm Dark grayish brown (2.5Y 4/2, moist) clay; porous massive; slightly sticky, slightly plastic, firm; many medium and coarse distinct clear dark brown (7.5YR 4/4) mottles; few very fine and fine discontinuous inped tubular pores; few very fine roots; very few medium weathered slate fragments; pH(field) 6.0; abrupt smooth boundary to

Btg1 17 - 40 cm Light olive brown (2.5Y 5/4, moist) clay; weak medium subangular blocky structure; slightly sticky, plastic, firm; many medium and coarse distinct clear brown (7.5YR 5/4 and 7.5YR 4/6) mottles; broken moderately thick clay and sesquioxide cutans; common very fine and fine discontinuous inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; very few medium weathered slate fragments; slightly calcareous; pH(field) 6.0; clear smooth boundary to

Btg2 40 - 70 cm Yellowish brown (10YR 5/4, moist) clay; moderate medium prismatic structure; slightly sticky, plastic, friable; many medium and coarse distinct clear mottles strong brown (7.5YR 5/6) and dark bluish gray (5B 4/1) mottles; broken moderately thick clay and sesquioxide cutans; common very fine and fine discontinuous inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; very few medium weathered slate fragments; slightly calcareous; pH(field) 6.0; gradual smooth boundary to

Btg3 70 - 95 cm Yellowish brown (10YR 5/4, moist) clay; moderate medium to coarse subangular blocky structure; slightly sticky, plastic; many medium and coarse distinct clear strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; continuous moderately thick clay and sesquioxide cutans; common very fine and fine discontinuous inped tubular pores; very few small spherical soft manganiferous concretions; very few medium weathered slate fragments; slightly calcareous; pH(field) 6.0; gradual smooth boundary to

Bg 95 - 120 cm Dark yellowish brown (10YR 4/4, moist) clay; weak medium subangular blocky structure; sticky, plastic; many medium and coarse distinct clear yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; broken moderately thick clay and sesquioxide cutans; few very fine and fine discontinuous inped tubular pores; few small spherical soft manganiferous concretions; slightly calcareous; pH(field) 6.0

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Apg	0 - 17	-	0	0	0	0	1	2	27	39	66	32	-	1.54	43	43	42	40	39	38	30	26
Btg1	17 - 40	-	0	0	0	0	1	1	30	38	68	31	-	1.60	41	41	39	37	36	35	29	25
Btg2	40 - 70	-	0	0	0	0	1	1	29	39	68	31	-	1.61	43	42	40	38	37	35	28	24
Btg3	70 - 95	-	0	0	0	0	1	1	28	39	68	31	-	-	-	-	-	-	-	-	-	-
Bg	95 - 120	-	0	0	0	0	1	1	23	43	66	33	-	1.62	41	41	40	38	37	36	34	29

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Apg	7.0	5.7	1.6	0.96	0.11	12.0	4.8	0.2	0.2	17.2	-	-	16.8	52	3.4	17.2	102	-	0.77
Btg1	7.7	6.0	3.1	0.25	0.07	11.2	4.9	0.2	0.2	16.5	-	-	13.8	45	0.9	16.5	120	-	0.16
Btg2	7.7	5.7	3.3	0.16	0.04	12.0	5.5	0.2	0.2	17.9	-	-	13.2	43	0.6	17.9	136	-	0.13
Btg3	7.6	5.6	3.8	0.25	-	10.7	5.6	0.3	0.2	16.8	-	-	14.0	45	0.9	16.8	120	-	0.12
Bg	7.5	5.6	3.4	0.25	-	12.0	6.4	0.3	0.0	18.7	-	-	15.7	47	0.9	18.7	119	-	0.13

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	VERM	KAOL	MIX	FELD	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
							- % -								
Apg	4	6	4	3	2	3	0.6	0.1	0.1	1.3	0.2	0.1	0.0	0.1	0.0
Btg1	4	5	4	3	2	3	0.2	0.1	0.0	1.5	0.3	0.1	0.1	0.0	0.0
Btg2	4	5	4	3	2	3	0.3	0.1	0.1	1.4	0.2	0.1	0.1	0.0	0.0
Btg3	4	5	4	3	2	3	0.4	0.1	0.1	1.4	0.2	0.2	0.1	0.0	0.0
Bg	4	6	4	3	2	3	0.5	0.1	0.0	1.5	0.2	0.1	0.1	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 03 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Fluvi-Stagnic Luvisol, anthraquic phase (1974 : Gleyic Luvisol, phreatric phase)
USDA/SCS SOIL TAXONOMY (1992) : Aquic Hapludalf, fine, mixed, thermic (1975 : Aquic Hapludalf)
CSTC (1991) : Recalcaric paddy soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon; stagnic properties
USDA/SCS (1992) : ochric epipedon, argillic horizon; aquic conditions within 50 cm depth
Soil moisture regime : aquic
Soil temperature regime : thermic

LOCATION : First of July People's Commune, Quibao, Shanghai County
Latitude : 31°19′ N Longitude : 121°24′ E Altitude : 4 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM : alluvial plain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : level plain of the Chang Jiang River
SLOPE Gradient : < 0.5%
POSITION OF SITE : flat
MICRO RELIEF Kind : none
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : clayey deltaic deposits

EFFECTIVE SOIL DEPTH : 100 cm

WATER TABLE Depth : 50 cm Kind : groundwater table
Estimated highest level : 50 cm Estimated lowest level : 102 cm
DRAINAGE : poor
PERMEABILITY : slow Slowly permeable layer from : 21 to 27 cm
FLOODING Frequency : irregular, fresh water
MOISTURE CONDITIONS PROFILE : 0 - 100 cm moist 100 - 120 cm wet

LAND USE : arable farming; crops: vegetables in continuous rotation. Until 1982 rice was grown.

ADDITIONAL REMARKS :
HYDROLOGY: until 1982 flooding by the Chang Jiang occurred every 10 years with a submergence of 10-20 cm depth; infiltration is estimated at 1-10 cm/day; surface drainage is controlled by ditches at various levels of importance. HUMAN INFLUENCES: ploughing, until 1982 puddling; the land has been bunded in 1982 into parcels of about 2 m wide. MORPHOLOGY: throughout the soil small pottery fragments occur.

The First of July People's Commune of Quibao comprised in 1982 about 200,000 people, divided over 11 production brigades. There are seven enterprises (small factories), some related to the agricultural production of the commune, others for building materials or cloth production (silk materials). The total cultivated area is 1270 ha (19,000 mu), 40% of which is used for the rice-wheat rotation, 40% for vegetables, 16% for cotton and 4% for other uses (e.g. fish ponds). The main cropping system is early rice - late rice - wheat/barley. Early rice is planted late May and harvested early August. Late rice is from early August to late October and wheat/barley is from November to late May. Yields are: rice (both early and late) 11.5 ton/ha, wheat/barley 4.4 ton/ha, cotton 0.9 ton/ha and rapeseed 1.7 ton/ha; vegetables 82.5 ton/ha/year. Fertilizers used for the rice-wheat cropping system are N: ammonium carbonate, 2.25 ton/ha; K: KCl, 18.75 kg/ha; P: super-phosphate, 262.5 kg/ha. In addition organic manure and straw is applied. Ammonium phosphate is used as fertilizer for vegetables. The commune has 200 pigs, ducks and chicken for organic manure production and meat. There are water buffalos to provide animal traction and, in addition, 300 sheep for milk.
The main soil type in the commune is the waterlogged paddy soil, according to the division used in the Taihu Region. Other soil types present are the percolating, submergic and gleyed paddy soils.

Slide nos. of the ISRIC collection: 5831-5842 (profile, landscape, crop, soil pit).
Thin section nos. of the ISRIC collection: 2687-2693.

CLIMATE : Köppen: Cfa
Station: SHANGHAI 31 12 N/121 26 E 5 m a.s.l. 13 km SSE of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		42	44	67	91	123	118	153	155	115	99	71	56	1134
precipitation	mm	62	48	58	84	94	94	180	147	142	130	71	51	36	1135
no. of raindays			10	10	12	13	12	14	11	11	12	9	8	8	130
T mean	°C	81	3.4	4.3	8.2	13.7	18.9	23.1	27.1	27.2	23.0	17.7	11.6	5.6	15.3
T max	°C	38	7.8	8.3	12.8	18.9	25.0	27.8	32.2	32.2	27.8	23.3	17.2	11.7	20.4
T min	°C	38	0.6	1.1	4.4	10.0	15.0	19.4	23.3	23.3	18.9	13.9	7.2	2.2	11.6
relative humidity	%		78	79	79	79	80	84	84	84	83	79	78	77	80
windspeed(at 2m)	m/s		4.6	4.6	4.9	4.9	4.6	4.4	4.9	4.7	4.1	3.9	4.2	4.5	4.5
bright sunshine	h/d		4.0	3.8	4.4	4.8	5.5	4.7	6.9	7.5	5.3	5.6	4.7	4.5	5.1

ISIS 4.0 data sheet of reference soil CN 03 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

DESCRIPTION OF THE PROFILE :
Deep, poorly drained, mottled, brown clay derived from alluvial deltaic deposits. Submergence and puddling has resulted in a porous massive topsoil abruptly overlying a massive plough pan. Organic carbon content is moderate. The subsoil shows weak to moderate angular blocky structures. Illuvial iron is present below 50cm.

Ap1 0 - 21 cm Brown (10YR 4/3, moist) clay; porous massive; slightly sticky, slightly plastic, friable; few fine faint clear dark yellowish brown (10YR 4/4) mottles; common micro and very fine continuous tubular pores; common very fine and fine roots; very few medium weathered slate fragments; few shells; pH(field) 6.0; abrupt smooth boundary to

Ap2 21 - 27 cm Dark grayish brown (10YR 4/2, moist) clay; massive; sticky, plastic, friable; common fine distinct clear yellowish brown (10YR 5/8) mottles; few micro continuous tubular pores; common very fine roots and common fine roots; very few medium weathered slate fragments; few shells; pH(field) 6.0; abrupt smooth boundary to

Bg1 27 - 52 cm Brown (10YR 4/3, moist) clay; weak medium angular blocky structure; slightly sticky, slightly plastic, firm; common fine distinct clear very dark grayish brown (10YR 3/2) and strong brown (7.5YR 5/6) mottles; common micro and very fine continuous exped and inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; very few medium weathered slate fragments; few shells; pH(field) 6.0; clear smooth boundary to

Bg2 52 - 65 cm Brown (10YR 4/3, moist) clay; moderate medium angular blocky structure; slightly sticky, slightly plastic, firm; few fine distinct clear dark yellowish brown (10YR 3/4) mottles; patchy thin clay and sesquioxide cutans; common micro continuous exped and inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; very few medium weathered slate fragments; few shells; pH(field) 6.0; clear smooth boundary to

Bg3 65 - 102 cm Brown (10YR 5/3 moist) clay; moderate coarse angular blocky structure; sticky, plastic, firm; many fine distinct clear yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2) mottles; patchy thin clay and sesquioxide cutans; common micro continuous exped and inped tubular pores; frequent small and medium spherical, soft and hard ferruginous and manganiferous concretions; very few medium weathered slate fragments; few shells; pH(field) 6.0; clear wavy boundary to

Cr 102 - 120 cm Dark gray (10YR 4/1, moist) clay; porous massive; slightly sticky, slightly plastic, friable; many fine and medium distinct clear yellowish brown (10YR 5/8) and black (N 2/0); few micro continuous tubular pores; very few medium weathered slate fragments; few shells; pH(field) 6.0

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap1	0 - 21	-	0	0	0	0	0	1	26	47	73	26	-	1.32	48	47	45	44	42	41	27	23
Ap2	21 - 27	-	0	0	0	0	1	1	25	49	74	25	-	1.41	46	45	44	42	41	40	25	22
Bg1	27 - 52	-	0	0	0	0	0	1	22	52	73	26	-	1.49	41	41	39	38	37	36	26	22
Bg2	52 - 65	-	0	0	0	0	0	0	13	51	64	36	-	1.56	42	41	39	38	37	35	34	29
Bg3	65 - 102	-	0	0	0	0	0	0	10	49	59	41	-	1.49	46	45	44	43	42	41	39	32
Cr	102 - 120	-	0	0	0	0	0	0	11	47	58	42	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap1	7.2	6.4	1.7	1.11	0.14	14.0	3.8	0.3	0.2	18.3	-	-	16.1	61	3.9	18.3	114	-	0.29
Ap2	7.5	6.6	2.7	0.77	0.10	12.7	3.7	0.3	0.2	16.9	-	-	15.1	61	2.7	16.9	112	-	0.34
Bg1	7.8	6.3	2.0	0.44	0.06	11.9	4.1	0.3	0.4	16.7	-	-	14.9	57	1.5	16.7	112	-	0.18
Bg2	8.0	6.4	2.3	0.47	0.06	14.0	6.0	0.3	0.4	20.7	-	-	18.6	52	1.6	20.7	111	-	0.16
Bg3	8.2	7.0	3.7	0.28	-	15.4	6.9	0.5	0.3	23.1	-	-	18.1	44	1.0	23.1	128	-	0.25
Cr	7.9	6.7	3.2	0.42	-	15.4	6.7	0.4	0.4	22.9	-	-	20.1	47	1.5	22.9	114	-	0.25

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	VERM	CHLO	SMEC	KAOL	MIX	QUAR	FELD	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
										- % -								
Ap1	4	4	3	4	4	2	1	-	2	0.4	0.1	0.0	0.9	0.1	0.3	0.0	0.0	0.0
Ap2	4	4	3	4	4	2	1	-	2	0.4	0.1	0.0	0.9	0.1	0.3	0.1	0.0	0.0
Bg1	4	4	3	4	4	2	1	-	2	0.3	0.1	0.1	0.9	0.2	0.3	0.1	0.0	0.0
Bg2	4	4	3	4	4	2	1	-	2	0.1	0.1	0.1	1.2	0.2	0.3	0.1	0.0	0.0
Bg3	4	4	3	4	4	2	1	-	2	0.1	0.1	0.1	1.8	0.2	0.4	0.2	0.0	0.0
Cr	4	4	3	4	4	2	2	2	2	0.1	0.1	0.1	1.5	0.2	0.3	0.0	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, CHLO chlorite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 04 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Siltic and Chromic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, fine, mixed, thermic (1975 : Typic Dystrochrept)
CSTC (1991) : Haplic latored soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Hunan Province, 8 km E of Changsha
Latitude : 28°12′ N Longitude : 113° 5′ E Altitude : 40 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM : alluvial plain Topography : undulating
PHYSIOGRAPHIC UNIT : footslope of hill
SLOPE Gradient : 6% Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : alluvium

EFFECTIVE SOIL DEPTH : > 180 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE / VEGETATION : afforestation of young pine trees with grass and herb undergrowth

ADDITIONAL REMARKS :
PARENT MATERIAL: the alluvial deposits in this region are underlain by purple rocks; locally layers of rounded gravel occur in the Red Earths of Changsha, mainly consisting of slightly weathered quartz. HYDROLOGY: infiltration is estimated at 10-50 cm/day. SURFACE DRAINAGE: coarse dendritic; in the lower reaches controlled by ditches for irrigating paddy fields. HUMAN INFLUENCES: locally levelling has taken place for vegetable growing. SOIL FAUNA: ants, beetles, worms, possibly snakes.

Slide nos. in the ISRIC collection: 5843-5853 (soil, landscape, vegetation).
Thin section nos. in the ISRIC collection: 2694-2702.

CLIMATE : Köppen: Cfa
Station: CHANGSHA 28 15 N/112 50 E 48 m a.s.l. 24 km W of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		33	33	56	72	103	119	156	160	121	98	60	43	1054
precipitation	mm	19	64	121	122	203	212	254	118	121	80	83	85	68	1531
no. of raindays			12	15	16	18	17	14	10	11	9	11	12	14	159
T mean	°C	12	4.3	6.2	10.9	16.8	22.0	25.6	29.3	29.0	24.6	18.3	12.1	6.7	17.2
T max	°C	14	7.2	8.9	15.0	21.1	26.7	30.0	34.4	34.4	30.0	23.9	17.8	10.6	21.7
T min	°C	14	1.7	2.8	7.8	13.3	19.4	22.8	25.6	25.6	21.1	15.0	9.4	3.9	13.9
relative humidity	%		84	87	85	84	83	81	78	76	79	79	82	81	82
windspeed(at 2m)	m/s		2.6	3.1	2.5	2.3	2.1	2.0	2.4	2.1	2.5	2.3	2.6	2.7	2.5
bright sunshine	h/d		2.8	1.8	3.0	2.4	4.3	4.8	6.6	7.4	5.2	6.5	3.7	2.5	4.3

PROFILE DESCRIPTION :
Very deep, well drained, red silty clay loam derived from early Quaternary alluvial deposits. The topsoil is low in organic carbon and has a weak to moderate subangular blocky structure. The subsoil has subangular blocky to prismatic structures, tending to become "nut-shaped" between 39 and 113 cm depth. The soil is very low in nutrients and has an acid to strongly acid soil reaction throughout. The amount of exchangeable aluminium is high.

Ah 0 - 6 cm Red (2.5YR 4/8, moist) clay loam; weak fine to very fine subangular blocky structure; very friable; common very fine discontinuous exped interstitial and tubular pores; common very fine roots and few medium roots; pH(field) 5.0; abrupt smooth boundary to

AB 6 - 25 cm Red (2.5YR 4/8, moist) clay loam; moderate fine to medium subangular blocky structure; friable; patchy thin clay and sesquioxide cutans; common very fine discontinuous inped tubular pores; common very fine roots and few medium roots; pH(field) 5.5; clear smooth boundary to

ISIS 4.0 data sheet of reference soil CN 04 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

Bt1 25 - 39 cm Red (2.5YR 4/8, moist) clay; moderate fine to medium subangular blocky structure; friable; broken moderately thick clay and sesquioxide cutans; common very fine to fine continuous and discontinuous inped tubular pores; common very fine and fine roots; pH(field) 5.0; clear smooth boundary to

Bt2 39 - 80 cm Red (2.5YR 5/8, moist) clay; moderate fine to medium prismatic structure; friable; few fine prominent sharp yellow (10YR 7/8) mottles; continuous moderately thick clay and sesquioxide cutans; common very fine discontinuous inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; pH(field) 5.0; diffuse smooth boundary to

Bt3 80 - 113 cm Red (2.5YR 4/8, moist) clay; moderate fine to medium prismatic structure; friable; few fine prominent sharp yellow (10YR 7/8) mottles; continuous moderately thick clay and sesquioxide cutans; few very fine discontinuous inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; pH(field) 4.5; diffuse smooth boundary to

Bt4 113 - 150 cm Red (2.5YR 5/8, moist) clay; moderate fine to medium subangular blocky structure; firm; few fine prominent sharp yellow (10YR 7/8) mottles; broken moderately thick clay and sesquioxide cutans; few very fine discontinuous inped tubular pores; few very fine roots; very few small spherical soft manganiferous concretions; pH(field) 5.0

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	Spec. surf. soil m2/g
Ah	0 - 6	-	0	1	1	2	6	10	13	38	51	39	20.4	1.35	46	44	40	34	32	28	23	20	-
AB	6 - 25	-	0	1	1	2	5	8	13	40	53	39	2.0	1.41	45	44	41	34	33	30	24	21	-
Bt1	25 - 39	-	0	1	1	2	5	9	12	42	54	37	0.0	1.43	44	43	39	34	33	30	24	21	-
Bt2	39 - 60	-	0	1	1	2	5	8	11	40	51	41	0.0	1.53	42	41	39	35	34	32	27	24	-
	60 - 80	-	0	1	1	2	5	8	13	41	54	38	0.5	-	-	-	-	-	-	-	-	-	-
Bt3	80 - 113	-	0	0	1	1	4	6	13	42	55	39	1.5	1.60	40	39	37	34	33	32	28	24	50
Bt4	113 - 130	-	0	1	1	2	6	10	13	40	53	38	1.0	-	-	-	-	-	-	-	-	-	-
	130 - 150	-	0	1	1	2	7	11	14	38	52	37	1.0	-	-	-	-	-	-	-	-	-	48

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.9	3.9	-	1.20	0.09	0.4	0.1	0.2	0.0	0.7	3.4	3.4	7.1	18	4.2	4.1	10	48	0.04
AB	4.9	3.9	-	0.55	0.06	0.0	0.1	0.1	0.0	0.2	3.3	3.2	5.5	14	1.9	3.5	4	58	0.03
Bt1	5.0	3.9	-	0.16	0.04	0.0	0.1	0.1	0.0	0.2	3.2	3.1	4.6	12	0.6	3.4	4	67	0.01
Bt2	5.1	3.9	-	0.13	-	0.0	0.1	0.1	0.0	0.2	3.4	3.3	5.1	12	0.5	3.6	4	65	0.01
	5.1	3.9	-	0.11	-	0.0	0.1	0.1	0.0	0.2	3.3	3.2	5.3	14	0.4	3.5	4	60	0.01
Bt3	5.1	3.9	-	0.11	-	0.4	0.1	0.1	0.0	0.6	3.3	3.3	5.3	14	0.4	3.9	11	62	0.02
Bt4	5.0	3.9	-	-	-	0.4	0.1	0.1	0.0	0.6	3.5	3.4	5.5	15	-	4.1	11	62	0.01
	5.0	3.8	-	-	-	0.0	0.1	0.1	0.0	0.2	3.8	3.6	5.7	15	-	4.0	4	63	0.01

ELEMENTAL COMPOSITION OF TOTAL CLAY (in weight %) AND MOLAR RATIOS

Hor.	SiO2	Al2O3	Fe2O3	CaO	MgO	K2O	Na2O	TiO2	MnO2	P2O5	IGN. LOSS	SiO2/ Al2O3	SiO2/ Fe2O3	SiO2/ R2O3	Al2O3/ Fe2O3
Bt3	46.3	27.6	10.3	0.05	1.14	2.76	-	1.25	0.10	0.11	9.3	2.9	12.0	2.3	4.2
Bt4	46.5	28.0	10.7	0.04	1.15	2.72	-	1.36	0.06	0.10	9.4	2.8	11.6	2.3	4.1

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	KAOL	MIX	QUAR	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
						- % -								
Ap	4	4	4	1	3	0.1	0.1	0.0	2.4	0.4	0.1	0.1	0.4	0.1
AB	4	4	4	1	3	0.2	0.1	0.0	2.4	0.5	0.1	0.1	0.3	0.1
Bt1	4	4	4	1	3	0.2	0.1	0.0	2.4	0.4	0.1	0.0	0.1	0.1
Bt2	4	4	4	1	3	0.2	0.2	0.0	2.5	0.5	0.1	0.1	0.0	0.1
	4	4	4	1	3	0.2	0.2	0.0	2.5	0.5	0.2	0.1	0.0	0.1
Bt3	4	4	4	1	3	0.2	0.1	0.0	2.4	0.5	0.1	0.0	0.0	0.1
Bt4	4	4	4	1	3	0.1	0.1	0.1	2.4	0.5	0.1	0.0	0.0	0.1
	4	4	4	1	3	0.1	0.1	0.0	2.6	0.5	0.1	0.0	0.0	0.1

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, KAOL kaolinite, MIX mixed layer silicates (vermiculite-chlorite), QUAR quartz, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 05 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Silti-Calcaric Cambisol (Chromic) (1974 : Chromic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Eutrochrept, fine, mixed, thermic (1975 : Typic Eutrochrept)
CSTC (1991) : Calcaric purple soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; calcareous
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Hunan Province, Qutang Commune, 25 km E of Changsha
Latitude : 28°12' N Longitude : 113° 9' E Altitude : 40 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM : low hill Topography : rolling
PHYSIOGRAPHIC UNIT :
SLOPE Gradient : 10% Form : straight
POSITION OF SITE : upper slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : slight sheet and slight rill

PARENT MATERIAL : purple shale of Tertiary age

EFFECTIVE SOIL DEPTH : 65 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 70 cm moist

LAND USE AND VEGETATION : (semi-) natural grassland vegetation, consisting mainly of cocongrass

ADDITIONAL REMARKS :
INFILTRATION: estimated at 1-10 cm/day. HYDROLOGY: surface drainage is coarse dendritic, mainly man-controlled by a system of ditches in the paddy fields. SOIL FAUNA: some ants and worms. LAND USE AND HUMAN INFLUENCES: levelling and local ploughing; cultivated land in the area is used for growing vegetables (soil tillage by hoeing; weed control by hand).

Slide nos. of the ISRIC collection: 5854-5859 (profile, landscape, vegetation).
Thin section nos. of the ISRIC collection: 2703-2706.

CLIMATE : Köppen: Cfa
Station: CHANGSHA 28 15 N/112 50 E 48 m a.s.l. 41 km W of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		33	33	56	72	103	119	156	160	121	98	60	43	1054
precipitation	mm	19	64	121	122	203	212	254	118	121	80	83	85	68	1531
no. of raindays			12	15	16	18	17	14	10	11	9	11	12	14	159
T mean	°C	12	4.3	6.2	10.9	16.8	22.0	25.6	29.3	29.0	24.6	18.3	12.1	6.7	17.2
T max	°C	14	7.2	8.9	15.0	21.1	26.7	30.0	34.4	34.4	30.0	23.9	17.8	10.6	21.7
T min	°C	14	1.7	2.8	7.8	13.3	19.4	22.8	25.6	25.6	21.1	15.0	9.4	3.9	13.9
relative humidity	%		84	87	85	84	83	81	78	76	79	79	82	81	82
windspeed(at 2m)	m/s		2.6	3.1	2.5	2.3	2.1	2.0	2.4	2.1	2.5	2.3	2.6	2.7	2.5
bright sunshine	h/d		2.8	1.8	3.0	2.4	4.3	4.8	6.6	7.4	5.2	6.5	3.7	2.5	4.3

ISIS 4.0 data sheet of reference soil CN 05 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Shallow, moderately well drained, clayey soil derived from "purple" shale. The soil colour is uniformly dark reddish brown and strongly related to the colour of the parent rock. Organic carbon content is low. The soil is calcareous and has an alkaline soil reaction throughout. Its subangular blocky structure is moderately developed.

Ap	0 - 10 cm	(Dark) reddish brown (5YR 3.5/4, moist) clay; moderate fine to medium subangular blocky structure; friable; common very fine and fine continuous inped tubular pores; many fine and medium roots; pH(field) 7.0; clear smooth boundary to
Bw1	10 - 25 cm	Reddish brown (5YR 4/4, moist) clay; moderate fine to medium subangular blocky structure; friable; common very fine and fine continuous inped tubular pores; common fine and medium roots; pH(field) 7.0; clear smooth boundary to
Bw2	25 - 48 cm	Reddish brown (5YR 4/4, moist) clay; moderate fine subangular blocky structure; friable; few fine prominent sharp very dark gray (10YR 3/1) mottles; few very fine continuous inped tubular pores; common fine roots; very few small spherical soft manganiferous concretions; very few coarse strongly weathered shale fragments; pH(field) 7.0; clear wavy boundary to
CR	48 - 68 cm	Reddish brown (5YR 4/4, moist) very gravelly clay; firm; few medium prominent sharp very dark gray (10YR 3/1) mottles; common very fine continuous tubular pores; few fine roots; very few small spherical soft manganiferous concretions; very frequent coarse weathered shale fragments; pH(field) 7.0; clear wavy boundary to
R	68 cm+	Reddish brown (5YR 4/4, moist); extremely firm; few medium prominent sharp very dark gray (10YR 3/1) mottles

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ap	0 - 10	-	0	0	0	2	7	9	11	36	47	44	-	1.43	48	47	44	42	41	38	33	31
Bw1	10 - 25	-	0	0	0	1	6	8	9	34	43	50	-	1.52	44	44	43	40	39	37	38	35
Bw2	25 - 48	-	0	0	0	1	4	5	7	42	49	46	-	1.56	44	44	43	41	40	38	38	35
CR	48 - 68	-	0	0	0	1	6	7	16	43	59	34	-	-	-	-	-	-	-	-	-	-

Remarks (Bw1) : anomaly between pF 2.7 and 3.4 caused by sampling heterogeneity and difference in analytical procedure.

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	8.0	6.9	5.5	0.53	0.07	36.0	1.0	0.4	0.0	37.4	-	-	23.1	53	1.9	37.4	162	-	0.22
Bw1	8.2	6.9	6.0	0.41	0.06	35.5	1.1	0.4	0.0	37.0	-	-	24.0	48	1.4	37.0	154	-	0.22
Bw2	8.2	6.5	3.5	0.23	0.04	34.2	1.6	0.4	0.0	36.2	-	-	24.2	53	0.8	36.2	150	-	0.15
CR	8.5	6.9	8.4	0.08	0.03	37.2	2.2	0.3	0.0	39.7	-	-	22.7	67	0.3	39.7	175	-	0.18

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	SMEC	KAOL	MIX	QUAR	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
										%				
Ap	4	3	4	1	2	0.1	0.1	0.1	1.8	0.1	0.1	0.1	0.0	0.0
Bw1	4	3	4	1	2	0.1	0.1	0.1	2.1	0.2	0.2	0.1	0.0	0.0
Bw2	4	2	4	1	2	0.1	0.1	0.1	2.0	0.2	0.2	0.1	0.0	0.0
CR	4	2	4	1	2	0.0	0.1	0.1	1.6	0.2	0.2	0.1	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: SMEC smectite, KAOL kaolinite, MIX mixed layer silicates (chlorite-vermiculite), QUAR quartz, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 06 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Chromi-Vertic Luvisol, rudic phase (1974 : Eutric Nitosol, stony phase)
USDA/SCS SOIL TAXONOMY (1992) : Vertic Paleudalf, very-fine, mixed, thermic (1975 : Vertic Paleudalf)
CSTC (1991) : Haplic brown limestone soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon; vertic properties
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangxi Zhuang Autonomous Region, Fuli Commune, 5 km SE of Yangshuo
Latitude : 24°49′ N Longitude : 110°31′ E Altitude : 150 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : plain with very steep hills
SLOPE Gradient : 7% Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : rocky (10-25% of area) Stoniness : very stony (3-15% of area)
Cracking : small cracks Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : residual material derived from Ordovician limestone

EFFECTIVE SOIL DEPTH : > 180 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 10 cm dry 10 - 120 cm moist

LAND USE : (semi-) natural vegetation
VEGETATION Type : grassland consisting dominantly of cocongrass with some shrubs

ADDITIONAL REMARKS :
PARENT ROCK: limestone consists dominantly of fine-grained calcite, traversed by veins of coarse-grained, well developed calcite crystals. CRACKINGS: depth down to 30 cm, spacing about 10 cm. HYDROLOGY: moderately fine dendritic drainage, sometimes underground; infiltration is estimated at 1-10 cm/day. pH: according to local soil scientists pH varies from 6.8 in the topsoil to about 6.5 in the subsoil. SOIL FAUNA: some ants and worms.

Slide nos. of the ISRIC collection: 5965-5974 (profile, landscape, vegetation).
Thin section nos. of the ISRIC collection: 2707-2713.

CLIMATE : Köppen: Cfa
Station: GUILIN 25 15 N/110 10 E 167 m a.s.l. 66 km NW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		42	42	57	80	95	108	126	135	131	107	72	58	1053
precipitation	mm	16	51	79	161	223	359	370	236	200	101	87	53	47	1967
T mean	°C	11	9.2	9.7	13.4	19.0	23.7	23.7	28.4	27.9	26.5	22.0	15.6	11.1	19.4
no. of raindays			12	14	19	19	20	19	19	16	8	8	11	11	176
relative humidity	%		77	79	82	80	84	82	82	81	70	70	74	74	78
windspeed(at 2m)	m/s		2.6	2.2	2.5	2.1	1.7	1.6	1.5	1.3	2.0	2.7	3.0	3.0	2.2
bright sunshine	h/d		2.5	1.4	1.8	3.5	3.8	5.0	6.0	7.0	6.9	4.8	4.2	4.4	4.3

ISIS 4.0 data sheet of reference soil CN 06 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Very deep, moderately well drained, reddish brown to yellowish red clay derived from limestone. The (dark) reddish brown topsoil has moderately developed crumb and subangular blocky structures and a medium to high content in organic carbon. The subsoil has dominantly moderately developed prismatic structures, becoming angular blocky (locally wedgeshaped) in the bottom part of the profile. Soil reaction is neutral throughout while the exchange complex is being dominated by calcium.

Ah 0 - 7 cm Dark reddish brown (5YR 3/3, moist and dry) clay; moderate medium crumb structure; hard; common very fine and fine continuous inped tubular pores; many very fine and fine roots; very few coarse weathered limestone fragments; clear smooth boundary to

AB 7 - 20 cm Reddish brown (5YR 4/3, moist) clay; moderate medium to coarse subangular blocky structure; friable; patchy moderately thick clay and humus cutans; common very fine to fine continuous inped tubular pores; common very fine roots; very few coarse weathered limestone fragments; gradual smooth boundary to

Bt1 20 - 44 cm Reddish brown (5YR 5/4, moist) clay; moderate medium prismatic structure; firm; patchy moderately thick clay and sesquioxide cutans; common very fine to fine continuous inped tubular pores; few very fine roots; very few small spherical hard manganiferous concretions; very few coarse weathered limestone fragments; gradual smooth boundary to

Bt2 44 - 64 cm Yellowish red (5YR 5/6, moist) clay; moderate coarse prismatic structure; firm; few fine distinct clear dark yellowish brown (10YR 4/4) mottles; continuous thick clay and sesquioxide cutans; few very fine continuous inped tubular pores; few very fine roots; very few small spherical hard manganiferous concretions; very few coarse weathered limestone fragments; gradual wavy boundary to

Bt3 64 - 94 cm Yellowish red (5YR 5/6, moist) clay; moderate coarse prismatic structure; friable; common fine distinct sharp dark gray (N 3/) manganese-iron coatings; continuous thick clay and sesquioxide cutans; few very fine continuous inped tubular pores; few very fine roots; few small spherical hard manganiferous concretions; very few coarse weathered limestone fragments; clear wavy boundary to

BC 94 - 120 cm Yellowish red (5YR 5/6, moist) clay; moderate medium angular blocky structure, locally wedgeshaped; friable; common medium prominent sharp gray (N 3/) manganese-iron coatings; patchy moderately thick clay and sesquioxide cutans; few slickensides; common very fine to fine continuous inped tubular pores; no roots; few medium spherical hard manganiferous concretions; very few coarse weathered limestone fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 7	-	1	1	1	2	1	5	5	22	26	69	-	-	-	-	-	-	-	-	-	-
AB	7 - 20	-	1	1	1	1	1	5	5	19	24	72	-	-	-	-	-	-	-	-	-	-
Bt1	20 - 44	-	0	1	1	1	1	3	1	16	17	80	-	-	-	-	-	-	-	-	-	-
Bt2	44 - 64	-	0	0	0	1	0	2	2	11	13	85	-	-	-	-	-	-	-	-	-	-
Bt3	64 - 94	-	0	0	1	1	1	2	2	11	13	85	-	-	-	-	-	-	-	-	-	-
BC	94 - 120	-	0	0	1	1	1	3	2	11	13	85	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	7.1	6.2	1.5	2.93	0.25	41.9	2.0	0.4	0.2	44.5	-	-	25.5	37	10.3	44.5	175	-	0.23
AB	6.7	5.5	0.5	1.85	0.19	19.0	0.3	0.2	0.2	19.7	-	-	20.1	28	6.5	19.7	98	-	0.07
Bt1	6.6	5.3	0.7	1.08	0.17	18.6	0.2	0.3	0.2	19.3	-	-	18.8	23	3.8	19.3	103	-	0.05
Bt2	7.0	5.8	1.0	0.79	0.16	20.7	0.1	0.3	0.2	21.3	-	-	20.5	24	2.8	21.3	104	-	0.05
Bt3	7.2	5.9	1.3	0.62	0.12	22.2	0.1	0.3	0.2	22.8	-	-	20.1	24	2.2	22.8	113	-	0.06
BC	7.0	5.9	1.0	0.46	0.08	22.2	0.1	0.3	0.2	22.8	-	-	20.5	24	1.6	22.8	111	-	0.05

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	KAOL	MIX	FELD	GOET	BOEH	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
							- % -								
Ah	1	6	6	2	4	2	0.4	0.3	0.0	4.5	0.9	0.1	0.2	0.1	0.1
AB	2	5	6	2	4	2	0.3	0.3	0.0	4.8	1.0	0.1	0.2	0.3	0.1
Bt1	2	5	6	2	4	2	0.2	0.2	0.0	4.8	1.2	0.2	0.2	0.4	0.1
Bt2	2	4	6	2	4	2	0.1	0.3	0.0	5.0	1.1	0.2	0.1	0.2	0.1
Bt3	2	4	6	2	4	2	0.1	0.2	0.0	5.0	1.1	0.2	0.1	0.2	0.1
BC	2	4	6	2	4	2	0.1	0.2	0.0	5.1	1.1	0.1	0.1	0.2	0.1

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, KAOL kaolinite, MIX mixed layer silicates (vermiculite-chlorite), FELD feldspar, GOET goethite, BOEH boehmite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 07 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Orthic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992) : Inceptic Eutrudox, fine, kaolinitic, thermic (1975 : Tropeptic Eutrorthox)
CSTC (1991) : Eutrophic latored soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, oxic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

Remarks : FAO (1988) classification is "Ferralic Cambisol" because the silt/clay ratio in the soil is too high for a ferralic B horizon. All other criteria for ferralic B horizon are met.

LOCATION : Guangdong Province, Logang Commune, approx. 30 km E of Guangzhou
Latitude : 23°13′ N Longitude : 113°28′ E Altitude : 45 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM :
PHYSIOGRAPHIC UNIT : hilly area
SLOPE Gradient : 10%
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil
Cracking : nil
SLOPE PROCESSES Soil erosion : slight sheet
Topography : rolling
Form : convex
Stoniness : nil
Slaking/crusting : nil

PARENT MATERIAL : residual material derived from coarse-acid igneous rock (granite)

EFFECTIVE SOIL DEPTH : > 180 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist
Run off : rapid

VEGETATION : (semi-) natural open vegetation, dominantly pine, shrubs and grasses
LAND USE : not relevant

ADDITIONAL REMARKS :
GEOLOGY: medium grained Mesozoic granite. HYDROLOGY: coarse dendritic surface drainage; infiltration is estimated at 25-50 cm/day. SOIL FAUNA: few ants and worms. HUMAN INFLUENCES: reforestation as anti-erosion measure, sometimes taking place by air-borne seeding of pine.

Slide nos. of the ISRIC collection: 5980-5986 (profile, landscape, vegetation).
Thin section nos. of the ISRIC collection: 2714-2720.

CLIMATE : Köppen: Cwa
Station: GUANGZHOU 23 0 N/113 13 E 18 m a.s.l. 36 km SW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		55	56	72	81	110	121	147	144	131	121	89	76	1203
precipitation	mm	41	27	65	101	185	256	292	264	249	149	49	51	34	1722
no. of raindays			7	12	14	18	17	20	17	17	12	6	6	7	153
T mean	°C	53	13.6	14.2	17.2	21.6	25.6	27.3	28.8	28.2	27.2	24.0	19.7	15.7	21.9
T max	°C	14	17.2	17.2	20.6	25.0	30.0	31.1	32.8	32.8	31.7	28.3	25.0	20.6	26.1
T min	°C	14	9.4	11.1	12.8	18.9	23.3	24.4	25.6	25.6	24.4	19.4	15.6	12.2	18.3
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
windspeed(at 2m)	m/s		2.1	2.0	1.8	1.8	1.7	1.6	1.8	1.7	1.7	1.9	1.9	1.9	1.8
bright sunshine	h/d		4.0	2.8	2.7	2.7	5.0	5.1	6.9	6.9	6.8	6.7	6.4	5.1	5.1

PROFILE DESCRIPTION :
Very deep, well drained red sandy clay derived from granite. The brownish coloured topsoil is low in organic carbon and very low in bases. The uniformly coloured red subsoil has only weakly developed subangular blocky structures or appears as porous massive. The soil reaction is acid throughout.

Ah 0 - 5 cm Brown (7.5YR 4/6, moist) sandy clay; weak fine subangular blocky structure; very friable; few very fine to fine continuous exped tubular pores; common fine and medium roots; very few very fine weathered quartz fragments; clear smooth boundary to

AE 5 - 19 cm Yellowish red to reddish yellow (5YR 5.5/8, moist) sandy clay; weak medium subangular blocky structure; very friable; patchy thin clay and humus cutans; few fine continuous exped tubular pores; few fine and medium roots; few very fine weathered quartz fragments; gradual wavy boundary to

ISIS 4.0 data sheet of reference soil CN 07 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

Bt1 19 - 48 cm Red (2.5YR 5/8, moist) sandy clay; weak medium subangular blocky structure; very friable; patchy thin clay and sesquioxide cutans; common very fine to fine continuous exped and inped tubular pores; few fine roots; few very fine weathered quartz fragments; clear smooth boundary to

Bt2 48 - 60 cm Red (2.5YR 5/8, moist) sandy clay; weakly coherent porous massive structure; very friable; patchy thin clay and sesquioxide cutans; common very fine to fine continuous tubular pores; few fine roots; frequent very fine weathered quartz fragments; clear smooth boundary to

Bt3 60 - 83 cm Red (2.5YR 5/8, moist) sandy clay; weak medium subangular blocky structure; friable; broken moderately thick clay and sesquioxide cutans; common very fine to fine continuous exped and inped tubular pores; no roots; frequent very fine weathered quartz fragments; diffuse smooth boundary to

Bt4 83 - 115 cm Red (2.5YR 5/8, moist) sandy clay; very weak medium subangular blocky structure; friable; broken moderately thick clay and sesquioxide cutans; common very fine to fine continuous exped tubular pores; no roots; frequent very fine weathered quartz and very few coarse weathered granite fragments; gradual wavy boundary to

BC 115 - 150 cm Red (2.5YR 5/8, moist) sandy clay; very weak medium subangular blocky structure; very friable; patchy thin clay and sesquioxide cutans; common very fine to fine continuous exped tubular pores; no roots; frequent very fine weathered quartz and few coarse strongly weathered granite fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	Spec. surf. soil m2/g
Ah	0 - 5	2	11	20	15	9	2	57	2	10	12	31	19.8	1.27	50	48	42	32	31	30	21	19	-
AE	5 - 19	2	12	17	11	7	2	48	1	11	11	41	0.0	1.41	46	44	38	33	32	29	25	24	-
Bt1	19 - 48	3	14	16	10	6	2	47	2	11	13	40	0.0	1.34	48	45	35	29	29	26	25	23	-
Bt2	48 - 60	6	15	16	9	5	2	46	3	12	15	39	2.0	-	-	-	-	-	-	-	-	-	33
Bt3	60 - 83	8	14	16	9	5	2	45	2	14	16	39	0.0	1.47	44	42	35	31	31	28	29	25	-
Bt4	83 - 115	7	14	15	8	4	2	43	4	19	23	34	1.5	1.46	44	41	35	31	30	28	28	26	31
BC	115 - 150	4	12	15	8	5	2	43	5	24	29	29	0.0	1.49	44	43	37	33	33	30	29	25	-

Remarks (Bt3) : anomaly between pF 2.7 and 3.4 caused by sampling heterogeneity and different analytical procedure

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.9	4.0	-	1.53	0.11	0.4	0.1	0.2	0.1	0.8	1.9	1.7	4.1	13	5.4	2.7	20	41	0.08
AE	5.2	4.1	-	0.58	0.03	0.4	0.1	0.0	0.2	0.7	1.4	1.3	2.5	6	2.0	2.1	28	52	0.02
Bt1	5.2	4.2	-	0.28	0.01	0.4	0.1	0.1	0.2	0.8	1.0	0.7	2.1	5	1.0	1.8	38	33	0.01
Bt2	5.2	4.2	-	0.16	0.00	0.4	0.1	0.0	0.2	0.7	0.9	0.7	1.4	4	0.6	1.6	50	50	0.01
Bt3	5.2	4.2	-	0.37	0.00	0.8	0.1	0.0	0.2	1.1	0.8	0.7	1.9	5	1.3	1.9	58	37	0.01
Bt4	5.2	4.1	-	0.19	-	0.4	0.1	0.0	0.2	0.7	1.1	0.9	1.8	5	0.7	1.8	39	50	0.01
BC	5.2	4.1	-	0.14	-	0.4	0.1	0.0	0.2	0.7	1.3	1.0	1.8	6	0.5	2.0	39	56	0.01

ELEMENTAL COMPOSITION OF TOTAL CLAY (in weight %) AND MOLAR RATIOS

Hor.	SiO2	Al2O3	Fe2O3	CaO	MgO	K2O	Na2O	TiO2	MnO2	P2O5	IGN. LOSS	SiO2/ Al2O3	SiO2/ Fe2O3	SiO2/ R2O3	Al2O3/ Fe2O3
Bt2	41.3	37.0	8.3	0.02	0.17	0.66	-	0.77	0.02	0.07	13.7	1.9	13.2	1.7	7.0
Bt4	39.6	36.3	8.4	0.03	0.16	0.61	-	0.79	0.03	0.08	13.6	1.9	12.5	1.6	6.8

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	KAOL	MIX	QUAR	GIBB	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
						- % -								
Ah	8	3	1	4	4	0.1	0.1	0.0	1.4	0.3	0.0	0.0	0.3	0.1
AE	8	3	1	4	4	0.0	0.1	0.0	1.8	0.4	0.0	0.0	0.2	0.1
Bt1	8	3	1	4	4	0.0	0.1	0.0	1.9	0.3	0.0	0.0	0.1	0.1
Bt2	8	3	1	4	4	0.0	0.1	0.0	2.0	0.3	0.0	0.0	0.0	0.0
Bt3	8	3	1	4	4	0.0	0.1	0.0	2.3	0.2	0.0	0.0	0.0	0.0
Bt4	8	3	1	4	4	0.0	0.1	0.0	2.1	0.3	0.1	0.0	0.0	0.0
BC	8	3	1	4	4	0.0	0.1	0.0	2.1	0.3	0.0	0.0	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GIBB gibbsite, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 08 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Xanthic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, fine-loamy, mixed, thermic (1975 : Typic Dystrochrept)
CSTC (1991) : Haplic latored-yellow soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Ding Hu Shan Biosphere Res., 85 km W of Guangzhou
Latitude : 23° 8′ N Longitude : 112°35′ E Altitude : 650 m a.s.l.
AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : mountain slope
SLOPE Gradient : 40% Form : concave
POSITION OF SITE : lower slope
MICRO RELIEF Kind : none
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material derived from Devonian sandstone

EFFECTIVE SOIL DEPTH : 100 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 105 cm moist

VEGETATION : (semi-) natural vegetation consisting of multivariate dense shrub
LAND USE : not relevant

GENERAL REMARKS :
HYDROLOGY: infiltration is estimated at 25-50 cm/day.

Slide nos. of the ISRIC collection: 5988-6000 (profile, details profile, landscape, vegetation, soil monolith transport).
Thin section nos. of the ISRIC collection: 2721-2723.

CLIMATE : Köppen: Cwa
Station: GUANGZHOU 23 0 N/113 13 E 18 m a.s.l. 80 km ESE of site Relevance: poor
Station: DING HU 23 6 N/111 56 E 5 km from site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
GUANGZHOU															
ETo (PenMon)	mm		55	56	72	81	110	121	147	144	131	121	89	76	1203
precipitation	mm	41	27	65	101	185	256	292	264	249	149	49	51	34	1722
no. of raindays			7	12	14	18	17	20	17	17	12	6	6	7	153
T mean	°C	53	13.6	14.2	17.2	21.6	25.6	27.3	28.8	28.2	27.2	24.0	19.7	15.7	21.9
T max	°C	14	17.2	17.2	20.6	25.0	30.0	31.1	32.8	32.8	31.7	28.3	25.0	20.6	26.1
T min	°C	14	9.4	11.1	12.8	18.9	23.3	24.4	25.6	25.6	24.4	19.4	15.6	12.2	18.3
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
windspeed(at 2m)	m/s		2.1	2.0	1.8	1.8	1.7	1.6	1.8	1.7	1.7	1.9	1.9	1.9	1.8
bright sunshine	h/d		4.0	2.8	2.7	2.7	5.0	5.1	6.9	6.9	6.8	6.7	6.4	5.1	5.1
DING HU															
precipitation	mm	15	34	61	101	221	317	272	240	310	187	146	11	27	1927
no. of raindays		15	8	9	18	17	21	18	15	18	12	8	3	4	151
T mean	°C	15	13.1	14.3	16.5	21.7	25.5	27.5	28.8	28.1	26.5	23.3	18.0	14.5	21.6
relative humidity	%	15	77	79	85	84	85	84	80	83	80	77	69	73	80

ISIS 4.0 data sheet of reference soil CN 08 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Moderately deep, well drained, strong brown slightly gravelly sandy clay loam derived from sandstone. The dark brown, moderately thick topsoil is lacking structure and has a medium content in organic carbon. The subsoil has weakly to moderately developed structures. A stone-line occurs between 34 and 48 cm. The disintegrating sandstone occurs below 100 cm depth. The soil reaction is strongly acid throughout and the amount of exchangeable bases is very low.

Ah	0 - 18 cm	Dark brown (10YR 3/3, moist) clay loam; moderately coherent porous massive; friable; common very fine to fine continuous exped and inped tubular and vesicular pores; many very fine and fine roots; clear wavy boundary to
EA	18 - 34 cm	Reddish yellow (7.5YR 6/8, moist) slightly gravelly sandy loam; moderate medium to coarse subangular blocky structure; friable; common very fine to fine continuous inped tubular pores; few very fine roots; very few coarse weathered sandstone fragments; clear smooth boundary to
Bt1	34 - 48 cm	Strong brown (7.5YR 5/8, moist) gravelly sandy clay loam; moderate medium subangular blocky structure; friable; patchy moderately thick clay and sesquioxide cutans; common very fine continuous inped tubular pores; few very fine roots; frequent coarse weathered sandstone fragments; clear smooth boundary to
Bt2	48 - 71 cm	Strong brown (7.5YR 5/8, moist) slightly gravelly sandy clay loam; weak medium to coarse subangular blocky structure; friable; patchy moderately thick clay and sesquioxide cutans; common very fine to fine continuous inped tubular pores; few very fine and fine roots; very few coarse weathered sandstone fragments; gradual smooth boundary to
BC	71 - 100 cm	Strong brown (7.5YR 5/8, moist) slightly gravelly sandy clay loam; weak medium to coarse subangular blocky structure; very friable; no cutans; common very fine continuous inped tubular pores; few very fine and fine roots; very few coarse weathered sandstone fragments; gradual wavy boundary to
C	100 cm +	Yellowish red (5YR 5/8, moist) sandy loam; moderately coherent massive; very friable; common very fine discontinuous exped interstitial pores; few very fine roots; very frequent coarse weathered sandstone fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 18	-	0	0	5	31	20	56	9	12	20	23	-	1.15	57	56	50	42	41	35	17	14
AE	18 - 34	3	0	1	5	32	21	58	8	13	20	21	-	1.46	46	45	43	36	36	31	18	15
Bt1	34 - 48	19	0	0	6	32	17	56	9	12	21	24	-	-	-	-	-	-	-	-	-	-
Bt2	48 - 71	-	1	1	6	32	18	57	7	13	20	23	-	-	-	-	-	-	-	-	-	-
BC	71 - 100	-	0	1	5	36	17	59	6	14	21	20	-	-	-	-	-	-	-	-	-	-
C	100 - 120	-	0	0	4	50	20	74	7	12	19	8	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.2	3.6	-	2.38	0.14	0.0	0.1	0.2	0.0	0.3	4.2	3.3	9.3	40	8.3	4.5	3	35	0.09
AE	4.5	3.7	-	0.83	0.06	0.0	0.0	0.2	0.0	0.2	2.5	2.0	4.4	21	2.9	2.7	5	45	0.03
Bt1	4.7	3.8	-	0.46	0.03	0.0	0.0	0.1	0.0	0.1	1.7	1.3	2.6	11	1.6	1.8	4	50	0.02
Bt2	4.8	4.0	-	0.34	0.03	0.0	0.0	0.1	0.0	0.1	1.3	0.9	2.1	9	1.2	1.4	5	43	0.02
BC	4.9	4.1	-	0.21	0.02	0.0	0.0	0.1	0.0	0.1	0.8	0.4	1.4	7	0.7	0.9	7	29	0.01
C	5.2	4.6	-	0.05	0.01	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.2	3	0.2	0.2	50	0	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o), Na dith. (d) & pyrophosph. (p)

Hor.	MICA /ILL	CHLO	KAOL	MIX	GIBB	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
										- % -					
Ah	4	5	4	2	4	4	0.4	0.2	0.0	2.4	0.6	0.1	0.0	1.4	0.5
AE	4	5	4	2	4	4	0.2	0.1	0.0	2.6	0.6	0.0	0.0	1.5	0.4
Bt1	4	5	4	2	4	4	0.1	0.1	0.0	2.9	0.6	0.0	0.0	1.6	0.3
Bt2	4	5	4	2	4	4	0.1	0.1	0.0	2.8	0.6	0.0	0.0	1.4	0.4
BC	4	4	4	3	4	4	0.0	0.1	0.0	2.7	0.6	0.0	0.0	1.0	0.3
C	5	3	4	3	3	4	0.0	0.0	0.0	1.1	0.2	0.0	0.0	0.3	0.1

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO soil chlorite, KAOL kaolinite, MIX mixed layer silicates, GIBB gibbsite, GOET goethite. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 09 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Silti-Fimic Anthrosol (Calcaric) (1974 : Calcaric Regosol)
USDA/SCS SOIL TAXONOMY (1992) : Plaggept, fine-silty, mixed, mesic (1975 : Plaggept)
CSTC (1991) : Haplic Lou soil

DIAGNOSTIC CRITERIA FAO (1988) : fimic A horizon
USDA/SCS (1992) : plaggen epipedon
Soil moisture regime : aridic
Soil temperature regime : mesic

LOCATION : Shaanxi Province, Wugong, Xiang Lin
Latitude : 34°26'30'' N Longitude : 108° 3'30'' E Altitude : 520 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : alluvial terrace Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : terrace of the Wei River
SLOPE Gradient : 1%
POSITION OF SITE :
MICRO RELIEF Kind : none
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : slight
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : silty Pleistocene loess

EFFECTIVE SOIL DEPTH : 300 cm

WATER TABLE Depth : groundwater level: 80 m in nearby well
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 150 cm dry 150 - 300 cm moist

LAND USE : medium level arable farming; crops : cereals; seasonally irrigated; rotation : crop rotation continuous
Land use/vegetation remarks : no natural vegetation left

ADDITIONAL REMARKS :
LAND USE: according to local information the anthropogenic soil layer of about 70 to 80 cm thick results from 2000 years of manuring with a mixture of loess and urine/dung (of cattle and man). This practice still continues, the application being 450-600 kg/ha (30-40 jin/mu). Recently also ammonium nitrate and ammonium carbonate (NH_3HCO_3) are used as fertilizer.
SOIL AND CROP MANAGEMENT/IRRIGATION: ploughing is nowadays mostly done by tractor (rented), but animal traction is still in use. Weeding is done manually. Insecticides are used against aphids, white spider etc. Irrigation is increasingly applied in the area. Many small wells are made to depths of 80 to max. 200 m. Most canals are earthen made. Some smaller structures (e.g. drainage tubes under the road) are made from cement. Water distribution and application is judged by the farmer (if there is no rain, one irrigates once every 15 to 20 days for maize). Since a few years the communal and production brigade system has been abandoned and replaced by an individual small farming system.
MAIN CROPS: winter wheat, sowing in October and harvest in June; maize, sowing after the wheat in June and harvested in the beginning of October; cotton, rapeseed, soybean, Kao Liang, sesame and barley are less important crops. Fertilized maize can have a production of more than 7500 kg/ha (1000 jin/mu; 1 jin = 1/2 kg, 1 mu = 1/15 ha).

CLIMATE : Köppen: Cwa
Station: WUGONG 34 15 N/108 13 E 448 m a.s.l. 25 km SSE of site Relevance: very good

		Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
precipitation	mm	22	7	9	26	57	64	53	114	91	112	65	28	4	630
EP Penman	mm	22	0	0	87	117	155	183	183	171	111	87	57	0	968
T mean	°C	22	-1.2	1.9	7.7	13.5	18.5	24.4	26.0	24.9	18.7	13.3	6.4	0.7	12.9
T max	°C	22	4.5	7.6	13.7	19.6	24.7	31.0	31.4	30.1	23.7	18.7	11.9	6.3	18.6
T min	°C	22	-5.5	-2.6	2.9	8.4	12.9	18.1	21.3	20.4	14.9	9.1	2.3	-3.4	8.2
relative humidity	%	22	63	65	67	71	71	63	73	75	81	79	75	68	71
windspeed(at 2m)	m/s	22	2.0	2.1	2.3	2.3	2.2	2.6	2.3	2.2	1.7	1.7	1.9	1.9	2.1

PROFILE DESCRIPTION :
Very deep, well drained, brown, silty clay loam in redistributed loess. The very thick, dark brown anthropogenic topsoil contains many small particles: coarse sand, charcoal, small gravel, pottery fragments and shells. Soil structure is strongly developed with a moderate, very large columnar structure between 30 to 138 cm. Calcium carbonate precipitations (pseudomycelia) occur throughout the profile with a highest density between 114 to 138 cm. From 30 to 200 cm common large pores or frequently filled vertical channels occur, caused by earthworm activity. Soil reaction is alkaline throughout.

Ap1 0 - 21 cm Brown to dark brown (7.5YR 4.5/4) moist, light brown (7.5YR 6/4) dry silt loam; moderate fine to medium subangular blocky and crumb structures; slightly sticky, slightly plastic, very friable, slightly hard; many very fine to medium pores; common fine roots; clear smooth boundary to

Ap2 21 - 30 cm Dark brown (7.5YR 4/4, moist) to brown (7.5YR 5/4, dry) silt loam; moderate to strong fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; common very fine to medium pores; few fine roots; clear smooth boundary to

Ap3	30 - 70 cm	Dark brown (7.5YR 4/4, moist) to brown (7.5YR 5/4, dry) silt loam; strong fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; broken moderately thick clay cutans; many very fine to medium pores; few fine roots; clear smooth boundary to
2Ap4	70 - 81 cm	Dark brown (7.5YR 3/4, moist) to brown (7.5YR 5/4, dry) silty clay loam; strong fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; many very fine to medium pores; few fine roots; frequent threadlike calcareous soft segregations (pseudomycelia); gradual smooth boundary to
2Ak	81 - 114 cm	Dark brown (7.5YR 3/3.5, moist and dry) silty clay loam; strong fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; many very fine to medium pores; few fine roots; frequent threadlike calcareous soft segregations (pseudomycelia); clear smooth boundary to
2AB	114 - 138 cm	Dark brown (7.5YR 4/4, moist and dry) silt loam; strong fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; many very fine to medium pores; few fine roots; very frequent threadlike calcareous inclusions (pseudomycelia); clear smooth boundary to
2Bck	138 - 200 cm	Dark brown to dark yellowish brown (8.5YR 4/4, moist) silt loam; weak fine to medium subangular blocky structure; slightly sticky slightly plastic, very friable, slightly hard; many very fine to medium pores; few fine roots; frequent threadlike calcareous soft segregations (pseudomycelia) and very few small hard calcareous nodules; diffuse smooth boundary to
2BC	200 - 250 cm	Dark brown to dark yellowish brown (8.5YR 4/4, moist) silt loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, loose, soft; many very fine to medium pores; few fine roots; few calcareous soft segregations; diffuse smooth boundary to
2C	250 - 300 cm	Dark brown to dark yellowish brown (8.5YR 4/4, moist) silt loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, loose, soft; many very fine to medium pores; few fine roots

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap1	0 - 21	-	0	0	0	0	0	1	31	42	72	27	-	1.39	47	46	43	37	34	31	21	19
Ap2	21 - 30	-	0	0	0	0	0	1	29	43	72	27	-	1.46	46	45	40	34	31	29	20	19
Ap3	30 - 70	-	0	0	0	0	0	1	29	42	71	28	-	1.53	45	44	39	34	32	30	21	19
2Ap4	70 - 81	-	0	0	0	0	0	1	25	40	65	34	-	-	-	-	-	-	-	-	-	-
2Ak	81 - 114	-	0	0	0	0	0	1	25	40	65	34	-	-	-	-	-	-	-	-	-	-
2AB	114 - 138	-	0	0	0	0	1	1	30	43	73	26	-	-	-	-	-	-	-	-	-	-
2Bck	138 - 200	-	0	0	0	0	1	2	33	42	75	23	-	-	-	-	-	-	-	-	-	-
2BC	200 - 250	-	0	0	0	0	1	1	35	43	78	21	-	-	-	-	-	-	-	-	-	-
2C	250 - 300	-	0	0	0	0	1	2	31	44	75	24	-	1.20	55	54	47	40	34	28	16	15

Hor.	pH H2O	pH KCl	CaCO3 %	ORG C %	MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap1	8.2	7.5	3.3	0.81	0.08	45.0	1.9	0.6	0.0	47.5	-	-	11.7	43	2.8	47.5	406	-	0.25
Ap2	8.2	7.4	2.1	0.67	0.08	49.1	2.0	0.5	0.0	51.6	-	-	11.9	44	2.3	51.6	434	-	0.40
Ap3	8.3	7.4	1.6	0.45	0.05	47.8	1.9	0.4	0.1	50.2	-	-	12.2	43	1.6	50.2	411	-	0.28
2Ap4	8.0	7.0	0.0	0.48	0.05	28.8	2.0	0.4	0.3	31.5	-	-	17.9	52	1.7	31.5	176	-	0.44
2Ak	8.1	7.0	0.0	0.43	0.05	29.6	1.9	0.3	0.4	32.2	-	-	16.7	49	1.5	32.2	193	-	0.29
2AB	8.0	7.0	3.4	0.40	0.04	42.1	0.8	0.2	0.0	43.1	-	-	10.6	40	1.4	43.1	407	-	0.51
2Bck	8.3	7.5	4.3	0.33	0.03	40.9	1.2	0.2	0.5	42.8	-	-	8.9	39	1.2	42.8	481	-	0.29
2BC	8.2	7.5	3.6	0.26	-	36.6	1.1	0.2	0.5	38.4	-	-	9.2	43	0.9	38.4	417	-	0.38
2C	8.3	7.5	3.0	0.32	-	48.9	1.8	0.3	0.2	51.2	-	-	9.6	40	1.1	51.2	533	-	0.36

Remarks: apparent oversaturation probably due to presence of small amounts of gypsum

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d) / P2O5 (citric acid)

Hor.	Fe(o) %	Al(o) %	Si(o) %	Fe(d) %	Al(d) %	Mn(d) %	P2O5 mg/kg
Ap1	0.1	0.1	0.0	1.0	0.1	0.0	2.2
Ap2	0.1	0.1	0.0	1.0	0.1	0.0	1.8
Ap3	0.1	0.1	0.0	1.0	0.1	0.0	2.0
2Ap4	0.1	0.1	0.0	1.3	0.1	0.1	0.7
2Ak	0.2	0.2	0.0	1.2	0.1	0.1	1.2
2AB	0.1	0.1	0.0	0.9	0.8	0.0	-
2Bck	0.1	0.1	0.0	0.8	0.1	0.0	-
2BC	0.1	0.1	0.0	0.8	0.1	0.0	-
2C	0.1	0.1	0.0	0.8	0.1	0.0	-

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Extr. Fe Al Si Mn: weight %. 1% citric acid extractable P_2O_5: mg/kg.

ISIS 4.0 data sheet of reference soil CN 10 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

FAO/UNESCO (1988) : Sodi-Calcaric Cambisol (Siltic) (1974 : Haplic Xerosol, sodic phase)
USDA/SCS SOIL TAXONOMY (1992) : Natric Cambiorthid, coarse-silty, mixed, frigid (1975 : Natric Cambiorthid)
CSTC (1991) : Haplic grey desert soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : aridic
Soil temperature regime : frigid

LOCATION : Gansu Province, Yu-Zhong, Jin Jiau Jui
Latitude : 35°54' 0'' N Longitude : 104° 7'30'' E Altitude : 1950 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : intermontain plain with hills
SLOPE Gradient : 25%
POSITION OF SITE : middle slope
MICRO RELIEF Kind : none
SURFACE CHAR. Rock outcrop : nil
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : primary silty loess of Pleistocene age

EFFECTIVE SOIL DEPTH : 190 cm

WATER TABLE : about 150 m deep in nearby well
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 120 cm dry 120 - 190 cm moist

LAND USE / VEGETATION : grass-/shrubland, incidentally grazed. No agriculture.

ADDITIONAL REMARKS :
LANDFORM: weakly tilted undulating intermontane plain with a few isolated small hills on one of which the profile is located. SURFACE CHARACTERISTICS: bare soil surfaces have sealed appearance, often with spots of tiny mosses and lichens. VEGETATION: 20-50% grass/herb vegetation; species seen nearby site: *Artemisia* spp., *Plantago lanceolata*, *Lasiagrostis splendens*, *Stipa* spp. and *Agropyrum cristatum*; soft soil crust is covered thinly by mosses/lichens.

Slide nos. of the ISRIC collection: 7513 - 7529.
Thin section nos. of the ISRIC collection: 3278-3282

CLIMATE : Köppen: DW
Station: YU ZHONG 35 52 N/104 9 E 1871 m a.s.l. 2 km ESE of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
precipitation	mm	26	2	3	11	25	47	46	83	91	62	30	6	1	407
EP Penman	mm	26	0	0	76	111	140	153	161	143	102	71	0	0	957
T mean	°C	26	-8.1	-4.4	2.5	8.7	13.4	16.9	19.0	18.1	13.0	7.1	-0.3	-6.2	6.6
T max	°C	26	-0.4	3.1	9.8	16.2	20.2	23.8	25.6	24.5	19.1	13.8	6.6	1.5	13.7
T min	°C	26	-13.7	-9.8	-2.8	2.5	6.8	10.0	12.8	12.3	7.9	2.0	-4.9	-11.4	1.0
relative humidity	%	26	56	56	56	54	57	59	67	68	73	71	66	60	62
windspeed(at 2m)	m/s	26	0.8	1.0	1.4	1.6	1.7	1.4	1.3	1.4	1.2	1.0	0.8	0.6	1.2

ISIS 4.0 data sheet of reference soil CN 10 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 14/12/94

PROFILE DESCRIPTION :
Very deep, well drained, yellowish brown silt derived from loess. It is dominantly porous massive structured tending to weak subangular blocky. The topsoil is low in organic carbon and has weak to moderately developed crumb and subangular blocky structures. In places a weak thin crust (0-0.5cm) is present due to slaking and mosses/lichens. The subsoil has few white speckles of CaCO3, gypsum or more soluble salts. Irregular, vertical planes of weakness are present between 62 and 155 cm depth, however no clear macrostructure can be detected. In one area of the profile between 100 and 110 cm depth a slightly darker coloured horizon is present with a few small charcoal particles (buried A horizon).

A	0 - 25 cm	Yellowish brown (10YR 5/4, moist) to very pale brown (10YR 7/3.5, dry) silt loam; weak to moderate fine to medium subangular blocky and crumb structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; many very fine and medium roots; gradual wavy boundary to
Bw1	25 - 62 cm	(Light) yellowish brown (10YR 5/4 moist; 10YR 5.5/4 dry) silt loam; weak coarse subangular blocky to weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine to fine pores; common very fine and fine roots; few unspecified soft segregations; diffuse smooth boundary to
Bw2	62 - 100 cm	Light yellowish brown (10YR 6/4, moist) silt loam; weak coarse subangular blocky to weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine pores; few fine roots; clear wavy boundary to
Bk	100 - 155 cm	Light yellowish brown (10YR 6/4, moist) silt loam; weak coarse subangular blocky to weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; few fine roots; very few irregular calcareous concretions; diffuse smooth boundary to
BC	155 - 190 cm	Light yellowish brown (10YR 6/4, moist) to very pale brown (10YR 7/3.5, dry) silt loam; coarse weak subangular blocky to weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; few fine roots

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
A	0 - 25	-	0	0	0	0	5	5	46	34	79	16	-	1.18	57	56	53	44	35	24	10	10
Bw1	25 - 62	-	0	0	0	0	5	5	44	36	80	15	-	1.14	59	58	55	47	35	22	11	10
Bw2	62 - 100	-	0	0	0	0	4	5	43	37	80	16	-	-	-	-	-	-	-	-	-	-
Bk	100 - 150	-	0	0	0	0	5	6	48	33	81	14	-	1.21	57	56	52	46	40	26	11	11
BC	150 - 190	-	0	0	0	0	5	6	45	36	81	14	-	1.19	57	57	54	49	43	32	11	10

Hor.	pH H2O	pH KCl	CaCO3 %	GYPS %	ORG C %	MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	CEC clay	ECEC OrgC	ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
							cmol(+)/kg													
A	8.3	7.8	3.5	0.1	0.96	0.09	43.1	2.5	0.4	0.4	46.4	-	-	6.9	45	3.4	46.4	672	6	0.30
Bw1	8.3	8.0	3.3	0.7	0.24	0.03	67.2	5.7	0.2	3.8	76.9	-	-	4.8	32	0.8	76.9	***	79	0.27
Bw2	8.9	8.6	3.1	0.2	0.20	-	38.5	6.1	0.2	9.3	54.1	-	-	4.7	30	0.7	54.1	***	198	0.25
Bk	8.9	8.7	3.6	0.4	0.17	-	51.2	6.3	0.2	8.9	66.6	-	-	3.9	28	0.6	66.6	***	228	0.28
BC	9.1	8.8	3.1	0.0	0.18	-	39.9	6.0	0.2	9.3	55.4	-	-	4.2	31	0.6	55.4	***	221	0.21

Remarks : apparent oversaturation probably due to presence of gypsum and small amounts of soda

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d)

Hor.	Fe(o) %	Al(o) %	Si(o) %	Fe(d) %	Al(d) %	Mn(d) %
A	0.1	0.0	0.0	0.6	0.0	0.0
Bw1	0.1	0.0	0.0	0.6	0.0	0.0
Bw2	0.1	0.0	0.0	0.7	0.0	0.0
Bk	0.1	0.0	0.0	0.6	0.0	0.0
BC	0.1	0.0	0.0	0.7	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, gypsum, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP: exchangeable sodium percentage. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 11 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Aridi-Calcaric Regosol (Siltic) (1974 : Calcaric Regosol)
USDA/SCS SOIL TAXONOMY (1992) : Fluventic Camborthid, fine-silty, mixed, frigid (1975 : Typic Torrifluvent)
CSTC (1991) : Warpic altocryic haplo-desert soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon; calcareous
USDA/SCS (1992) : ochric epipedon
Soil moisture regime : aridic
Soil temperature regime : frigid

LOCATION : Gansu Province, Yu Zhong, Jin Liao Jui
Latitude : 35°53′ 0′′ N Longitude : 104° 7′30′′ E Altitude : 1900 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : intermontain plain
SLOPE Gradient : 1%
POSITION OF SITE :
MICRO RELIEF Kind : artificial terracing
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : Slaking/crusting :
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : loess

WATER TABLE : several tens of meters
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : arable farming; Crops : wheat; continuously irrigated; Improvements : levelling
VEGETATION Type : no natural vegetation left
Land use/vegetation remarks : irrigated for 40 years, see remarks

ADDITIONAL REMARKS :
PARENT MATERIAL: Pleistocene secondary loess with layers of gravelly river deposits in deeper subsoil; gravel is rounded and of different sizes, indicative for braided river channels originating from the nearby mountains. LAND USE: main crops: wheat (March-June/July), corn (April-July), (pearl)millet (April-September), flax, black corn (?), watermelon, apples. Irrigation is necessary for good yields, generally 3 to 4 applications per year through flooding ("basin" irrigation) of about 10 cm water. Infiltration is rapid. Tillage: ploughing by animal traction, weeding manually. Fertilizers: traditional mixture of loess with sheep/cattle/man urine/dung, nowadays also N and P fertilizers. Productivity: wheat (irrigated) 3000-3700 kg/ha (400-500 jin/mu). It can reach 5 ton/ha.

Slides nos. of the ISRIC collection: 7531-7547.
Thin section nos. of the ISRIC collection: 3283-3285

CLIMATE : Köppen: Dw
Station: YU ZHONG 35 52 N/104 9 E 1871 m a.s.l. 2 km E of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
precipitation	mm	26	2	3	11	25	47	46	83	91	62	30	6	1	407
EP Penman	mm	26	0	0	76	111	140	153	161	143	102	71	0	0	957
T mean	°C	26	-8.1	-4.4	2.5	8.7	13.4	16.9	19.0	18.1	13.0	7.1	-0.3	-6.2	6.6
T max	°C	26	-0.4	3.1	9.8	16.2	20.2	23.8	25.6	24.5	19.1	13.8	6.6	1.5	13.7
T min	°C	26	-13.7	-9.8	-2.8	2.5	6.8	10.0	12.8	12.3	7.9	2.0	-4.9	-11.4	1.0
relative humidity	%	26	56	56	56	54	57	59	67	68	73	71	66	60	62
windspeed(at 2m)	m/s	26	0.8	1.0	1.4	1.6	1.7	1.4	1.3	1.4	1.2	1.0	0.8	0.6	1.2

ISIS 4.0 data sheet of reference soil CN 11 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Deep, well drained, brown silt clay loam, dominantly porous massive structured, with gravelly layers in the deeper subsoil. The topsoil has weak subangular blocky and crumb structures and is low in organic carbon. The soil slakes easily after irrigation and the dried-up surface gives polygonal cracks (takyric tendency). Soil reaction is slightly alkaline throughout.

Ap	0 - 28 cm	Brown (10YR 4/3, moist) silty clay loam; weak fine to medium subangular blocky and crumb structure; slightly sticky, slightly plastic, very friable; many very fine to fine pores; common fine roots; gradual smooth boundary to
B	28 - 54 cm	Brown (10YR 4/3, moist) silty clay loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many very fine to fine pores; few fine roots; gradual smooth boundary to
C1	54 - 100 cm	Brown (10YR 4/3, moist) silty clay loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many very fine to fine pores; few fine roots; abrupt wavy boundary to
2C2	100 - 110 cm	gravel; abrupt wavy boundary to
2C3	110 - 135 cm	Brown (10YR 4/3, moist) silty clay loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many very fine to fine pores; abrupt wavy boundary to
2C4	135 - 150 cm	gravel

Remarks : there is a slight colour difference between B to C1, however, this is not detectable with Munsell colour charts.

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 28	-	1	1	1	1	3	6	37	37	74	20	-	1.34	47	45	41	36	33	30	18	16
B	28 - 54	-	0	1	1	1	3	6	33	41	74	21	-	1.25	50	49	40	33	30	26	17	15
C1	54 - 100	-	0	1	1	2	3	7	34	37	71	22	-	1.22	51	50	42	34	31	28	17	15
2C2	100 - 110	67	23	22	10	4	3	61	15	14	29	10	-	-	-	-	-	-	-	-	-	-
2C3	110 - 135	<1	1	1	2	6	7	17	35	31	66	17	-	-	-	-	-	-	-	-	-	-
2C4	135 - 160	62	19	29	24	9	2	83	5	1	6	11	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	GYPS %	ORG C %	MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
												cmol(+)/kg								
Ap	8.2	7.7	2.4	0.1	0.76	0.16	41.1	3.2	0.4	0.2	44.9	-	-	8.1	40	2.7	44.9	554	-	0.29
B	8.3	7.7	2.7	0.0	0.59	0.07	44.8	3.9	0.3	0.1	49.1	-	-	9.0	43	2.1	49.1	546	-	0.35
C1	8.1	7.6	2.0	0.0	0.72	0.08	44.8	4.3	0.3	0.1	49.5	-	-	9.8	45	2.5	49.5	505	-	0.46
2C2	8.2	7.8	0.6	0.0	0.43	0.04	36.3	2.6	0.1	0.3	39.3	-	-	5.4	56	1.5	39.3	728	-	0.34
2C3	8.1	7.5	1.0	0.0	0.73	0.08	37.1	3.8	0.1	0.2	41.2	-	-	10.3	61	2.6	41.2	400	-	0.36
2C4	8.2	7.8	0.3	0.0	0.26	0.03	15.5	1.6	0.1	0.0	17.2	-	-	4.9	46	0.9	17.2	351	-	0.34

WATER SOLUBLE SALTS

Hor.	Ca	Mg	Na	K	Sum Cations	CO3	HCO3	Cl	SO4	NO3	Sum Anions	pH	EC5	ECE	SAR	SP
	mmol(+)/l					mmol(-)/l							mS/cm			
C1	0.7	0.4	0.1	0.0	1.2	-	0.2	0.1	0.1	0.0	0.3	7.1	-	2.0	1	43.1

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d)

Hor.	Fe(o) %	Al(o) %	Si(o) %	Fe(d) %	Al(d) %	Mn(d) %
Ap	0.1	0.1	0.0	0.8	0.1	0.0
B	0.1	0.1	0.0	0.9	0.1	0.0
C1	0.1	0.1	0.1	0.9	0.1	0.0
2C2	0.1	0.0	0.0	0.7	0.0	0.0
2C3	0.2	0.1	0.1	0.9	0.1	0.1
2C4	0.1	0.0	0.0	0.7	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, gypsum, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. SAR: sodium adsorption ratio. SP: water saturation percentage. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 12 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Nudiyermi-Calcaric Regosol (Siltic), salic and sodic phase (1974 : Haplic Xerosol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Torriorthent, coarse-silty, mixed, frigid (1975 : Typic Torriorthent)
CSTC (1991) : Haplic cold desert soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A
USDA/SCS (1992) : ochric epipedon
Soil moisture regime : aridic
Soil temperature regime : frigid

LOCATION : Xinjiang Autonomous Region, between Changyi and Hubuti
Latitude : 44° 6' 0'' N Longitude : 87° 2'30'' E Altitude : 550 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : piedmont Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : plain north of Tian Shan Mountains
SLOPE Gradient : 1%
POSITION OF SITE : flat
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : small cracks Slaking/crusting :
Salt : moderate Alkali :
SLOPE PROCESSES Soil erosion : slight sheet and slight gully

PARENT MATERIAL : Pleistocene loess

WATER TABLE Depth : 750 cm Kind : groundwater table
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 160 cm dry

LAND USE / VEGETATION : semi-natural grassland, grazed

ADDITIONAL REMARKS :
SURFACE CHARACTERISTICS: topsoil has a soft and thin platy to massive porous structured crust with "gasbubble" porosity, probably caused when melting snow or rain turns the topsoil into a mudlayer. Subsequently, heating by the sun causes expansion of entrapped or liberated air. The soil falls immediately apart when wetted. VEGETATION: about 90% bare soil; dominant species at site: *Anabasis*, *Peterosimonia*, *Reaumuria*, *Salsola* and *Suadae*. LAND USE: land is incidentally grazed by camels and sheep. Irrigated agriculture is practised at several km distance.

Slide nos. of the ISRIC collection: 7548-7568.
Thin section nos. of the ISRIC collection: 3286-3291.

CLIMATE : Köppen: BSk
Station: CHANGYI 44 1 N / 87 18 E 577 m a.s.l. 17 km ESE of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	17	12	14	35	98	156	176	187	164	116	67	23	11	1059
precipitation	mm	17	4	6	17	20	22	27	18	18	14	15	13	9	183
T mean	°C	17	-18.0	-13.6	-1.3	10.3	17.4	22.2	24.4	22.6	16.4	7.5	-3.5	-13.2	6.0
T max	°C	17	-11.1	-7.0	4.3	17.6	24.7	29.5	31.3	30.2	24.4	15.1	2.3	-7.5	12.8
T min	°C	17	-23.6	-29.7	-6.5	3.6	9.8	14.8	17.5	15.6	9.5	1.5	-7.9	-18.0	-0.3
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
windspeed(at 2m)	m/s	17	1.3	1.4	1.8	2.2	2.4	2.2	2.1	1.9	1.8	1.7	1.5	1.3	1.8
bright sunshine	h/d	17	5.4	6.5	6.9	8.6	9.5	10.1	10.2	9.8	9.1	8.0	5.5	4.0	7.8

ISIS 4.0 data sheet of reference soil CN 12 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, brown silt loam derived from loess, dominantly porous massive structured. The topsoil has some weak platy structures and is low in organic carbon. The subsoil shows some weakly developed columnar, angular and subangular blocky structures. The entire soil is moderately saline and has an alkaline reaction.

A	0 - 6 cm	Brown (10YR 5/3, dry) silty clay loam; porous massive to weak platy structure; slightly sticky, slightly plastic, very friable, hard; many fine pores; few fine roots; clear smooth boundary to
C1	6 - 36 cm	Brown (10YR 5/3, dry) silty clay loam; weak very coarse columnar structure; slightly sticky, slightly plastic, very friable, hard; many very fine to fine pores; few fine roots; gradual smooth boundary to
C2	36 - 77 cm	Brown (10YR 5/3, dry) silty clay loam; weak fine to medium angular to subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; many very fine to fine pores; few fine roots; gradual smooth boundary to
C3	77 - 160 cm	Brown (10YR 5/3, dry) silty clay loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; very fine to fine pores

Remarks : Probably a weak, very large, columnar structure is present in the C1 horizon, as present cracks or "planes of weakness" are visible. A very few tiny white spots of CaCO3 or gypsum were observed in the C2 horizon.

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
A	0 - 6	-	0	0	1	2	10	14	29	41	71	16	-	1.42	45	43	39	30	27	24	17	15
C1	6 - 36	-	0	0	0	1	11	12	32	43	74	14	-	1.38	52	50	47	40	33	24	14	12
C2	36 - 77	-	0	0	0	1	21	22	33	30	63	16	-	1.37	52	50	45	39	33	26	13	11
C3	77 - 125	-	0	0	0	1	13	14	30	37	67	19	-	-	-	-	-	-	-	-	-	-
	125 - 160	-	0	0	0	1	23	24	32	24	56	20	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	GYPS %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	ESP	EC 2.5 mS/cm
							cmol(+)/kg													
1	8.6	8.3	3.6	0.0	0.73	-	40.7	3.6	2.7	2.2	49.2	-	-	7.6	48	2.6	49.2	647	42	3.40
2	8.5	8.2	3.5	0.6	0.27	-	46.4	3.6	0.9	2.4	53.3	-	-	7.4	54	0.9	53.3	720	40	4.70
3	8.6	8.3	2.5	2.2	0.14	-	102	3.3	0.5	7.3	113	-	-	7.2	46	0.5	113	***	43	5.40
4	8.7	8.3	3.0	0.9	0.15	-	43.3	3.2	0.6	3.0	50.1	-	-	6.3	34	0.5	50.1	795	46	4.60
5	9.0	8.4	2.9	0.0	0.14	-	36.1	3.0	0.5	4.3	43.9	-	-	7.0	35	0.5	43.9	627	48	3.40

Remarks : ESP (exchangeable sodium percentage) estimated from saturation extract data.

WATER SOLUBLE SALTS

Hor.	Ca	Mg	Na	K	Sum Cations	CO3	HCO3	Cl	SO4	NO3	Sum Anions	pH	EC5	ECE	SAR	SP
	mmol(+)/l					mmol(-)/l							mS/cm			
A	1.2	0.5	9.2	0.4	11.3	-	0.2	7.2	2.6	1.0	11.0	7.5	-	13.7	49	42.4
C1	1.6	0.5	9.9	0.1	12.1	-	0.1	4.7	6.3	0.7	11.8	6.8	-	14.5	47	42.1
C2	1.5	0.5	11.0	0.0	13.1	-	0.1	7.0	6.0	0.5	13.6	7.9	-	14.3	51	46.0
C3	1.7	0.5	12.1	0.0	14.3	-	0.1	7.2	8.1	0.4	15.8	6.8	-	15.0	54	46.7
	0.8	0.3	9.9	0.0	11.1	-	0.1	5.6	3.4	0.4	9.3	6.9	-	14.4	65	39.8

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d)

Hor.	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
	%					
A	0.1	0.1	0.1	0.5	0.0	0.0
C1	0.1	0.1	0.1	0.5	0.0	0.0
C2	0.1	0.1	0.1	0.5	0.0	0.0
C3	0.1	0.1	0.1	0.6	0.0	0.0
	0.1	0.1	0.1	0.5	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, gypsum, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP: exchangeable sodium percentage. SAR: sodium adsorption ratio. SP: water saturation percentage. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 13 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Silti-Cumulic Anthrosol (1974 : Calcaric Regosol)
USDA/SCS SOIL TAXONOMY (1992) : Anthropic Torrifluvent, fine-silty, mixed, frigid (1975 : Anthropic Torrifluvent)
CSTC (1991) : Warpic altocryic haplo-desert soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon
USDA/SCS (1992) : anthropic epipedon
Soil moisture regime : aridic
Soil temperature regime : frigid

LOCATION : Xinjiang Autonomous Region, 2 km W of Changyi
Latitude : 44° 0' 0'' N Longitude : 87°12' 0'' E Altitude : 600 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : piedmont Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : plain north of Tian Shan Mountains
SLOPE Gradient : 1%
POSITION OF SITE : flat
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : large cracks Slaking/crusting : capped
SLOPE PROCESSES Soil erosion : slight sheet and gully

PARENT MATERIAL : irrigation deposits, about 50 cm thick, overlying probable loess deposits

WATER TABLE : ground water level at a depth of about 10 m
DRAINAGE : well
PERMEABILITY : no slow permeable layer(s)
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : arable farming; crops : wheat, continuously irrigated

ADDITIONAL REMARKS :
SURFACE CHARACTERISTICS: soil slakes easily when irrigated; the dried-up surface crust shows heavy polygonal cracking. LAND USE: main crops and growth period: winter wheat (September-July), corn (April-September), rape (April-June), sunflower, flax; ploughing is done by tractor, weeding and harvesting manually. IRRIGATION: since 200 years, 5 basin floodings per growing season of 900-1200 m3/ha (60-80 m3/mu), water quality is good, although silt content is high; infiltration rate decreases with each gift. Fertilizers (P and complex) and animal dung are always used (quantities given are doubtful). Productivity of the major crops: winter wheat 3750 kg/ha (500 jin/mu), corn 9000 kg/ha (1200 jin/mu), generally 5250-6000 kg/ha (700-800 jin/mu), rape 1500-2250 kg/ha (200-300 jin/mu).

Slide nos. of the ISRIC collection: 7569-7584.
Thin section nos. of the ISRIC collection: 3292-3295.

CLIMATE : Köppen: BSk
Station: CHANGYI 44 1 N / 87 18 E 577 m a.s.l. 2 km E of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	17	12	14	35	98	156	176	187	164	116	67	23	11	1059
precipitation	mm	17	4	6	17	20	22	27	18	18	14	15	13	9	183
T mean	°C	17	-18.0	-13.6	-1.3	10.3	17.4	22.2	24.4	22.6	16.4	7.5	-3.5	-13.2	6.0
T max	°C	17	-11.1	-7.0	4.3	17.6	24.7	29.5	31.3	30.2	24.4	15.1	2.3	-7.5	12.8
T min	°C	17	-23.6	-29.7	-6.5	3.6	9.8	14.8	17.5	15.6	9.5	1.5	-7.9	-18.0	-0.3
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
windspeed(at 2m)	m/s	17	1.3	1.4	1.8	2.2	2.4	2.2	2.1	1.9	1.8	1.7	1.5	1.3	1.8
bright sunshine	h/d	17	5.4	6.5	6.9	8.6	9.5	10.1	10.2	9.8	9.1	8.0	5.5	4.0	7.8

ISIS 4.0 data sheet of reference soil CN 13 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, dark brown silty clay derived from irrigation deposits overlying loess of silt loam texture. The topsoil has a low organic carbon content and is very hard when dry. The soil has very weakly expressed subangular blocky structures becoming porous massive below 50 cm depth. Throughout the first meter few faint reddish mottles occur, caused by either reddish coloured irrigation mud or redox processes resulting from too long saturation. Soil reaction is alkaline throughout.

Ap1	0 - 12 cm	Dark brown (7.5YR 3/2, moist) silty clay; very weak medium subangular blocky structure; sticky, plastic, very friable, very hard; many fine roots; clear smooth boundary to
Ap2	12 - 28 cm	Dark brown (7.5YR 3/3, moist) silty clay; very weak medium subangular blocky structure; sticky, plastic, very friable, very hard; many fine roots; diffuse smooth boundary to
C1	28 - 50 cm	Dark brown (7.5YR 4/3, moist) silty clay; very weak medium subangular blocky structure; sticky, plastic, very friable, hard; common very fine roots; diffuse smooth boundary to
2C2	50 - 96 cm	Dark brown to brown (7.5YR 4.5/4, moist) silt loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; common very fine roots; diffuse smooth boundary to
2C3	96 - 150 cm	Dark brown (7.5YR 4/3, moist) silt loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; few very fine roots

Remarks: horizon boundary at 28 cm is disputable; from 0-50 cm very rare river pebbles present.

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap1	0 - 12	-	1	1	1	1	3	6	14	43	57	37	-	1.25	51	46	39	35	33	31	26	21
Ap2	12 - 28	-	0	1	1	2	4	7	14	42	56	38	-	-	-	-	-	-	-	-	-	-
C1	28 - 50	-	0	0	1	2	5	8	23	35	58	33	-	1.48	45	44	39	37	35	34	28	23
2C2	50 - 96	-	0	1	1	7	8	17	14	38	53	31	-	1.50	46	46	43	40	38	36	26	20
2C3	96 - 150	-	0	0	0	1	1	2	7	38	45	53	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
						cmol(+)/kg													
Ap1	8.1	7.3	2.2	0.89	0.10	46.3	3.6	0.9	0.7	51.5	-	-	19.5	53	3.1	51.5	264	4	0.46
Ap2	8.1	7.2	2.5	0.86	0.09	50.2	3.6	0.9	0.6	55.3	-	-	21.1	56	3.0	55.3	262	3	0.38
C1	8.2	7.3	2.3	0.61	0.02	48.1	3.4	0.8	0.5	52.8	-	-	18.6	56	2.1	52.8	284	3	0.34
2C2	8.2	7.3	1.0	0.35	0.04	46.9	3.1	0.5	0.4	50.9	-	-	17.4	57	1.2	50.9	293	2	0.29
2C3	8.1	6.9	0.9	0.45	0.05	42.1	4.5	0.7	0.7	48.0	-	-	29.5	56	1.6	48.0	163	3	0.41

WATER SOLUBLE SALTS

Hor.	Ca	Mg	Na	K	Sum Cations	CO3	HCO3	Cl	SO4	NO3	Sum Anions	pH	EC5	ECE	SAR	SP
	mmol(+)/l					mmol(-)/l							mS/cm			
Ap1	0.5	0.1	0.2	0.0	0.8	-	0.5	0.1	0.1	0.0	0.6	7.9	-	1.17	2	58.2
2C3	0.5	0.1	0.2	0.0	0.8	-	0.2	0.0	0.1	0.0	0.3	7.3	-	1.09	2	60.9

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d) / EXTRACTABLE P2O5

Hor.	Top - Bot	Fe(o) %	Al(o) %	Si(o) %	Fe(d) %	Al(d) %	Mn(d) %	P2O5 mg/kg
Ap1	0 - 12	0.1	0.1	0.1	0.8	0.1	0.0	2.2
Ap2	12 - 28	0.1	0.1	0.1	0.8	0.1	0.0	1.8
C1	28 - 50	0.1	0.1	0.1	0.7	0.1	0.0	1.3
2C2	50 - 96	0.1	0.1	0.1	0.7	0.0	0.0	0.6
2C3	96 - 150	0.2	0.1	0.1	1.1	0.1	0.0	-

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP: exchangeable sodium percentage. SAR: sodium adsorption ratio. SP: water saturation percentage. Extr. Fe Al Si Mn: weight %. 1% citric acid extractable P_2O_5: mg/kg.

ISIS 4.0 data sheet of reference soil CN 14 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Petri-Sodic Solonchak (Siltic), phreatric phase
(1974) : Orthic Solonchak, phreatric phase
USDA/SCS SOIL TAXONOMY (1992) : Aquollic Salorthid, coarse-silty, mixed, mesic (1975 : Aquollic Salorthid)
CSTC (1991) : Salipanic brown desert soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon, salic and sodic properties
USDA/SCS (1992) : ochric epipedon, salic horizon
Soil moisture regime : aridic
Soil temperature regime : mesic

LOCATION : Xinjiang Autonomous Region, Turpan
Latitude : 42°50′ 0′′ N Longitude : 89°30′ 0′′ E Altitude : 80 m b.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : intermontane basin Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : Turpan depression
SLOPE Gradient : 1%
POSITION OF SITE :
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : capped
Salt : strong
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : colluvio-alluvial deposits

WATER TABLE Depth : 200 cm Kind : groundwater table
DRAINAGE : imperfectly
PERMEABILITY : no slowly permeable layer(s)
MOISTURE CONDITIONS PROFILE : 0 - 30 cm dry 30 - 125 cm moist

LAND USE / VEGETATION : semi-natural grassland, incidentally grazed by camels; no irrigation

ADDITIONAL REMARKS :
SURFACE CHARACTERISTICS: thin crust with "fluffy, crispy" crumby structure. VEGETATION: 10-20% covered by a salt-resistant herb and reed vegetation, consisting mainly of *Alhagi* and *Phragmites*.

Slide nos. of the ISRIC collection: 7585-7591 (profile, details profile, landscape).
Thin section nos. of the ISRIC collection: 3296-3301.

CLIMATE : Köppen: BWk
Station: TURPAN 42 56 N / 89 12 E 35 m a.s.l. 35 km WNW of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	29	17	26	75	137	195	224	228	198	138	75	31	14	1358
precipitation	mm	29	2	0	1	0	1	3	2	3	1	1	0	1	16
T mean	°C	29	-9.5	-2.1	9.3	18.9	25.7	31.0	32.7	30.4	23.3	12.6	1.8	-7.2	13.9
T max	°C	29	-3.1	5.1	16.6	26.1	33.1	38.2	39.9	38.2	32.0	21.8	9.4	-1.0	21.4
T min	°C	29	-14.5	-8.2	2.2	11.3	17.5	22.9	25.1	22.6	15.5	5.9	-3.5	-11.7	7.1
relative humidity	%	29	59	46	33	27	27	29	31	36	41	49	53	62	41
windspeed(at 2m)	m/s	29	0.7	1.0	1.4	1.8	1.9	2.0	1.8	1.6	1.4	1.0	0.8	0.6	1.4
bright sunshine	h/d	29	5.8	7.3	7.9	8.7	9.7	10.3	10.3	10.2	9.6	8.5	6.8	5.3	8.4

ISIS 4.0 data sheet of reference soil CN 14 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Deep, imperfectly drained, brown, saline sandy loam with a thick hard, dirty white crystallized salt pan in the topsoil. The subsoil shows few to common white salt spots.

A	0 - 8 cm	Pale brown (10YR 6/3, moist) sandy loam; crumb structure; very friable, soft; many very fine to medium pores; common medium roots; abrupt wavy boundary to
Az	8 - 25 cm	extremely hard salt pan; few medium roots in cracks; abrupt smooth boundary to
Cz	25 - 44 cm	Brown (10YR 5/3, moist) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; few very fine to fine pores; few medium roots; clear smooth boundary to
Cy(z)	44 - 65 cm	Brown (10YR 5/3, moist) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable; few very fine to fine pores; few medium roots; diffuse smooth boundary to
C(z)	65 - 125 cm	Brown (10YR 5/3, moist) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable; few very fine to fine pores

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
A	0 - 8	-	0	0	0	2	15	18	35	32	66	16	-	-	-	-	-	-	-	-	-	-
Az	8 - 25	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cz	25 - 44	-	0	0	0	1	14	15	42	34	76	9	-	0.99	69	63	57	45	30	23	17	15
Cy(z)	44 - 65	-	0	0	0	1	12	14	44	31	74	12	-	1.21	58	56	50	39	33	28	20	16
C(z)	65 - 125	-	0	0	0	3	16	19	36	30	66	15	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
						cmol(+)/kg													
A	8.7	8.6	2.6	1.59	0.11	101	15.2	1.8	6.8	125	-	-	8.5	52	5.6	125	***	77	39.0
Az	8.6	8.4	1.1	0.38	0.04	59.5	16.2	0.1	61.4	137	-	-	1.3	-	1.3	137	***	55	59.0
Cz	8.5	8.2	2.9	0.46	0.06	154	19.1	0.8	2.9	176	-	-	8.4	95	1.6	176	***	43	14.0
Cy(z)	8.9	8.7	3.0	0.24	0.03	170	11.6	0.9	2.1	184	-	-	8.7	74	0.8	184	***	52	8.9
C(z)	8.5	8.2	3.0	0.28	0.03	202	11.9	0.7	2.8	217	-	-	9.5	65	1.0	217	***	21	6.0

Remarks : ESP (exchangeable sodium percentage) estimated from saturation extract data.

WATER SOLUBLE SALTS

Hor.	Ca	Mg	Na	K	Sum Cations	CO3	HCO3	Cl	SO4	NO3	Sum Anions	pH	EC5	ECE	SAR	SP
	mmol(+)/l					mmol(-)/l							mS/cm			
A	2.9	18.8	153.1	2.3	177.0	-	1.4	97.6	70.8	1.0	170.8	8.1	-	40.0	224.0	43.3
Az	0.3	176.9	173.3	0.8	351.3	-	2.7	29.6	284.7	1.0	318.0	7.4	-	>60.0	84.0	48.6
Cz	1.5	33.8	51.2	0.3	86.9	-	0.7	7.4	80.7	0.0	88.7	8.0	-	28.6	52.0	45.3
Cy(z)	1.2	5.9	29.0	0.2	36.3	-	0.2	8.0	30.0	0.0	38.2	8.4	-	22.8	75.0	41.7
C(z)	1.3	1.9	13.9	0.1	17.2	-	0.1	5.4	11.9	0.0	17.7	7.8	-	15.9	19.0	48.7

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d)

Hor.	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
	%					
A	0.1	0.1	0.2	0.7	0.1	0.0
Az	0.0	0.0	0.0	0.1	0.0	0.0
Cz	0.1	0.2	0.1	0.5	0.1	0.0
Cy(z)	0.1	0.1	0.1	0.6	0.1	0.0
C(z)	0.1	0.1	0.2	0.6	0.1	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP: exchangeable sodium percentage. SAR: sodium adsorption ratio. SP: water saturation percentage. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 15 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Orthi-Haplic Arenosol (1974 : Eutric Regosol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Torripsamment, mixed, mesic (1975 : Typic Torripsamment)
CSTC (1991) : Haplic blown sand soil

DIAGNOSTIC CRITERIA FAO (1988) :
USDA/SCS (1992) :
Soil moisture regime : aridic
Soil temperature regime : mesic

LOCATION : Xinjiang Autonomous Region, about 80 km N of Urumqi
Latitude : 44°26' 0'' N Longitude : 87°45' 0'' E Altitude : 500 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 8/85

GENERAL LANDFORM : dune field Topography : undulating
PHYSIOGRAPHIC UNIT : Junggar Desert
SLOPE Gradient : 45%
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : none

PARENT MATERIAL : eolian sand
Remarks : sand dune

WATER TABLE Depth : ground water level more than 10 m
DRAINAGE : somewhat excessive
PERMEABILITY : no slowly permeable layer(s)
MOISTURE CONDITIONS PROFILE : 0 - 150 cm dry

LAND USE : (semi-) natural vegetation
VEGETATION Type : grassland

ADDITIONAL REMARKS :
VEGETATION: the semi-fixed sand dunes have a 10% (or less) vegetational coverage consisting mainly out of *Aristida*, *Haloxylon*, *Calligonum*, *Echinopsilon* and *Alhagia*.

Slide nos. of the ISRIC collection: 7801-7808 (profile, landscape, vegetation).
Thin section nos. of the ISRIC collection: 3302-3304.

CLIMATE : Köppen: BSk
Station: CHANGYI 44 1 N / 87 18 E 577 m a.s.l. 60 km SW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	17	12	14	35	98	156	176	187	164	116	67	23	11	1059
precipitation	mm	17	4	6	17	20	22	27	18	18	14	15	13	9	183
T mean	°C	17	-18.0	-13.6	-1.3	10.3	17.4	22.2	24.4	22.6	16.4	7.5	-3.5	-13.2	6.0
T max	°C	17	-11.1	-7.0	4.3	17.6	24.7	29.5	31.3	30.2	24.4	15.1	2.3	-7.5	12.8
T min	°C	17	-23.6	-29.7	-6.5	3.6	9.8	14.8	17.5	15.6	9.5	1.5	-7.9	-18.0	-0.3
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
windspeed(at 2m)	m/s	17	1.3	1.4	1.8	2.2	2.4	2.2	2.1	1.9	1.8	1.7	1.5	1.3	1.8
bright sunshine	h/d	17	5.4	6.5	6.9	8.6	9.5	10.1	10.2	9.8	9.1	8.0	5.5	4.0	7.8

ISIS 4.0 data sheet of reference soil CN 15 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, somewhat excessively drained, very pale brown fine sand. Strongly tilted stratification is clearly visible from about 15 cm and deeper; thin layers are differentiated from each other by colour and granulometric differences. About 10-20% of the sand grains consist of dark coloured grains.

C 0 - 150 cm Very pale brown (10YR 8/3, moist) fine sand; structureless single grain structure; non sticky, non plastic, loose; few fine roots

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
C	0 - 50	-	0	0	1	63	32	96	1	1	1	3	-	1.60	41	40	38	11	6	6	3	2
	50 - 100	-	0	0	1	57	38	96	1	1	1	3	-	1.62	41	40	38	11	6	6	3	3

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	ESP	EC 2.5 mS/cm
C	8.9	8.2	0.8	0.03	-	20.0	1.0	0.2	0.8	22.0	-	-	2.1	81	0.1	22.0	***	38	0.18
	9.0	8.3	0.9	0.02	-	20.0	1.0	0.2	0.1	21.3	-	-	2.3	82	0.1	21.3	926	4	0.27

EXTRACTABLE Fe Al Si Mn (by amm. oxal. (o) & Na dith. (d)

Hor.	Fe(o) %	Al(o) %	Si(o) %	Fe(d) %	Al(d) %	Mn(d) %
C	0.0	0.0	0.0	0.4	0.0	0.0
	0.0	0.0	0.0	0.3	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP: exchangeable sodium percentage. Extr. Fe Al Si Mn: weight %.

ISIS 4.0 data sheet of reference soil CN 16 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Yermi-Calcaric Regosol, skeletic phase (1975 : Calcaric Regosol, petric phase)
USDA/SCS SOIL TAXONOMY (1992) : Typic Torriorthent, fragmental, mixed, frigid (1975 : Typic Torriorthent)
CSTC (1991) : Haplic skeletisol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon
USDA/SCS (1992) : ochric epipedon
Soil moisture regime : aridic
Soil temperature regime : frigid

LOCATION : Xinjiang Autonomous Region, about 40 km S of Urumqi
Latitude : 43°35' 0'' N Longitude : 87°40' 0'' E Altitude : 750 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 9/85

GENERAL LANDFORM : piedmont Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : southern plain of Tian Shan Mountains
SLOPE Gradient : 1%
POSITION OF SITE :
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : Stoniness : exceedingly stony
Cracking : Slaking/crusting : capped
SLOPE PROCESSES Soil erosion : slight sheet wind

PARENT MATERIAL : gravelly sandy colluvium

WATER TABLE : no watertable observed
DRAINAGE : excessive
PERMEABILITY : no slowly permeable layer(s)
MOISTURE CONDITIONS PROFILE : 0 - 120 cm dry

LAND USE / VEGETATION : (semi-) natural vegetation (grassland), incidentally browsed by camels

ADDITIONAL REMARKS :
CLIMATE: somewhat in between Urumqi and Changyi. SURFACE CHARACTERISTICS: very shallow broad "run-off" channels or streamlines are visible (mainly through a denser vegetation cover). VEGETATION: the Gobi or gravel/stone desert has an irregular vegetational cover; about 10% consists mainly of *Reaumaria*, *Zljinia regelii*, *Ephedra* and *Zygo phyllum*.

Slide nos. of the ISRIC collection: 7809-7815 (profile, landscape/vegetation, monolith sampling).
Thin section nos. of the ISRIC collection: none

CLIMATE : Köppen: Dfa
Station: CHANGYI 44 1 N / 87 18 E 577 m a.s.l. 60 km NW of site Relevance: moderate
Station: URUMQI 43 47 N / 87 37 E 918 m a.s.l. 40 km N of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
CHANGYI															
ETo (PenMon)	mm	17	12	14	35	98	156	176	187	164	116	67	23	11	1059
precipitation	mm	17	4	6	17	20	22	27	18	18	14	15	13	9	183
T mean	°C	17	-18.0	-13.6	-1.3	10.3	17.4	22.2	24.4	22.6	16.4	7.5	-3.5	-13.2	6.0
T max	°C	17	-11.1	-7.0	4.3	17.6	24.7	29.5	31.3	30.2	24.4	15.1	2.3	-7.5	12.8
T min	°C	17	-23.6	-29.7	-6.5	3.6	9.8	14.8	17.5	15.6	9.5	1.5	-7.9	-18.0	-0.3
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
windspeed(at 2m)	m/s	17	1.3	1.4	1.8	2.2	2.4	2.2	2.1	1.9	1.8	1.7	1.5	1.3	1.8
bright sunshine	h/d	17	5.4	6.5	6.9	8.6	9.5	10.1	10.2	9.8	9.1	8.0	5.5	4.0	7.8
URUMQI															
ETo (PenMon)	mm	14	14	13	31	92	155	176	193	178	129	69	23	11	1084
precipitation	mm	14	9	11	21	34	35	39	22	24	26	24	19	15	278
T mean	°C	14	-15.4	-12.1	-4.0	9.0	15.9	21.2	23.5	22.0	16.8	7.4	-4.2	-11.6	5.7
T max	°C	14	-9.6	-6.4	0.7	15.1	22.2	27.0	29.6	28.4	23.4	13.4	0.7	-6.4	11.5
T min	°C	14	-20.3	-16.8	-8.1	3.5	9.8	15.3	17.3	16.0	11.0	2.5	-7.9	-16.1	0.5
relative humidity	%	14	80	81	77	54	44	45	44	42	45	57	76	82	61
windspeed(at 2m)	m/s	14	1.4	1.5	1.8	2.6	2.8	2.6	2.5	2.5	2.4	2.1	1.6	1.3	2.1
bright sunshine	h/d	14	4.9	5.6	6.2	8.1	9.4	9.8	10.0	9.8	9.3	7.8	4.9	3.8	7.5

ISIS 4.0 data sheet of reference soil CN 16 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, excessively drained, gravel with a thin brown, slightly gravelly sandy loam topsoil. A desert pavement is present at the surface.

A	0 - 8 cm	Brown (10YR 4/3, moist) slightly gravelly loamy sand; weak fine to medium crumb structure; non sticky, non plastic, very friable, slightly hard; many very fine to medium pores; few fine roots; clear smooth boundary to
C1	8 - 24 cm	Brown (10YR 4/3, moist) slightly gravelly loamy sand; weak fine to medium subangular blocky structure; non sticky, non plastic, very friable, slightly hard; many very fine to fine pores; few fine roots; clear wavy boundary to
C2	24 - 120 cm	gravel; loose; few fine roots

Remarks: the A horizon consists of 3 thin layers. The first layer (top 1.5 cm) sometimes has a "foam or gasbubble" structure. The second layer is formed by a 4 cm clear loose laminated layer. The third or bottom part of the A horizon shows some crumb structure. The 24 cm boundary is not fixed, sometimes this boundary is at 15 cm or 20 cm depth. The C2 horizon may be divided into: 24-60 cm (coarse gravel) and 60-120 cm (fine gravel). The C2 horizon is a dark coloured gravel layer.
No samples are available for this soil.

ISIS 4.0 data sheet of reference soil CN 17 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Veti-Haplic Acrisol (Pachic and Chromic) (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Kandiudult, clayey, kaolinitic, isohyperthermic (1975 : Typic Paleudult)
CSTC (1991) : Haplic latosol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, kandic horizon
Soil moisture regime : udic
Soil temperature regime : isohyperthermic

LOCATION : Hainan Island, Dan Xiang County, 8 km W of Na-da city, in rubber plantation
Latitude : 19°29′ N Longitude : 109°29′ E Altitude : 140 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Liang / Wang Minzhu Date (mm/yy) : 10/92

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : low, broad hill
SLOPE Gradient : 2% Form : straight
POSITION OF SITE : upper slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting :
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material from highly weathered coarse-acid igneous rock (granite)

EFFECTIVE SOIL DEPTH : > 150 cm

WATER TABLE : not observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layers
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 50 cm dry 50 - 155 cm moist

LAND USE : Crops : rubber, planted in 1963
VEGETATION Type : evergreen forest Status : cut over

ADDITIONAL REMARKS :
VEGETATION: original vegetation is a deciduous tropical forest. Before 1963 secondary forest, in 1963 planting of rubber trees. Tree distance 6 x 3 meter. FERTILIZER USE: urea and phosphorus. Yield about 3 ton/ha/year.

Soil map 1:500.000 indicates that CN017 is located in the largest map unit, i.e. Latosol derived form granite. This soil type covers the largest part of Hainan Island. Granite is the dominant parent rock of Hainan Island. Field observations show that besides this reddish-brown clayey soil, other variants exist. The soil varies from reddish brown clay to light greyish sandy loam/loamy sand. The greyish colour is caused by groundwater influence but probably also induced by a coarser, more acid granite type resulting in a sandy soil. No detailed maps were made available, but field observations in a transect from West to East show that both soil types appeared to be representative for large areas.
The soil is formed in an erosion terrace in granite. The altitude of the terrace is around 150 meter. The landscape has a plain-like appearance and consists of low, broad interfluves (hills). CN017 is located on an upper slope position of broad, low hill, being representative for the larger part of the hill. On the lower slope, transitional to the valley, soil colours become more yellow and the subsoil strongly mottled.
The soil has a high biological activity. Pores and cavities are made by termites (dominant), ants and worms. Spherical termite cavities occur having a diameter of about 5 to 6 cm and flat floor, with or without fungus gardens. Their density is about 2 per m2.
Penetrometer readings in the moist B horizon are about 4 kg/cm2.
FAO/Unesco (1974) soil classification assumes presence of an argillic horizon overlying an oxic horizon, however, clay cutans are lacking. In view of clay increase between 0 and 40 cm depth this soil fits the concept of a Ferric Acrisol.

Slides in the ISRIC collection: landscape, soil, rubber trees.

CLIMATE : Köppen: Am
Station: NADA 19 30 N/109 30 E 148 m a.s.l. 3 km W of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	71	73	105	126	149	141	152	136	117	105	81	71	1328
pan evaporation	mm	22	101	109	153	189	217	194	212	179	145	145	109	101	1853
precipitation	mm	27	22	24	37	90	210	216	236	306	354	202	84	35	1816
no. of raindays		27	10	10	9	11	17	17	16	19	19	14	11	9	163
T mean	°C	26	16.9	18.2	21.6	24.9	26.9	27.4	27.5	26.7	25.7	23.6	20.5	18.0	23.2
T max	°C	26	22.2	24.0	27.8	31.4	32.9	32.9	33.0	32.0	30.6	28.3	25.2	22.9	28.6
T min	°C	26	13.5	14.7	17.8	21.0	23.2	24.1	23.9	23.5	22.8	20.6	17.5	14.8	19.8
relative humidity	%	26	84	84	82	79	80	81	81	85	87	84	84	84	83
windspeed(at 2m)	m/s	26	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.9	2.4	2.2	2.0	2.0	1.9
bright sunshine	h/d	27	4.3	4.4	5.0	6.1	7.1	6.9	7.6	6.4	6.6	5.5	4.7	4.3	5.7

ISIS 4.0 data sheet of reference soil CN 17 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, reddish brown sandy clay loam derived from granite. Soil structure is only weakly expressed. It is highly porous and well rooted, shows a strong biological activity and contains in the deeper subsoil weathered granite fragments.

Ah 0 - 20 cm Dark reddish brown (2.5YR 3/4, moist) to reddish brown (2.5YR 4/4, dry) sandy clay loam; weak fine subangular blocky structure; slightly sticky, slightly plastic, friable, slightly hard; many very fine and fine tubular pores; many fine and coarse roots throughout; gradual smooth boundary to

AB 20 - 40 cm Dark red (2.5YR 3/6, moist) sandy loam; weak fine subangular blocky structure; slightly sticky, slightly plastic, friable; many very fine to fine tubular pores; many fine roots throughout; very frequent termite channels; gradual smooth boundary to

Bw 40 - 155 cm Red (2.5YR 4/7, moist) sandy clay loam; weakly coherent porous massive to weak fine subangular blocky structure; slightly sticky, slightly plastic, friable; many very fine to fine tubular pores; common fine roots throughout; very frequent termite channels; gradual smooth boundary to

BC 155 - 180 cm Red (2.5YR 4/7, moist) sandy loam; weakly coherent porous massive structure; non sticky, non plastic, friable; many very fine tubular pores; few fine roots throughout; frequent fine strongly weathered granite fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 5	-	5	18	22	24	5	74	1	6	7	19	13.9	-	-	-	-	-	-	-	-	-
	5 - 20	-	5	14	19	23	7	69	1	5	6	25	17.0	1.42	40	38	32	28	27	24	19	17
AB	20 - 40	-	6	14	17	20	4	61	1	7	8	32	17.6	-	-	-	-	-	-	-	-	-
Bw	40 - 100	-	8	12	14	15	5	54	1	8	9	37	2.9	1.40	39	38	34	31	30	28	24	21
	100 - 155	-	10	13	13	14	3	53	2	8	10	37	4.4	1.35	40	39	36	33	32	30	25	21
BC	155 - 180	-	21	12	9	10	4	55	1	9	10	35	3.4	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.8	4.1	-	1.50	0.12	0.6	0.3	0.2	0.1	1.2	0.7	0.5	3.5	18	5.2	1.9	34	14	0.16
	4.3	4.1	-	0.85	0.08	0.0	0.0	0.1	0.1	0.2	1.2	0.9	2.5	10	3.0	1.4	8	36	0.11
AB	4.2	4.1	-	0.55	0.06	0.0	0.0	0.1	0.0	0.1	1.2	0.9	2.3	7	1.9	1.3	4	39	0.06
Bw	4.2	4.2	-	0.29	0.04	0.2	0.0	0.1	0.0	0.3	1.0	0.5	1.6	4	1.0	1.3	19	31	0.06
	4.5	4.4	-	0.18	0.03	0.0	0.3	0.1	0.1	0.5	0.3	0.0	1.6	4	0.6	0.8	31	0	0.05
BC	4.6	4.5	-	0.13	0.05	0.0	0.3	0.1	0.0	0.4	0.3	0.0	1.4	4	0.5	0.7	29	0	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray) / P retention

Hor.	MICA /ILL	KAOL	MIX	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg	Pret %
Ah	2	8	-	3	3	1.4	0.2	3.3	13
	2	8	3	3	3	1.6	0.2	1.0	17
AB	2	8	3	3	3	2.1	0.2	0.0	17
Bw	2	8	3	3	3	2.7	0.2	0.0	24
	2	8	3	3	3	2.8	0.2	0.0	23
BC	-	8	-	3	3	2.8	0.2	0.0	22

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, KAOL kaolinite, MIX mixed layer silicates, GIBB gibbsite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg. P_{ret} (phosphate retention): weight %.

ISIS 4.0 data sheet of reference soil CN 18 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Rhodi-Geric Ferralsol (1974 : Acric Ferralsol)
USDA/SCS SOIL TAXONOMY (1992) : Anionic Acrudox, very-fine, kaolinitic, isohyperthermic (1975 : Typic Acrorthox)
CSTC (1991) : Haplic latosol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, ferralic B horizon; geric properties
USDA/SCS (1992) : ochric epipedon, oxic horizon
Soil moisture regime : udic
Soil temperature regime : isohyperthermic

LOCATION : Hainan Island, Chang Ma County, 2 km W of Fu-shang Town, Hong Guang St. farm
Latitude : 19°50' N Longitude : 109°54' E Altitude : 105 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Wang Minzhu Date (mm/yy) : 10/92

GENERAL LANDFORM : peneplain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : low broad nearly level hill
SLOPE Gradient : 1% Form : straight
POSITION OF SITE : crest
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting :
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material derived from fine-basic igneous rock (basalt)

EFFECTIVE SOIL DEPTH : > 300 cm

WATER TABLE : not observed, estimated to be at a depth of 20 meters (verbal comm.)
DRAINAGE : well
PERMEABILITY : no slowly permeable layers observed
MOISTURE CONDITIONS PROFILE : 0 - 50 cm dry 50 - 300 cm moist

LAND USE : Crops : rubber, planted in 1966. Rubber yield is about 1000 kg/ha

ADDITIONAL REMARKS :
Northern Hainan Island has a series of extensive, terrace-like basalt plains ranging in elevation from about 50 to 150 m. CN018 is representative for the very deep dark red clay soils derived from basalt. The profile is comparable to the very deep Brazilian Ferralsols developed on basalt in e.g. the Sao Paolo region.
Penetrometer reading in the slightly moist soil is about 2 to 2.5 kg/cm2.

CLIMATE : Köppen: Am
Station: HAIKOU 20 2 N/110 21 E 14 m a.s.l. 50 km W of site Relevance: very good
Station: NADA 19 30 N/109 30 E 148 m a.s.l. 60 km SW of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
HAIKOU															
ET (PenMon)	mm	27	71	67	99	123	152	147	161	140	123	115	90	74	1362
pan evaporation	mm	27	102	96	138	182	211	197	216	178	155	160	130	110	1874
precipitation	mm	30	24	30	52	93	188	241	207	240	303	172	98	38	1685
no. of raindays		30	9	10	10	11	16	16	14	16	16	12	10	9	150
T mean	°C	30	17.2	18.2	21.6	24.9	27.4	28.1	28.4	27.7	26.8	24.8	21.8	18.7	23.8
T max	°C	30	20.9	22.3	26.2	29.8	32.4	32.8	33.2	32.0	30.6	28.3	25.1	22.2	28.0
T min	°C	30	14.6	15.6	18.8	21.9	24.2	25.1	25.1	24.8	24.2	22.1	19.2	16.1	21.0
relative humidity	%	30	85	87	87	85	84	84	83	86	86	83	82	83	85
windspeed(at 2m)	m/s	27	2.8	2.9	2.9	3.0	2.6	2.4	2.4	2.2	2.3	2.6	2.9	2.6	2.6
bright sunshine	h/d	30	4.2	4.1	4.7	6.3	7.8	7.5	8.3	7.1	6.6	6.5	5.7	4.8	6.1
NADA															
ETo (PenMon)	mm	26	71	73	105	126	149	141	152	136	117	105	81	71	1328
pan evaporation	mm	22	101	109	153	189	217	194	212	179	145	145	109	101	1853
precipitation	mm	27	22	24	37	90	210	216	236	306	354	202	84	35	1816
no. of raindays		27	10	10	9	11	17	17	16	19	19	14	11	9	163
T mean	°C	26	16.9	18.2	21.6	24.9	26.9	27.4	27.5	26.7	25.7	23.6	20.5	18.0	23.2
T max	°C	26	22.2	24.0	27.8	31.4	32.9	32.9	33.0	32.0	30.6	28.3	25.2	22.9	28.6
T min	°C	26	13.5	14.7	17.8	21.0	23.2	24.1	23.9	23.5	22.8	20.6	17.5	14.8	19.8
relative humidity	%	26	84	84	82	79	80	81	81	85	87	84	84	84	83
windspeed(at 2m)	m/s	26	2.0	1.9	1.9	1.8	1.8	1.8	1.7	1.9	2.4	2.2	2.0	2.0	1.9
bright sunshine	h/d	27	4.3	4.4	5.0	6.1	7.1	6.8	7.6	6.4	5.7	5.5	4.7	4.3	5.7

ISIS 4.0 data sheet of reference soil CN 18 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, dark reddish brown clay derived from basalt. Soil colour, structure and other properties are uniform to a depth of about 6 meters. Rooting is as deep as 3 meters. There is a very high biological activity caused by termites.

Ah 0 - 20 cm Dark reddish brown (2.5YR 3/4, moist) clay; moderately coherent porous massive to weak fine subangular blocky structure; slightly sticky, slightly plastic, friable, hard; many very fine and common fine pores; many fine and common medium roots throughout; diffuse smooth boundary to

Bo1 20 - 120 cm Dark reddish brown (2.5YR 3/4, moist) clay; weakly coherent porous massive to weak fine subangular blocky structure; slightly sticky, slightly plastic, very friable; many very fine and common fine random tubular pores; common fine roots throughout; frequent termite channels

Bo2 120 - 300 cm Dark reddish brown (2.5YR 3/4, moist) clay; weakly coherent porous massive to weak fine subangular blocky structure; slightly sticky, slightly plastic, very friable; many very fine and common fine random tubular pores; frequent termite channels

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 20	-	1	1	2	5	2	11	1	12	12	77	1.9	1.10	58	56	51	43	41	37	30	27
Bo1	20 - 50	-	1	1	2	4	2	9	2	7	9	82	4.7	-	-	-	-	-	-	-	-	-
	50 - 80	-	0	1	2	3	1	7	6	6	12	81	5.5	1.01	55	54	49	42	41	38	30	28
	80 - 120	-	0	1	2	3	2	8	0	11	11	81	2.0	-	-	-	-	-	-	-	-	-
Bo2	120 - 200	-	1	1	2	3	2	7	1	14	15	78	2.4	1.10	55	54	52	49	48	45	34	31
	200 - 300	-	0	1	1	2	2	6	2	15	17	77	3.6	1.11	55	54	48	45	44	42	36	33

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.3	4.1	-	1.48	0.13	0.2	0.3	0.0	0.1	0.6	1.5	0.9	5.9	8	5.2	2.1	10	15	0.06
Bo1	4.3	4.3	-	0.78	0.08	0.0	0.3	0.1	0.1	0.5	0.8	0.5	1.8	2	2.7	1.3	28	28	0.04
	4.5	4.7	-	0.42	0.05	0.0	0.3	0.1	0.3	0.7	0.2	0.0	2.1	3	1.5	0.9	33	0	0.02
	4.8	4.9	-	0.33	0.04	0.0	0.3	0.0	0.2	0.5	0.0	0.0	2.0	2	1.2	0.5	25	0	0.02
Bo2	4.6	5.1	-	0.26	0.04	0.2	0.3	0.0	0.1	0.6	0.0	0.0	2.3	3	0.9	0.6	26	0	0.03
	4.5	5.1	-	0.16	0.03	0.2	0.3	0.0	0.1	0.6	0.1	0.0	2.1	3	0.6	0.7	29	0	0.03

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray) / P retention

Hor.	CHLO	KAOL	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg	Pret %
Ah	2	6	3	3	7.8	0.7	0.0	43
Bo1	2	6	3	3	8.1	0.7	0.0	51
	2	6	3	3	8.3	0.8	0.0	56
	2	6	3	3	7.2	0.6	0.0	58
Bo2	2	6	3	3	7.6	0.7	0.0	61
	2	6	3	3	7.9	0.7	0.0	63

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: CHLO chlorite, KAOL kaolinite, GIBB gibbsite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg. P_{ret} (phosphate retention): weight %.

ISIS 4.0 data sheet of reference soil CN 19 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Veti-Haplic Acrisol (Pachic and Xanthic) (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Kandiudult, clayey, kaolinitic, isohyperthermic (1975 : Typic Paleudult)
CSTC (1991) : Argillic latored soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, kandic horizon
Soil moisture regime : udic
Soil temperature regime : isohyperthermic

LOCATION : Hainan Island, 15 km north of Tong Zha City, about 500 m from road to the Antenne
Latitude : 18° 45' 00" N Longitude : 109° 28' 45" E Altitude : 770 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Wang Minzhu Date (mm/yy) : 10/92

GENERAL LANDFORM : mountain Topography : steeply dissected
PHYSIOGRAPHIC UNIT : Toen-ling Mountains
SLOPE Gradient : 40% Form : straight
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting :
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material derived from coarse-acid igneous rocks (granite)
Weathering degree : high

EFFECTIVE SOIL DEPTH : > 250 cm

WATER TABLE : not observed
DRAINAGE : moderately well to well
PERMEABILITY : no slowly permeable layers
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 10 cm dry 10 - 250 cm moist

LAND USE : (semi-) natural vegetation
VEGETATION Type : semi deciduous forest Status : secondary

ADDITIONAL REMARKS :
CN019 is representative for soils of the central highlands, consisting of middle high mountains, dominantly composed of granite. The depth of the solum may vary from shallow to very deep. The underlying granite is nearly always strongly weathered.
The original forest has been cut over large areas, replaced by secondary forest, but generally natural grassland (tuffed tall grasses) takes over.
The first half meter below the A-horizon (approx. the AB and Bw1 horizons) have common coarse old root channels filled with dark topsoil material. The AB horizon is multicoloured. Besides the given matrix colour, frequent patches of A and Bw1 colours occur.
The soil has nearly a ferralic B horizon below 46 cm, however, silt/clay ratio is a too high. The requirements for a kandic horizon are met which starts at about 30 cm depth.

CLIMATE : Köppen: Am
Station: QIONGZHONG 19 2 N / 109 50 E 250 m a.s.l. 30 km W of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	21	59	64	99	117	130	123	136	121	102	87	63	59	1161
pan evaporation	mm	20	95	101	163	200	218	195	218	185	150	127	90	84	1824
precipitation	mm	21	37	39	44	101	239	226	253	306	484	451	208	59	2447
no. of raindays		21	14	13	10	11	18	18	17	21	22	19	17	14	194
T mean	°C	21	16.5	17.7	21.2	23.8	25.9	26.4	26.6	25.9	24.8	22.9	20.0	17.5	22.4
T max	°C	21	21.8	23.2	27.2	30.1	32.2	32.1	32.4	31.5	29.9	27.4	24.4	22.3	27.9
T min	°C	21	12.7	14.0	16.8	19.2	21.5	22.5	22.4	22.3	21.6	19.8	16.9	14.0	18.7
relative humidity	%	21	87	87	83	82	82	84	82	86	89	88	89	88	86
windspeed(at 2m)	m/s	21	0.8	1.0	1.3	1.3	1.0	1.0	1.1	0.9	0.9	0.9	0.6	0.6	1.0
bright sunshine	h/d	21	3.6	3.8	4.8	5.9	6.4	5.6	6.6	5.6	4.7	3.9	3.2	3.3	4.8

ISIS 4.0 data sheet of reference soil CN 19 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, yellowish brown sandy clay derived from granite. The prominent but thin dark topsoil has a medium to high organic carbon content. The subsoil is only weakly structured and has a very low base saturation. Soil reaction is strongly acid throughout.

Ah	0 - 11 cm	Very dark grayish brown (10YR 3/2, moist) sandy clay; weak to moderate fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable, slightly hard; many fine and common medium random tubular pores; many fine and common medium roots throughout; clear smooth boundary to
AB	11 - 22 cm	Dark yellowish brown (10YR 4/4 moist) sandy clay; moderate fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable; few fine distinct clear yellowish red (5YR 5/6) mottles and many fine faint diffuse mottles; many fine and few medium random tubular pores; many fine and few medium roots throughout; clear wavy boundary to
Bw1	22 - 46 cm	Yellowish brown (10YR 5/6, moist) sandy clay; weak medium subangular blocky parting to weak fine subangular blocky structure; slightly sticky, slightly plastic, friable; few fine faint mottles; many fine tubular pores; common medium and many fine roots throughout; gradual smooth boundary to
Bw2	46 - 80 cm	Brownish yellow (10YR 6/6, moist) sandy clay; weak medium subangular blocky parting to weak fine subangular blocky structure; slightly sticky, slightly plastic, friable; many fine tubular pores; many fine roots throughout; diffuse smooth boundary to
Bw3	80 - 140 cm	Yellowish brown (9YR 5/8, moist) sandy clay; weak medium subangular blocky parting to weak fine subangular blocky structure; slightly sticky, slightly plastic, very friable; many fine tubular pores; common fine roots throughout; diffuse smooth boundary to
Bw4	140 - 200 cm	Strong brown (7.5YR 5/8, moist) sandy clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many fine tubular pores; few fine roots throughout;

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 11	-	8	17	14	12	4	55	2	16	18	27	13.8	-	-	-	-	-	-	-	-	-
AB	11 - 22	-	9	16	12	9	6	52	7	14	21	27	15.5	1.23	50	48	45	42	41	38	28	21
Bw1	22 - 46	-	10	14	10	9	4	46	5	14	20	35	19.9	1.40	44	44	41	39	38	37	32	25
Bw2	46 - 80	-	9	13	9	7	4	42	2	13	16	42	7.4	-	-	-	-	-	-	-	-	-
Bw3	80 - 140	-	10	11	8	8	3	40	6	13	19	41	5.5	1.27	47	46	44	42	42	40	37	27
Bw4	140 - 200	-	7	12	9	8	5	41	4	14	18	41	3.0	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.6	4.0	-	2.22	0.16	0.6	0.3	0.4	0.1	1.4	1.5	0.9	6.2	23	7.8	2.9	23	15	0.07
AB	4.4	4.0	-	1.26	0.10	0.0	0.3	0.2	0.0	0.5	1.8	1.4	3.9	15	4.4	2.3	13	36	0.05
Bw1	4.2	3.9	-	0.61	0.07	0.0	0.0	0.1	0.0	0.1	1.8	1.6	3.7	11	2.1	1.9	3	43	0.03
Bw2	4.2	4.0	-	0.62	0.06	0.0	0.0	0.1	0.2	0.3	2.1	1.8	4.3	10	2.2	2.4	7	42	0.03
Bw3	4.5	4.1	-	0.62	0.06	0.2	0.0	0.1	0.0	0.3	1.8	1.4	4.1	10	2.2	2.1	7	34	0.02
Bw4	4.3	4.1	-	0.34	0.04	0.2	0.0	0.1	0.1	0.4	1.7	1.4	4.4	11	1.2	2.1	9	32	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	KAOL	MIX	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah	3	3	8	3	3	3	1.0	0.2	0.0
AB	3	3	8	3	3	3	1.1	0.2	0.0
Bw1	3	3	8	3	3	3	1.6	0.3	0.0
Bw2	3	3	8	3	3	3	1.9	0.4	0.0
Bw3	2	3	8	3	3	3	2.0	0.4	0.7
Bw4	1	2	8	2	3	3	2.1	0.4	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, GIBB gibbsite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 20 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Veti-Ferralic Cambisol (Chromic) (1974 : Orthic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludox, fine, kaolinitic, isohyperthermic (1975 : Typic Haplorthox)
CSTC (1991) : Haplic latored soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, oxic horizon
Soil moisture regime : udic
Soil temperature regime : isohyperthermic

Remarks: FAO (1988) classification is "Ferralic Cambisol" because the silt/clay ratio in the soil is too high for a ferralic B horizon. All other criteria for ferralic B horizon are met.

LOCATION : Hainan Island, Wan-Ning county, Xing-Long town, east of Tai Yang River
Latitude : 18°46' N Longitude : 110°20' E Altitude : 40 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Wang Minzhu / Liang Date (mm/yy) : 10/92

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : low, broad, interfluve (hill)
SLOPE Gradient : 2% Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : Slaking/crusting :
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material derived from coarse-acid igneous rock (granite)
Weathering degree : slight

EFFECTIVE SOIL DEPTH : 200 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil
MOISTURE CONDITIONS PROFILE : 0 - 20 cm dry 20 - 200 cm moist

LAND USE : fallow. Former land-use rubber trees

ADDITIONAL REMARKS :
The east coastal erosion terrace in the granite consists of an undulating to nearly flat landscape. Hilly parts alternate with large flat valley plains merging towards the coastal plains. The soils developed in the granite hills are not very deep, generally between 0.5 to 1.5 meter. The granite rock is weathered to great depth (> 10 meter). The deeper subsoils frequently show strong mottling probably caused by past high groundwater levels ('pseudo plinthite'?).
10 km north of the site the upper half of the soil consists of 50% or more coarse ironstone gravel overlying the weathered granite saprolite. It is not clear if the ironstone gravel is the result of in situ soil forming processes, or results from deposition (alluvial/colluvial processes).

CLIMATE : Köppen: Am
Station: LINGSHUI 18 30 N / 110 2 E 10 m a.s.l. 30 km SE of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	25	90	84	109	123	146	138	149	136	120	121	105	96	1416
pan evaporation	mm	25	149	132	154	166	190	170	182	159	145	161	158	153	1919
precipitation	mm	25	10	13	24	65	148	229	155	271	343	278	99	19	1654
no. of raindays		25	5	5	5	7	13	17	15	18	19	16	9	5	132
T mean	°C	25	19.8	20.7	23.2	25.6	27.6	28.0	28.0	27.4	26.7	25.2	23.1	20.9	24.7
T max	°C	25	24.3	25.0	27.3	29.6	31.6	31.6	31.8	31.3	30.6	29.0	26.9	25.1	28.7
T min	°C	25	16.6	17.9	20.5	22.8	24.8	25.4	25.3	24.7	24.0	22.4	20.2	17.9	21.9
relative humidity	%	25	78	81	83	84	83	85	84	86	86	81	77	77	82
windspeed(at 2m)	m/s	25	2.3	2.0	1.8	1.7	1.7	1.6	1.6	1.4	1.7	2.5	2.7	2.5	1.9
bright sunshine	h/d	25	6.3	5.7	5.8	6.9	7.8	7.5	8.2	7.1	6.6	6.6	6.4	6.4	6.8

ISIS 4.0 data sheet of reference soil CN 20 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, yellowish red coarse sandy loam; deeper subsoil is strongly mottled. The soil colour of the BA horizon is slightly darker. It is assumed that the overlying topsoil is strongly influenced by human activity. Organic carbon content is medium throughout the upper 25 cm. The soil has a porous massive appearance and the upper meter is poorly supplied with bases. Soil reaction is strongly acid throughout.

Ap	0 - 6 cm	Dark brown (7.5YR 3/4, moist) coarse loamy sand (field), sandy clay loam (lab); structureless to weak crumb structure; non sticky, non plastic, loose, loose; many fine and common coarse roots throughout; clear smooth boundary to
AB	6 - 30 cm	Strong brown (7.5YR 5/6, moist) sandy loam (field), sandy clay (lab); weakly coherent porous massive to weak medium subangular blocky structure; slightly sticky, slightly plastic, very friable, slightly hard; many fine interstitial pores; many fine and few coarse roots throughout; clear smooth boundary to
BA	30 - 45 cm	Dark brown (7.5YR 4/6, moist) sandy loam (field), sandy clay (lab); weakly coherent porous massive to weak medium subangular blocky structure; slightly sticky, slightly plastic, very friable; many fine interstitial pores; common fine roots throughout; clear smooth boundary to
Bw	45 - 110 cm	Yellowish red (5YR 5/8 moist) sandy loam (field), clay (lab); weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many fine interstitial pores; common fine roots throughout; diffuse smooth boundary to
BC(g)	110 - 140 cm	Yellowish red (5YR 5/8, moist) coarse loamy sand (field), sandy clay loam (lab); porous massive structure; non sticky, non plastic, very friable; few coarse distinct brownish yellow (10YR 6/8) mottles; many fine interstitial pores; few fine roots throughout; diffuse smooth boundary to
CB(g)	140 - 200 cm	Yellowish red (5YR 5/8 moist) coarse loamy sand (field), sandy clay loam (lab); weakly coherent porous massive structure; non sticky, non plastic, very friable; many coarse prominent brownish yellow (10YR 6/8) mottles; many fine interstitial pores

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 6	-	27	12	7	7	2	56	1	10	11	33	19.0	-	-	-	-	-	-	-	-	-
AB	6 - 30	-	24	11	6	7	3	52	1	10	12	37	7.4	-	-	-	-	-	-	-	-	-
BA	30 - 45	-	28	10	6	7	2	52	2	9	11	37	6.6	-	-	-	-	-	-	-	-	-
Bw	45 - 110	-	23	8	4	4	3	42	4	9	13	45	2.3	-	-	-	-	-	-	-	-	-
BC(g)	110 - 140	-	22	9	5	7	3	46	7	16	23	32	2.9	-	-	-	-	-	-	-	-	-
CB(g)	140 - 200	-	21	10	6	8	5	48	6	16	22	30	5.5	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	3.9	3.9	-	1.87	0.18	0.2	0.3	0.2	0.1	0.8	1.7	1.1	5.3	16	6.5	2.5	15	21	0.16
AB	4.0	4.0	-	1.16	0.10	0.0	0.0	0.1	0.1	0.2	1.7	1.4	3.5	9	4.1	1.9	6	40	0.07
BA	4.1	4.0	-	0.87	0.09	0.0	0.0	0.1	0.1	0.2	1.6	1.1	3.7	10	3.0	1.8	5	30	0.04
Bw	4.1	4.0	-	0.44	0.07	0.2	0.0	0.0	0.0	0.2	1.8	1.6	2.8	6	1.5	2.0	7	57	0.04
BC(g)	4.2	4.0	-	0.13	0.03	1.6	0.0	0.0	0.1	1.7	1.8	1.6	3.9	12	0.5	3.5	44	41	0.04
CB(g)	4.2	4.0	-	0.14	0.03	1.4	0.0	0.0	0.0	1.4	1.9	1.6	2.8	9	0.5	3.3	50	57	0.04

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	CHLO	KAOL	MIX	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg
Ap	2	8	2	2	4	1.8	0.3	1.9
AB	2	8	2	2	4	1.8	0.3	2.9
BA	2	8	2	2	4	2.0	0.4	1.1
Bw	2	8	2	2	4	2.6	0.4	0.3
BC(g)	2	8	2	2	4	2.0	0.2	0.8
CB(g)	-	8	1	2	4	2.0	0.3	0.9

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, GIBB gibbsite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 21 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Alumi-Haplic Acrisol (Pachic and Chromic) (1974 : Orthic Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Udic Kandiustult, clayey, kaolinitic, thermic (1975 : Oxic Paleustult)
CSTC (1991) : Haplic red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, kandic horizon
Soil moisture regime : ustic
Soil temperature regime : thermic

Remarks : < 10% weatherable minerals in the 20-200 micron fraction is assumed based on the lack of bases on the exchange complex and the dominance of kaolinite in the clay fraction down to 150 cm

LOCATION : Jiangxi Province, Yujiang, Red Soil Ecological Station of ISS-AS
Latitude : 28°13' N Longitude : 116°55' E Altitude : 45 m a.s.l.
AUTHOR(S) : Kauffman, J.H. Date (mm/yy) : 11/92

GENERAL LANDFORM : intermontane basin Topography : undulating
PHYSIOGRAPHIC UNIT : low, broad, interfluve
SLOPE Gradient : 3% Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : moderate sheet and severe gully

PARENT MATERIAL : residual material derived from the Red Quaternary clay formation (1)

EFFECTIVE SOIL DEPTH : > 150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : slow Slowly permeable layer from : 150 to 500 cm
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 200 cm dry 200 - 400 cm moist

LAND USE : fallow
Remarks : Red Quaternary Clay soils are not cultivated (2)

ADDITIONAL REMARKS :
(1) The intermontane basins in S. China are known as 'Red Basins'. At Yingtan the width of the basin is about 30 km. The basin has a plain appearance and consists of nearly level to undulating interfluves (low broad hills) with broad nearly level valleys.
(2) The Red Quaternary Clay soils of the interfluves are not used for cultivation by the farmer. Present vegetation is sparse grass cover and Masson Pine planted about 15 years ago. Growth is slow (height about 4 meters and diameter 8 cm).

The Red Quaternary Clay soil interfluves (hills) are affected by erosion. This is caused by the high run-off, resulting in sheet erosion. On middle and lower slopes, run-off water concentrates and severe gully erosion may occur. Erosion is man-induced, because the original broad-leaved forest has been cleared long ago. Before the use of inorganic fertilizers, the grass/herb vegetation with some topsoil was removed for the fertilization of the paddy fields in the valley. At present this practice is not done anymore, however, the litter is still frequently collected by farmers for kitchen fuel. This will continue to reduce the vegetation cover, incorporation of organic matter in the topsoil, lowering bio-activity and therefore still enhance the run-off and erosion.
The soil has all properties for a ferralic B horizon except for the high silt content (silt/clay >> 0.2).

CLIMATE : Köppen: Cwa
Station: YUJIANG 12 km W of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	45	65	90	112	126	183	174	135	109	69	50	1200
precipitation	mm	37	75	130	188	257	286	284	124	112	94	63	62	53	1729
no. of raindays		28	12	15	19	18	19	17	10	11	10	9	9	11	161
T mean	°C	28	5.9	7.5	12.0	17.8	22.2	25.9	30.0	29.3	25.6	19.7	13.8	8.3	18.2
T max	°C	28	10.4	11.7	16.5	22.5	26.5	30.3	35.0	34.6	30.5	24.8	18.8	13.0	22.9
T min	°C	28	2.5	4.3	8.7	14.2	18.8	22.5	25.8	25.2	21.7	15.7	10.0	4.8	14.5
relative humidity	%	27	77	79	80	80	80	80	71	72	74	72	74	76	76
windspeed(at 2m)	m/s	26	2.1	2.4	2.5	2.4	2.4	2.1	2.2	2.1	2.3	2.4	2.1	2.0	2.2
bright sunshine	h/d	27	3.7	3.4	3.3	4.2	4.5	5.6	9.0	8.5	7.1	6.0	5.0	4.4	5.4

ISIS 4.0 data sheet of reference soil CN 21 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Very deep, well drained, reddish brown to red clay derived from Quaternary clay. The topsoil is nearly structureless. The subsoil has a subangular blocky structure becoming angular blocky in the strongly mottled deep subsoil. The soil is compact, there are mainly micropores and few very fine to fine pores. The soil permeability is therefore judged to be reduced, especially in the strongly mottled deeper subsoil, where ped surfaces are covered by clay cutans and show very few pores. The soil surface is smooth and has a thin seal. Especially on eroded bare soil surfaces a bio-seal may be formed, reducing even more the infiltration capacity of the topsoil for rain.

A	0 - 22 cm	Yellowish red (5YR 5/8, moist), reddish yellow (7.5YR 6/8, dry) sandy clay; weakly coherent porous massive to fine to weak medium subangular blocky structure; sticky, slightly plastic, firm, very hard; many micro pores and common very fine pores; many fine roots throughout; clear smooth boundary to
AB	22 - 45 cm	Red (2.5YR 4/8 moist), yellowish red (5YR 5/8, dry) clay; weak fine to medium subangular blocky structure; sticky, slightly plastic, very friable, hard; many micropores and common very fine pores; common fine roots throughout; gradual smooth boundary to
Bw1	45 - 95 cm	Red (1YR 4/6, moist, 2.5YR 4/8, dry) clay; weak to moderate fine to medium subangular blocky structure; sticky, slightly plastic, very friable, hard; continuous moderately thick clay cutans; many micropores and common very fine pores; few fine roots throughout; gradual smooth boundary to
Bw2	95 - 150 cm	Red (2.5YR 4/6 moist) clay; moderate fine to medium subangular blocky to moderate fine to medium angular blocky structure; sticky, slightly plastic, friable; continuous moderately thick clay cutans; common very fine pores; few fine roots throughout; diffuse smooth boundary to
Bg1	150 - 220 cm	Dark red (2.5YR 3/6, moist) clay; strong medium angular blocky structure; sticky, slightly plastic, firm; many medium distinct strong brown (7.5YR 5/6) mottles; clay cutans on pedfaces; few very fine pores; diffuse smooth boundary to
Bg2	220 - 450 cm	Dark red (2.5YR 3/6, moist) clay; strong medium angular blocky structure; sticky, slightly plastic, firm; many coarse prominent light yellowish brown (10YR 6/4) mottles; continuous moderately thick clay cutans on pedfaces

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
A	0 - 7	-	0	1	2	7	9	19	13	30	43	38	1.7	-	-	-	-	-	-	-	-	-
	7 - 22	-	0	1	2	7	7	17	12	31	43	39	1.4	1.35	46	41	37	35	33	31	25	23
AB	22 - 45	-	0	1	2	5	6	14	13	26	40	47	0.0	-	-	-	-	-	-	-	-	-
Bw1	45 - 95	-	0	1	2	5	5	12	11	26	36	52	2.0	1.20	45	44	42	40	38	37	29	26
Bw2	95 - 150	-	0	0	1	4	6	11	11	25	36	53	1.4	1.27	45	44	42	40	39	38	32	29
Bg1	150 - 220	-	0	0	1	3	6	10	12	25	36	54	5.0	1.46	45	44	43	41	40	39	37	34
Bg2	220 - 270	-	0	0	0	2	5	7	13	26	39	54	-	1.36	49	49	48	46	45	45	41	41
	300 - 350	-	0	0	0	1	6	8	15	24	39	53	-	-	-	-	-	-	-	-	-	-
	370 - 450	-	0	0	0	1	9	10	13	30	43	47	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
A	4.3	3.8	-	0.42	0.05	1.8	0.0	0.1	0.0	1.9	3.4	3.2	6.2	16	1.5	5.3	31	52	0.04
	4.4	3.8	-	0.24	0.04	1.6	0.0	0.0	0.0	1.6	3.7	3.4	6.2	16	0.8	5.3	26	55	0.02
AB	4.5	3.8	-	0.15	0.04	1.4	0.0	0.0	0.0	1.4	4.5	4.1	7.6	16	0.5	5.9	18	54	0.01
Bw1	4.5	3.7	-	0.12	0.04	1.4	0.0	0.0	0.0	1.4	5.3	5.0	9.2	18	0.4	6.7	15	54	0.01
Bw2	4.5	3.6	-	0.11	0.04	1.2	0.0	0.0	0.0	1.2	6.2	5.9	9.9	19	0.4	7.4	12	60	0.01
Bg1	4.5	3.6	-	0.25	0.04	1.4	0.0	0.0	0.0	1.4	8.1	7.8	15.8	29	0.9	9.5	9	49	0.01
Bg2	4.4	3.6	-	0.09	0.04	1.2	0.0	0.1	0.0	1.3	10.0	9.6	13.4	25	0.3	11.3	10	72	0.01
	4.3	3.5	-	0.05	0.04	1.2	0.0	0.2	0.0	1.4	11.7	11.0	17.6	33	0.2	13.1	8	63	0.02
	4.4	3.6	-	0.04	0.03	1.2	0.0	0.3	0.0	1.5	13.2	12.8	22.2	47	0.1	14.7	7	58	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	GOET	Fe %	Al %	AVAIL. P mg/kg
A	2	2	2	5	3	4	1	2.1	0.3	0.0
	2	2	2	5	3	3	1	2.1	0.3	0.0
AB	2	2	2	5	3	3	2	2.7	0.3	0.0
Bw1	2	2	2	5	3	2	1	3.2	0.4	0.0
Bw2	3	2	2	6	3	2	2	3.4	0.3	0.0
Bg1	3	2	2	6	3	1	2	4.3	0.4	0.0
Bg2	3	2	2	6	3	-	2	6.7	0.5	0.1
	4	3	3	6	3	-	2	5.6	0.4	0.0
	4	3	3	4	3	-	1	4.0	0.3	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 22 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

FAO/UNESCO (1988) : Alumi-Ferric Alisol (Pachic and Chromic) (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Paleustult, clayey, mixed, thermic (1975 : Typic Paleustult)
CSTC (1991) :

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, albic E, argic B horizon; ferric properties
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : ustic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Yujiang
Latitude : 28°13′ N Longitude : 116°55′ E Altitude : 40 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Wang Minzhu Date (mm/yy) : 11/92

GENERAL LANDFORM : intermontane basin Topography : undulating
PHYSIOGRAPHIC UNIT : low, broad, interfluve
SLOPE Gradient : 2% Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : moderate sheet

PARENT MATERIAL : residual material derived from fine sandstone

EFFECTIVE SOIL DEPTH : 100 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well to well
PERMEABILITY : slow Slowly permeable layer from : 100 to 200 cm
FLOODING Frequency : nil Run off : rapid

MOISTURE CONDITIONS PROFILE : 0 - 100 cm dry 100 - 200 cm moist

LAND USE : fallow
Land use/vegetation remarks : near site arable farming; crops: tea, buck-wheat, turnip, peanuts, millet.

ADDITIONAL REMARKS :
The strongly mottled subsoil is considered to be pseudo-plinthite, because it does not harden upon wetting and drying. It is not clear whether the mottling results from a past period with different climatic conditions or is caused by actual processes. Groundwater observations throughout the year are necessary to verify the assumed stagnation of water in the deeper subsoil. Possibly the sandstone and the strongly mottled deeper subsoil are having insufficient permeability to transmit vertically and/or laterally the excess precipitation during the rainy season.

CLIMATE : Köppen: Cwa
Station: YUJIANG 12 km W of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	45	65	90	112	126	183	174	135	109	69	50	1200
precipitation	mm	37	75	130	188	257	286	284	124	112	94	63	62	53	1729
no. of raindays		28	12	15	19	18	19	17	10	11	10	9	9	11	161
T mean	°C	28	5.9	7.5	12.0	17.8	22.2	25.9	30.0	29.3	25.6	19.7	13.8	8.3	18.2
T max	°C	28	10.4	11.7	16.5	22.5	26.5	30.3	35.0	34.6	30.5	24.8	18.8	13.0	22.9
T min	°C	28	2.5	4.3	8.7	14.2	18.8	22.5	25.8	25.2	21.7	15.7	10.0	4.8	14.5
relative humidity	%	27	77	79	80	80	80	80	71	72	74	72	74	76	76
windspeed(at 2m)	m/s	26	2.1	2.4	2.5	2.4	2.4	2.1	2.2	2.1	2.3	2.4	2.1	2.0	2.2
bright sunshine	h/d	27	3.7	3.4	3.3	4.2	4.5	5.6	9.0	8.5	7.1	6.0	5.0	4.4	5.4

ISIS 4.0 data sheet of reference soil CN 22 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 15/12/94

PROFILE DESCRIPTION :
Deep, imperfectly drained red sandy clay loam derived from sandstone. The topsoil is very weakly developed (light colour and no structure). The subsoil is strongly mottled. Soil reaction is strongly acid throughout.

A	0 - 22 cm	Yellowish red (6YR 5/8, moist) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, hard; common medium distinct brownish yellow (10YR 6/8) mottles; common very fine tubular pores; common fine roots throughout; clear smooth boundary to
AB	22 - 46 cm	Yellowish red (5YR 5/8, moist) sandy loam; weak fine subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; common medium distinct brownish yellow (10YR 6/8) mottles; many micro pores and few very fine tubular pores; common fine roots throughout; gradual smooth boundary to
Bg1	46 - 95 cm	Red (2.5YR 4/6, moist) sandy clay loam; moderate fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable; many medium distinct yellowish red (5YR 5/6) mottles; patchy moderately thick clay cutans; few very fine pores; few fine roots throughout; diffuse smooth boundary to
Bg2	95 - 180 cm	Red (2.5YR 4/8, moist) sandy clay loam; weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; many coarse prominent reddish yellow (7.5YR 6/6) and pinkish gray (7.5YR 7/3) mottles

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
A	0 - 8	-	0	1	3	23	27	54	1	16	17	29	0.9	-	-	-	-	-	-	-	-	-
	8 - 22	-	0	1	3	14	29	47	7	15	23	31	1.5	1.45	42	40	36	33	31	29	24	23
AB	22 - 46	-	0	1	3	21	19	43	6	14	20	37	1.5	-	-	-	-	-	-	-	-	-
Bg1	46 - 95	-	0	1	2	14	25	41	7	13	20	39	1.5	1.38	43	43	39	36	35	33	29	27
Bg2	95 - 140	-	0	1	3	19	20	42	7	13	19	39	1.9	1.45	42	42	40	38	37	36	30	27
	140 - 180	-	0	0	2	14	28	45	5	13	18	37	22.3	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
A	4.3	3.8	-	0.21	0.03	1.4	0.0	0.1	0.0	1.5	3.2	2.9	4.2	14	0.7	4.7	36	69	0.03
	4.5	3.8	-	0.13	0.02	1.4	0.0	0.1	0.0	1.5	3.8	3.4	8.7	28	0.5	5.3	17	39	0.02
AB	4.4	3.9	-	0.17	0.02	1.2	0.0	0.0	0.0	1.2	4.2	4.1	14.7	40	0.6	5.4	8	28	0.01
Bg1	4.4	3.8	-	0.07	0.02	1.2	0.0	0.0	0.0	1.2	4.8	4.5	11.9	31	0.2	6.0	10	38	0.02
Bg2	4.4	3.8	-	0.04	0.02	1.0	0.0	0.0	0.0	1.0	6.0	5.4	13.1	34	0.1	7.0	8	41	0.01
	4.4	3.7	-	0.03	0.01	1.2	0.0	0.0	0.0	1.2	6.5	5.7	17.9	48	0.1	7.7	7	32	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by Na dith. (d) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	KAOL	MIX	QUAR	GOET	Fe %	Al %	AVAIL. P mg/kg
A	1	4	5	3	2	3	1.4	0.4	0.3
	1	4	5	3	2	3	1.8	0.4	0.0
AB	1	4	6	4	1	3	2.1	0.5	0.0
Bg1	1	4	6	4	-	3	2.6	0.4	0.0
Bg2	1	4	5	3	-	3	2.6	0.4	0.0
	1	4	5	3	-	3	2.5	0.4	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 23 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Dystric Cambisol (Xanthic) (1974 : Dystric Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Dystric Ustochrept, fine-loamy, mixed, thermic (1975 : Dystric Ustochrept)
CSTC (1991) :

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : ustic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Yujiang, Lijia farm
Latitude : 28°13' N Longitude : 116°55' E Altitude : 50 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Wang Minzhu / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : low broad interfluve
SLOPE Gradient : 2% Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : moderate sheet

PARENT MATERIAL : residual material derived from fine red sandstone
Weathering degree : high

EFFECTIVE SOIL DEPTH : 100 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well to well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 50 cm dry 50 - 125 cm moist

LAND USE : fallow
Remarks : the hard sandstone can be relatively easily cut in blocks and is frequently used for house building. Many quarries are observed in the area.

CLIMATE : Köppen: Cwa
Station: YUJIANG 12 km W of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	45	65	90	112	126	183	174	135	109	69	50	1200
precipitation	mm	37	75	130	188	257	286	284	124	112	94	63	62	53	1729
no. of raindays		28	12	15	19	18	19	17	10	11	10	9	9	11	161
T mean	°C	28	5.9	7.5	12.0	17.8	22.2	25.9	30.0	29.3	25.6	19.7	13.8	8.3	18.2
T max	°C	28	10.4	11.7	16.5	22.5	26.5	30.3	35.0	34.6	30.5	24.8	18.8	13.0	22.9
T min	°C	28	2.5	4.3	8.7	14.2	18.8	22.5	25.8	25.2	21.7	15.7	10.0	4.8	14.5
relative humidity	%	27	77	79	80	80	80	80	71	72	74	72	74	76	76
windspeed(at 2m)	m/s	26	2.1	2.4	2.5	2.4	2.4	2.1	2.2	2.1	2.3	2.4	2.1	2.0	2.2
bright sunshine	h/d	27	3.7	3.4	3.3	4.2	4.5	5.6	9.0	8.5	7.1	6.0	5.0	4.4	5.4

ISIS 4.0 data sheet of reference soil CN 23 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Shallow to moderately deep yellow sandy loam derived from sandstone. The shallow soil overlays a weathered sandstone, the hard sandstone starts at about 100 cm. Organic carbon content is low and the soil reaction is strongly acid throughout. The amount of exchangeable aluminium is high to very high.

Ah	0 - 5 cm	Dark brown (10YR 3/3, moist) to yellowish brown (10YR 5/8, dry) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable, hard; many fine roots throughout; gradual smooth boundary to
B	5 - 30 cm	Brownish yellow (10YR 6/8, moist) sandy clay loam; weakly coherent porous massive to weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; few fine tubular pores; common fine roots throughout; gradual smooth boundary to
BC	30 - 65 cm	Yellow (10YR 7/8, moist) loam; weakly coherent porous massive to weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; few medium faint orange (2.5YR 7/8) mottles; few fine tubular pores; few fine roots throughout; few medium soft ferruginous nodules; clear wavy boundary to
C	65 - 100 cm	Sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; common fine tubular pores; abrupt smooth boundary to
R	100 - 120 cm	Sand; non sticky, non plastic

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 5	-	1	2	13	35	25	75	6	4	11	15	5.5	-	-	-	-	-	-	-	-	-
B	5 - 30	-	0	1	18	24	20	63	4	9	13	24	2.0	1.65	35	32	30	26	23	20	18	15
BC	30 - 65	-	0	1	25	29	10	65	4	9	13	23	5.5	1.45	42	41	39	35	33	31	26	24
C	65 - 100	-	0	0	24	30	17	71	4	7	11	18	5.9	1.54	41	40	39	36	34	32	27	22
R	100 - 120	-	0	0	20	46	13	80	6	10	16	5	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.5	4.1	-	0.58	0.04	1.4	0.0	0.1	0.0	1.5	2.4	2.2	4.0	27	2.0	3.9	38	55	0.03
B	4.4	3.9	-	0.16	0.02	1.2	0.0	0.0	0.0	1.2	7.0	6.4	8.7	36	0.6	8.2	14	74	0.02
BC	4.4	3.8	-	0.06	0.01	1.0	0.0	0.1	0.0	1.1	9.1	8.8	11.2	50	0.2	10.2	10	79	0.02
C	4.5	3.8	-	0.04	0.01	1.0	0.0	0.1	0.0	1.1	9.3	8.8	9.0	51	0.1	10.4	12	98	0.02
R	4.7	3.9	-	0.00	0.01	1.4	0.0	0.1	0.0	1.5	8.8	8.4	9.8	196	0.0	10.3	15	86	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	CHLO	SMEC	KAOL	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah	4	3	4	4	0.9	0.2	1.1
B	4	3	4	4	1.2	0.3	0.0
BC	4	3	4	4	0.9	0.3	0.0
C	3	4	4	4	0.7	0.2	0.0
R	3	5	3	-	0.2	0.1	3.7

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: CHLO chlorite, SMEC smectite, KAOL kaolinite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 24 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Orthi-Ferric Alisol, anthraquic phase (1974 : Ferric Acrisol, phreatric phase)
USDA/SCS SOIL TAXONOMY (1992) : Anthraquic Hapludalf, fine, mixed, thermic (1975 : Typic Hapludalf)
CSTC (1991) : Hydragric paddy soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon; ferric properties
USDA/SCS (1992) : ochric epipedon, argillic horizon; anthraquic conditions
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Jujiang, Liujia farm, Zhongshan Liujia
Latitude : 28°13' N Longitude : 116°55' E Altitude : 40 m a.s.l.
AUTHOR(S) : Kauffman, J.H. / Luo Guobao / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : low, broad, smooth interfluve
SLOPE Gradient : 5% Form : straight
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : not observed

PARENT MATERIAL : residual material derived from sandstone

EFFECTIVE SOIL DEPTH : 140 cm

WATER TABLE Depth : 160 cm Kind : groundwater table
Estimated highest level : 0 cm Estimated lowest level : 200 cm
DRAINAGE : imperfect-moderately well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : Run off : ponded

MOISTURE CONDITIONS PROFILE : 0 - 10 cm dry 10 - 140 cm moist 140 - 210 cm wet

LAND USE : arable farming
Land use/vegetation remarks : terraced paddy field

ADDITIONAL REMARKS :
The valley and lower hill slopes are cultivated already for centuries. The middle slopes are terraced and brought under cultivation since the construction of large reservoirs in the area (about 1950 till present).
The soil is derived from sandstone. Mainly in situ formation but some colluvial material has contributed to the soil.
CN024 forms the middle catena-member and is related to CN023 which is located on top of the interfluve at a distance of about 100 to 150 meter.
Both soils are situated in a 'Red Basin' (intermontane basin). At Yingtan the width of the basin is about 30km.

CLIMATE : Köppen: Cwa
Station: YUJIANG 12 km W of site Relevance: very good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	45	65	90	112	126	183	174	135	109	69	50	1200
precipitation	mm	37	75	130	188	257	286	284	124	112	94	63	62	53	1729
no. of rain days		28	12	15	19	18	19	17	10	11	10	9	9	11	161
T mean	°C	28	5.9	7.5	12.0	17.8	22.2	25.9	30.0	29.3	25.6	19.7	13.8	8.3	18.2
T max	°C	28	10.4	11.7	16.5	22.5	26.5	30.3	35.0	34.6	30.5	24.8	18.8	13.0	22.9
T min	°C	28	2.5	4.3	8.7	14.2	18.8	22.5	25.8	25.2	21.7	15.7	10.0	4.8	14.5
relative humidity	%	27	77	79	80	80	80	80	71	72	74	72	74	76	76
windspeed(at 2m)	m/s	26	2.1	2.4	2.5	2.4	2.4	2.1	2.2	2.1	2.3	2.4	2.1	2.0	2.2
bright sunshine	h/d	27	3.7	3.4	3.3	4.2	4.5	5.6	9.0	8.5	7.1	6.0	5.0	4.4	5.4

ISIS 4.0 data sheet of reference soil CN 24 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Deep, moderately well drained, yellowish brown loam; weathered sandstone is found at a depth of 2 meter. The soil is low in organic carbon and has an acid to strongly acid reaction.

Ap	0 - 18 cm	Dark yellowish brown (10YR 4/4, moist) loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable; common fine distinct strong brown (7.5YR 5/8) mottles; many fine roots throughout; abrupt wavy boundary to
AB	18 - 30 cm	Brown (10YR 4/6, moist) loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable; many fine distinct strong brown (7.5YR 5/8); common fine roots throughout; gradual smooth boundary to
Bw	30 - 70 cm	Brown (7.5YR 4/6, moist) loam; weakly coherent porous massive to weak medium subangular blocky structure; slightly sticky, slightly plastic, very friable; many medium distinct mottles; few fine roots throughout; gradual smooth boundary to
Bg1	70 - 110 cm	Light yellowish brown (10YR 6/4, moist) loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many coarse prominent yellowish brown (10YR 5/6); gradual smooth boundary to
Bg2	110 - 140 cm	Very pale brown (10YR 7/3, moist) sandy loam; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable; many coarse prominent yellowish brown (10YR 5/8) mottles
Bg3	140 - 200 cm	White (10YR 8/2, moist) loamy sand; many medium prominent brownish yellow (10YR 6/8) mottles; abrupt smooth boundary to
C/R	200 - 240 cm	Sand with sandstone fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ap	0 - 18	-	0	3	9	24	28	65	8	15	23	13	-	1.45	39	38	35	28	24	21	17	13
AB	18 - 30	-	0	3	7	21	14	44	7	20	27	29	-	-	-	-	-	-	-	-	-	-
Bw	30 - 70	-	0	2	5	13	9	28	7	26	33	39	-	1.41	45	44	42	40	39	38	29	28
Bg1	70 - 110	-	0	2	7	15	14	38	7	23	30	32	-	1.43	44	43	42	40	38	37	29	26
Bg2	110 - 140	-	0	3	9	34	16	63	8	13	21	17	-	-	-	-	-	-	-	-	-	-
Bg3	140 - 170	-	0	3	10	25	25	63	5	9	14	23	-	-	-	-	-	-	-	-	-	-
	170 - 200	-	0	2	12	34	14	63	5	8	14	24	-	-	-	-	-	-	-	-	-	-
C/R	200 - 240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	4.8	4.1	-	0.61	0.07	2.6	0.7	0.1	0.0	3.4	1.0	0.9	4.0	32	2.1	4.4	85	22	0.04
AB	5.1	4.3	-	0.27	0.05	4.7	1.0	0.1	0.1	5.9	0.5	0.2	7.3	25	0.9	6.4	81	3	0.03
Bw	5.4	4.5	-	0.22	0.05	5.6	1.0	0.1	0.1	6.8	0.2	0.0	9.5	24	0.8	7.0	72	0	0.02
Bg1	4.6	4.0	-	0.11	0.03	2.4	0.3	0.1	0.0	2.8	2.9	2.7	7.1	22	0.4	5.7	39	38	0.03
Bg2	4.7	4.0	-	0.00	0.01	0.8	0.3	0.1	0.3	1.5	1.6	1.4	5.0	30	0.0	3.1	30	28	0.02
Bg3	4.8	3.9	-	0.02	0.02	3.4	0.7	0.1	0.0	4.2	2.2	2.0	7.0	30	0.1	6.4	60	29	0.02
	4.8	3.9	-	0.04	0.01	5.3	0.7	0.1	0.1	6.2	3.1	3.0	9.8	41	0.1	9.3	63	31	0.03
C/R	4.8	3.9	-	0.00	0.00	5.2	1.0	0.1	0.1	6.4	3.9	3.4	11.9	127	0.0	10.3	54	29	0.03

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by Na dith. (d) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	MIX	QUAR	GOET	Fe %	Al %	AVAIL. P mg/kg
Ap	1	2	2	4	3	3	1	0.6	0.1	20.8
AB	2	2	2	4	3	3	2	1.6	0.4	0.3
Bw	2	2	2	4	3	3	2	1.6	0.5	0.2
Bg1	2	2	2	4	3	3	2	1.5	0.4	0.3
Bg2	2	2	2	4	3	3	3	0.8	0.2	3.8
Bg3	2	2	2	4	4	2	5	1.9	0.3	6.2
	2	2	4	3	4	2	5	1.8	0.3	0.2
C/R	1	-	4	3	4	1	-	0.1	0.1	0.5

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 25 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Niti-Haplic Acrisol (Pachic and Chromic) (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Paleudult, clayey, mixed, thermic (1975 : Typic Hapludult)
CSTC (1991) : Haplic red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon; weatherable minerals
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Jinxian, Zhaobu, Beian, km 24.8 on road Jinxian-Sanyang
Latitude : 28°29' 0'' N Longitude : 116°16' 0'' E Altitude : 30 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : plain Topography : undulating
PHYSIOGRAPHIC UNIT : summit of broad interfluve
SLOPE Gradient : 2% Aspect : S Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind : level
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : stable

PARENT MATERIAL : unconsolidated Quaternary red clay

EFFECTIVE SOIL DEPTH : 200 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well
PERMEABILITY : moderate; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 11 cm wet; 11 - 146 cm moist

LAND USE : low level arable farming; crops : cotton; seasonal irrigation (not sufficient water for paddy rice); rotation : continuous crop rotation; improvements : terracing, dating back 20 years.

ADDITIONAL REMARKS :
The Bt horizon is now only 11 cm from the surface because of terracing.

Slide nos. of the ISRIC collection: 13891-13896 (landscape, profile, profile details).

CLIMATE : Köppen: Cwa
Station: JINXIAN 28 23 N/116 17 E 30 m a.s.l. 20 km S of site Relevance: very good

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon) mm	12	30	31	47	68	101	114	159	148	106	77	52	40	973
pan evaporation mm	12	43	43	67	103	165	183	290	239	146	111	82	66	1539
precipitation mm	12	80	113	181	205	205	267	130	128	84	71	50	25	1525
no. of raindays	12	15	17	20	18	16	15	11	10	10	10	9	7	158
tot.glob.rad. MJ/m2	12	204.6	183.6	260.4	309.0	421.6	450.0	592.1	564.2	411.0	344.1	267.0	266.6	4274.2
T mean °C	12	5.3	6.2	10.6	16.9	22.6	26.1	29.9	29.0	24.5	19.2	13.4	7.1	17.6
T max °C	12	8.6	9.5	14.3	21.0	26.8	30.1	34.5	33.4	28.3	23.3	17.6	11.7	21.6
T min °C	12	2.6	4.1	8.1	14.0	19.1	23.0	26.2	25.5	21.5	16.0	10.0	4.2	14.5
relative humidity %	12	83	85	85	83	80	81	72	77	81	80	79	76	80
windspeed(at 2m) m/s	12	1.7	1.8	1.8	1.6	1.7	1.7	1.8	1.6	1.8	1.7	1.7	1.5	1.7
bright sunshine h/d	12	2.7	2.2	2.3	3.2	4.8	5.3	8.0	7.8	5.8	4.6	4.4	4.7	4.7

ISIS 4.0 data sheet of reference soil CN 25 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Very deep, moderately well drained, dark red to red clay derived from Quaternary red clayey deposits. The topsoil is only 11 cm thick and consists of reworked B material. Organic carbon content is low. The subsoil has very strongly developed angular blocky structures. Soil reaction is acid in the surface layers and strongly acid in the subsoil below 50 cm depth.

Ap 0 - 11 cm Dark yellowish brown (10YR 4/6, moist) clay loam; weak to moderate medium to coarse subangular blocky structure; sticky, plastic, firm; few fine continuous exped-inped tubular pores; slightly porous; many fine and medium roots throughout; few pedotubules; clear smooth boundary to

Bt1 11 - 90 cm Dark red (2.5YR 3/6, moist), dark reddish brown (5YR 3/6, dry) clay; very strong fine angular blocky structure; very sticky, very plastic, very hard; continuous moderately thick clay cutans on pedfaces; few fine discontinuous exped-inped tubular pores; slightly porous; few medium roots between peds and few fine roots throughout; very few small spherical hard manganiferous concretions; no biological activity; gradual smooth boundary to

Bt2 90 - 145 cm Red (2.5YR 4/8, moist), yellowish red (5YR 4/8, dry) clay; very strong fine angular blocky structure; very sticky, very plastic, very hard; few medium prominent clear strong brown (7.5YR 5/8) mottles; continuous moderately thick clay cutans on pedfaces; few fine discontinuous exped-inped tubular pores; slightly porous; no roots; few medium spherical hard manganiferous concretions; no biological activity

Auger 145 - 200 cm Red (2.5YR 4/8, moist) clay

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 11	-	1	1	2	4	4	12	20	42	62	26	10.3	1.23	46	43	39	34	34	29	22	19
Bt1	11 - 50	-	0	0	0	1	2	3	10	34	44	53	1.0	1.30	47	45	41	38	38	36	35	32
	50 - 90	-	0	0	0	1	2	3	10	34	44	53	2.3	-	-	-	-	-	-	-	-	-
Bt2	90 - 145	-	0	1	1	1	3	5	11	33	44	51	1.5	1.49	42	42	41	40	39	38	36	32
Auger	190 - 200	-	0	1	1	1	5	8	13	32	46	47	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	5.5	4.7	-	0.82	0.10	5.0	1.3	0.5	0.1	6.9	0.1	0.0	8.6	34	2.9	7.0	80	0	0.08
Bt1	5.4	4.5	-	0.15	0.05	6.2	1.4	0.2	0.0	7.8	0.0	0.0	10.4	20	0.5	7.8	75	0	0.04
	4.8	4.0	-	0.09	0.05	4.1	1.4	0.3	0.0	5.8	1.5	1.1	10.0	19	0.3	7.3	58	11	0.03
Bt2	4.7	3.9	-	0.08	0.05	2.6	1.3	0.3	0.0	4.2	2.7	2.3	9.2	18	0.3	6.9	46	25	0.03
Auger	4.6	3.8	-	0.03	0.04	0.4	0.7	0.2	0.0	1.3	4.2	3.9	8.3	18	0.1	5.5	16	47	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	KAOL	MIX	QUAR	GOET	Fe %	Al %	AVAIL. P mg/kg
Ap	4	3	4	3	2	1	2.0	0.2	2.4
Bt1	4	3	5	3	1	2	3.2	0.4	1.0
	4	3	5	3	1	2	3.3	0.4	1.2
Bt2	4	3	5	3	1	1	3.3	0.4	0.5
Auger	4	3	6	3	1	2	3.5	0.3	0.2

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 26 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Humi-Dystric Cambisol (Alumic) (1974 : Dystric Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, coarse-loamy, mixed, mesic (1975 : Umbric Dystrochrept)
CSTC (1991) : Para-yellow soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; strongly humic
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Yanshan, Wuyi Mountains Natural Reserve
Latitude : 27°50′ 0′′ N Longitude : 117°19′ 0′′ E Altitude : 1800 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : high slope v-shaped valley
SLOPE Gradient : 45% Aspect : NE Form : straight
POSITION OF SITE : upper slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
Average size : 20 cm
Cracking : Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : locally unstable

PARENT MATERIAL : residual material derived from coarse-acid igneous rock (granite)
Texture : sandy clay
Weathering degree : high Resistance : very high
Remarks : rotten granite >2m

EFFECTIVE SOIL DEPTH : 80 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : high; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 100 cm moist

VEGETATION : (semi)natural vegetation, dominantly *Tsuga tchekiangensis* with bamboo undergrowth
Type : semi deciduous forest Status : primary
LAND USE : not relevant

ADDITIONAL REMARKS :
Extremely heavy rainfall in June 1992 (about 1000 mm in 10 days) provoked several landslides in the physiographic unit. Profile is located on the somewhat less steeper upper part of the V-shaped valley slope, hence soils are expected to be somewhat deeper than elsewhere. Lower on the slope the soils are shallower. The summit of the range has many outcrops.

Slide nos. of the ISRIC collection: 13897-13904 (landscape, profile, profile details, vegetation).

CLIMATE : Köppen: Cw
Station: YANSHAN 28 19 N/117 33 E; 100 m a.s.l. 60 km NNW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	12	32	33	50	71	102	114	148	145	105	79	53	41	973
pan evaporation	mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642
precipitation	mm	12	104	143	149	192	181	242	211	174	124	105	83	60	1768
T mean	°C	12	6.0	7.0	11.3	17.3	22.5	26.0	29.6	28.8	24.6	19.4	13.9	7.5	17.8
T max	°C	12	10.0	10.5	15.2	21.7	27.2	30.5	34.7	34.0	29.1	24.3	18.7	13.0	22.4
T min	°C	12	3.6	4.5	8.4	13.9	18.7	22.4	25.3	25.6	21.0	15.9	10.0	3.2	14.4
relative humidity	%	12	81	83	83	82	79	81	74	76	79	78	78	76	79
windspeed(at 2m)	m/s	12	1.6	1.8	1.8	1.8	1.6	1.6	1.5	1.5	1.7	1.6	1.5	1.4	1.6
bright sunshine	h/d	12	2.9	2.0	2.3	3.3	4.8	5.3	7.3	7.5	5.4	4.7	4.7	5.0	4.6

ISIS 4.0 data sheet of reference soil CN 26 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Moderately deep, well drained, brown slightly stony loam derived from granite. The dark (yellowish) brown topsoil is high to very high in organic carbon and has a moderately developed crumb structure. The subsoil is only weakly structured. Base saturation is very low and the soil reaction is strongly acid throughout.

Ah 0 - 10 cm Dark brown (10YR 3/3, moist) slightly stony sandy clay loam; leaves, slightly decomposed; moderate medium crumb structure; slightly sticky, slightly plastic; many fine continuous exped-inped vesicular pores and common medium random continuous exped vesicular pores; highly porous; many very fine to coarse roots throughout; very few medium weathered granite fragments; frequent pedotubules; clear wavy boundary to

Bw 10 - 35 cm Dark yellowish brown (10YR 4/6, moist) slightly stony loam; weak to moderate medium subangular blocky structure; sticky, plastic, very friable; common fine continuous exped-inped vesicular pores and few medium random continuous exped vesicular pores; moderately porous; many very fine to coarse roots throughout; few medium and coarse strongly weathered granite fragments; frequent pedotubules; gradual irregular boundary to

BC 35 - 80 cm Brown (7.5YR 5/4, moist) loam; very weak medium subangular blocky structure; sticky, plastic, very friable; common fine continuous exped-inped vesicular pores; moderately porous; few very fine to coarse roots matted around stones or gravel; dominant extremely coarse strongly weathered granite fragments; few pedotubules; abrupt smooth boundary to

R 80 - 100 cm dominant extremely coarse strongly weathered rotten granite fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 10	-	5	8	6	5	3	27	5	29	35	39	-	-	-	-	-	-	-	-	-	-
Bw	10 - 35	-	5	8	6	5	2	27	6	32	38	36	-	-	-	-	-	-	-	-	-	-
BC	35 - 80	-	9	15	11	9	5	49	6	22	28	23	-	-	-	-	-	-	-	-	-	-
R	80 - 100	-	8	16	15	17	6	61	9	17	26	13	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.1	3.8	-	6.03	0.49	0.2	0.3	0.4	0.0	0.9	8.8	7.8	19.7	51	21.1	9.7	5	40	0.16
Bw	4.1	4.1	-	4.00	0.31	0.0	0.0	0.2	0.0	0.2	4.3	4.2	12.1	34	14.0	4.5	2	35	0.07
BC	4.5	4.3	-	0.95	0.07	0.0	0.0	0.1	0.0	0.1	1.9	2.0	5.1	23	3.3	2.0	2	39	0.02
R	4.9	4.3	-	0.03	0.01	0.2	0.0	0.1	0.0	0.3	2.1	2.3	3.0	22	0.1	2.4	10	77	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	KAOL	QUAR	GIBB	Fe %	Al %	AVAIL. P mg/kg
Ah	2	4	4	3	4	1.6	0.4	2.3
Bw	2	4	4	3	4	1.6	0.6	0.9
BC	3	4	4	3	4	0.7	0.3	4.0
R	4	-	4	1	2	0.3	0.1	2.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, QUAR quartz, GIBB gibbsite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 27 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Dystric Cambisol (Xanthic), lithic phase (1974 : Dystric Cambisol, lithic phase)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, fine, mixed, thermic (1975 : Umbric Dystrochrept)
CSTC (1991) : Haplic para-yellow soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Jiangxi Province, Yanshan, Wuyi Mts., 7 km north of Nature Reserve Station
Latitude : 27°52′ 0′′ N Longitude : 117°45′ 0′′ E Altitude : 700 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) :11/92

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : lower slope of v-shaped valley
SLOPE Gradient : 40% Aspect : W Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : no fresh outcrops Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : locally unstable

PARENT MATERIAL : residual material derived from coarse-acid igneous rock (granite)
Texture : sandy clay
Weathering degree : high Resistance : moderate

EFFECTIVE SOIL DEPTH : 45 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 8 cm dry 8 - 200 cm moist

VEGETATION : (semi-) natural vegetation (bamboo forest with Chinese pines and ferns)
Type : evergreen forest Status : primary
LAND USE : not relevant

ADDITIONAL REMARKS :
Within the rotten rock pockets of soil occur to a depth of about 150 cm. The weathered granite has a pinkish colour. Erosion (rill and gully) is evident along transport lines of cut timber. The valley has a clear V-shaped form without any accumulation at the transition to the valley bottom. The flat bottom is intensively cultivated (paddy).

Slide nos. of the ISRIC collection: 13905-13912 (landscape, profile, profile details).

CLIMATE : Köppen: Cw
Station: YANSHAN 28 19 N/117 33 E 100 m a.s.l. 60 km NNW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	12	32	33	50	71	102	114	148	145	105	79	53	41	973
pan evaporation	mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642
precipitation	mm	12	104	143	149	192	181	242	211	174	124	105	83	60	1768
T mean	°C	12	6.0	7.0	11.3	17.3	22.5	26.0	29.6	28.8	24.6	19.4	13.9	7.5	17.8
T max	°C	12	10.0	10.5	15.2	21.7	27.2	30.5	34.7	34.0	29.1	24.3	18.7	13.0	22.4
T min	°C	12	3.6	4.5	8.4	13.9	18.7	22.4	25.3	25.6	21.0	15.9	10.0	3.2	14.4
relative humidity	%	12	81	83	83	82	79	81	74	76	79	78	78	76	79
windspeed(at 2m)	m/s	12	1.6	1.8	1.8	1.8	1.6	1.6	1.5	1.5	1.7	1.6	1.5	1.4	1.6
bright sunshine	h/d	12	2.9	2.0	2.3	3.3	4.8	5.3	7.3	7.5	5.4	4.7	4.7	5.0	4.6

ISIS 4.0 data sheet of reference soil CN 27 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Shallow, well drained, yellowish brown sandy clay loam derived from granite. The thin dark coloured topsoil has a very high organic carbon content and a moderately developed crumb structure. The soil is strongly acid throughout.

O	2 - 0 cm	not decomposed leaves; clear wavy boundary to
Ah	0 - 8 cm	Very dark brown (10YR 2/2, moist) to dark brown (10YR 3/3, dry) slightly gravelly sandy clay loam; moderate fine to medium crumb structure; slightly sticky, slightly plastic, very friable, slightly hard; many fine continuous exped-inped interstitial pores and many medium random continuous exped interstitial pores; highly porous; many very fine to coarse roots throughout; very few medium weathered granite fragments; very frequent worm channels and pedotubules; gradual wavy boundary to
Bw	8 - 45 cm	Yellowish brown (10YR 5/6, moist) slightly gravelly sandy clay loam; very weak medium subangular blocky structure; sticky, plastic, very friable; common fine continuous exped-inped tubular pores; moderately porous; many very fine to coarse roots throughout; very few medium weathered granite fragments; frequent pedotubules; clear irregular boundary to
CR	45 - 200 cm	Brownish yellow (10YR 6/8, moist) sandy clay; very sticky, plastic, firm; many heterogeneous prominent sharp white (10YR 8/1) mottles and many medium prominent sharp black (10YR 2/1) mottles; few fine continuous exped-inped tubular pores; moderately porous; few fine roots in cracks; no biological activity

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 8	-	8	10	9	10	7	43	8	19	28	30	-	-	-	-	-	-	-	-	-	-
Bw	8 - 45	-	6	8	9	11	5	39	8	18	26	36	-	0.92	58	52	43	34	33	28	22	18
CR	45 - 80	-	19	21	15	14	7	75	14	3	17	8	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	Al SAT %	EC 2.5 mS/cm
Ah	4.7	4.0	-	5.18	0.39	1.6	0.7	0.6	0.0	2.9	2.9	2.8	15.9	53	18.1	5.8	18	18	0.07
Bw	4.5	4.1	-	1.75	0.15	0.0	0.0	0.1	0.1	0.2	3.7	3.7	9.7	27	6.1	3.9	2	38	0.02
CR	5.0	4.1	-	0.01	0.00	0.0	0.0	0.2	0.0	0.2	1.6	1.4	4.4	53	0.0	1.8	5	32	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	CHLO	KAOL	MIX	QUAR	Fe %	Al %	AVAIL. P mg/kg
Ah	2	2	2	6	4	2	1.3	0.4	1.3
Bw	2	1	1	5	3	1	1.6	0.5	0.2
CR	2	1	1	4	3	-	0.9	0.1	4.8

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 28 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Haplic Acrisol (Chromic) (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludult, clayey, kaolinitic, mesic (1975 : Typic Hapludult)
CSTC (1991) : Argillic red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : udic
Soil temperature regime : mesic

LOCATION : Jiangxi Province, Yanshan, Zixi, 3km on road Zixi-Sangang
Latitude : 28° 01′ 30" N Longitude : 117° 47′ 00" E Altitude : 250 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : crest of lower part mountains
SLOPE Gradient : 40% Aspect : N Form : convex
POSITION OF SITE : crest
MICRO RELIEF Kind : terracettes Pattern : linear Height : 50 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : fairly stony
Form : angular irregular Average size : 5 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight gully Aggradation : not apparent
Slope stability : locally unstable

PARENT MATERIAL 1 : colluvium derived from : coarse-acid igneous rock
Texture : sandy clay
2 : residual material derived from : coarse-acid igneous rock
Texture : sandy clay
Depth lithological discontinuity : 45 cm
Remarks : parent materials are separated by a stoneline

EFFECTIVE SOIL DEPTH : 90 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : moderate; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 130 cm moist

LAND USE : low level arable farming; crops: tea; no irrigation
VEGETATION Type : shrub Status : degraded
Land use remarks : oil-tea is grown with few inputs.

ADDITIONAL REMARKS :
Two parent materials: granite (weathered in situ) and colluvium separated by a stoneline. Depth of stoneline in road-cut varies with location. Sometimes rotten rock close to the surface and colluvium (stoneline) absent.

Slide nos. of the ISRIC collection: 13913-13916 (landscape, profile, profile details)

CLIMATE : Köppen: Cw
Station: YANSHAN 28 19 N/117 33 E 100 m a.s.l. 60 km NNW of site Relevance: moderate

YANSHAN		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	12	32	33	50	71	102	114	148	145	105	79	53	41	973
pan evaporation	mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642
precipitation	mm	12	104	143	149	192	181	242	211	174	124	105	83	60	1768
T mean	°C	12	6.0	7.0	11.3	17.3	22.5	26.0	29.6	28.8	24.6	19.4	13.9	7.5	17.8
T max	°C	12	10.0	10.5	15.2	21.7	27.2	30.5	34.7	34.0	29.1	24.3	18.7	13.0	22.4
T min	°C	12	3.6	4.5	8.4	13.9	18.7	22.4	25.3	25.6	21.0	15.9	10.0	3.2	14.4
relative humidity	%	12	81	83	83	82	79	81	74	76	79	78	78	76	79
windspeed(at 2m)	m/s	12	1.6	1.8	1.8	1.8	1.6	1.6	1.5	1.5	1.7	1.6	1.5	1.4	1.6
bright sunshine	h/d	12	2.9	2.0	2.3	3.3	4.8	5.3	7.3	7.5	5.4	4.7	4.7	5.0	4.6

ISIS 4.0 data sheet of reference soil CN 28 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Deep, well drained, colluvial yellowish red clay overlying red clay derived from in situ weathered granite. The two materials are separated from each other by a stoneline of about 20 cm thick. The soil shows moderately to strongly developed angular blocky structures. It is low in organic carbon and strongly acid throughout.

Ah	0 - 5 cm	Dark brown (7.5YR 4/6, moist) sandy clay; very weak fine to medium angular blocky structure; very sticky, very plastic, firm; few to common, fine to very fine continuous tubular pores; many very fine to coarse roots throughout; no coarse fragments; few pedotubules; clear smooth boundary to
Bt1	5 - 45 cm	Yellowish red (5YR 4/8, moist) slightly gravelly clay; moderate medium angular blocky structure parting to strong fine angular blocky structure; very sticky, very plastic, firm; patchy thick clay cutans on pedfaces; few fine to very fine continuous tubular pores; common fine and few medium roots; few fine weathered quartz fragments; few pedotubules; clear smooth boundary to
2Bt2	45 - 65 cm	Yellowish red (5YR 5/8, moist) very stony clay; weak to moderate medium angular blocky structure; very sticky, very plastic, firm; patchy thick clay cutans on pedfaces; few fine to very fine continuous tubular pores; few very fine and fine roots; very frequent medium weathered quartz fragments; few pedotubules; clear smooth boundary to
2Bt3	65 - 90 cm	Red (2.5YR 5/8, moist) slightly gravelly clay; strong medium to coarse angular blocky structure parting to strong fine angular blocky structure; very sticky, very plastic, very firm; broken moderately thick clay cutans on pedfaces; few very fine continuous tubular pores; few very fine roots; few fine weathered quartz fragments; few pedotubules; abrupt irregular boundary to
2BC	90 - 130 cm	Red (2.5YR 5/8, moist) slightly stony clay; moderate medium to coarse angular blocky structure; very sticky, very plastic, firm; patchy thin clay cutans on pedfaces; few very fine continuous tubular pores; few very fine roots; frequent medium strongly weathered granite fragments and few medium weathered quartz fragments; few pedotubules

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 5	-	4	4	10	11	4	33	9	14	22	45	22.4	0.85	52	43	37	32	31	28	23	20
Bt1	5 - 45	-	5	4	8	7	3	27	5	15	19	54	2.1	1.22	48	46	42	38	38	36	35	27
2Bt2	45 - 65	-	6	6	9	10	4	34	10	16	25	41	2.6	-	-	-	-	-	-	-	-	-
2Bt3	65 - 90	-	5	4	8	7	4	27	8	8	16	57	0.0	-	-	-	-	-	-	-	-	-
2BC	90 - 130	-	6	8	16	12	3	45	5	12	16	38	0.5	1.23	48	45	41	37	37	35	32	28

Hor.	pH H2O	pH KCl	CaCO3 %	ORG C %	MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.1	3.6	-	1.75	0.10	0.2	0.0	0.1	0.0	0.3	5.1	4.5	11.0	24	6.1	5.4	3	41	0.04
Bt1	4.4	3.7	-	0.54	0.04	0.0	0.0	0.0	0.0	0.1	4.2	3.9	8.7	16	1.9	4.3	1	45	0.01
2Bt2	4.5	3.8	-	0.45	0.03	0.4	0.0	0.0	0.0	0.4	3.4	3.2	6.7	16	1.6	3.8	6	48	0.01
2Bt3	4.5	3.8	-	0.15	0.02	0.2	0.0	0.0	0.0	0.2	3.6	3.6	15.1	26	0.5	3.8	1	24	0.01
2BC	4.6	3.9	-	0.06	0.01	0.2	0.0	0.0	0.1	0.3	3.0	2.7	6.6	17	0.2	3.3	5	41	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	CHLO	KAOL	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah	6	8	3	2.1	0.5	0.2
Bt1	5	8	3	2.8	0.7	0.0
2Bt2	5	8	3	2.4	0.5	0.0
2Bt3	5	8	3	2.7	0.5	0.0
2BC	5	8	3	2.0	0.4	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: CHLO chlorite, KAOL kaolinite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 29 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, fine, mixed, thermic (1975 : Typic Dystrochrept)
CSTC (1991) : Haplic para-red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Wengyuan County, Shen Menai, 10km on road Wengyuan-Fengcheng
Latitude : 24°17' 0'' N Longitude : 114°11' 0'' E Altitude : 600 m a.s.l.
AUTHOR(S) : Luo Guabao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : higher part of lower mountains
SLOPE Gradient : 30% Aspect : NNE Form : complex
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : small cracks Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight gully Aggradation : not apparent
Slope stability : locally unstable

PARENT MATERIAL 1 : colluvium derived from : shale
Texture : clayey
Weathering degree : high
2 : residual material derived from : shale
Texture : clayey
Weathering degree : high Resistance : moderate
Depth lithological discontinuity : 70 cm
Remarks : Devonian shale

EFFECTIVE SOIL DEPTH : 150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : moderate; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 90 cm dry 90 - 120 cm moist

LAND USE : (semi-) natural vegetation (Masson pine, fir, bamboo, fern)
VEGETATION Type : semi-deciduous woodland Status : secondary

ADDITIONAL REMARKS :
Soil can vary in depth over short distances. In places less than 50cm on more eroded sites (steeper slopes) or on more resistant facies of shale. Pockets of strongly weathered shale occur side-by-side in the CR horizon. It is assumed that the moderately weathered stones occurring in the 2Bt1 horizon are the result of colluvial action, hence the two parent materials.

Slide nos. of the ISRIC collection: 13917-13921 (landscape,profile, profile details, monolith taking)

CLIMATE : Köppen: Cw
Station: WENGYUAN 24 22 N/114 29 E 215 m a.s.l. 32 km SSE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	46	61	74	92	101	131	125	105	90	68	54	990
pan evaporation	mm	26	79	67	80	98	116	124	174	163	151	139	112	88	1388
precipitation	mm	27	51	81	131	219	327	334	183	195	115	61	36	41	1773
no. of raindays		27	10	13	16	17	21	20	17	18	12	7	6	8	163
T mean	°C	27	10.1	11.6	15.7	20.2	23.9	25.7	27.1	26.8	25.1	20.9	16.2	12.0	19.6
T max	°C	27	16.4	16.9	20.6	24.8	28.4	30.3	32.7	32.4	30.6	27.1	22.8	18.6	25.1
T min	°C	27	6.0	8.0	12.2	16.9	20.7	22.6	23.3	23.2	21.3	16.5	11.7	7.6	15.9
relative humidity	%	27	73	78	81	82	84	85	81	82	80	75	72	72	79
windspeed(at 2m)	m/s	27	1.3	1.3	1.1	1.0	0.9	0.9	1.0	0.8	1.0	1.2	1.4	1.4	1.1
bright sunshine	h/d	26	4.0	3.0	2.6	2.8	3.4	4.1	6.8	6.6	5.8	5.6	5.5	4.8	4.6

ISIS 4.0 data sheet of reference soil CN 29 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Moderately deep, well drained, strong brown clay derived from Devonian shale. The dark yellowish brown topsoil has moderately developed subangular blocky structures and has a high organic carbon content. The subsoil is strongly angular blocky, becoming stony below 70 cm depth. Soil reaction is strongly acid throughout.

Ah	0 - 15 cm	Dark yellowish brown (10YR 4/6, moist) to yellowish brown (10YR 5/6, dry) clay loam; moderate subangular blocky structure; slightly sticky, slightly plastic, friable, hard; common fine to medium continuous exped vesicular pores; highly porous; many very fine and fine roots throughout; frequent worm channels; clear wavy boundary to
Bt1	15 - 70 cm	Strong brown (7.5YR 5/6, moist) to reddish yellow (7.5YR 6/8, dry) clay; very strong very coarse angular blocky parting to strong medium to coarse angular blocky structure; very sticky, very plastic, firm, very hard; continuous moderately thick clay and sesquioxide cutans on pedfaces; few to common very fine to fine continuous inped tubular pores; slightly porous; common very fine roots throughout; few channels; clear wavy boundary to
2Bt2	70 - 90 cm	Strong brown (7.5YR 5/6, moist) to reddish yellow (7.5YR 6/8, dry) stony clay; very strong to strong coarse angular blocky structure; very sticky, very plastic, firm, very hard; broken moderately thick clay and sesquioxide cutans on pedfaces; few very fine to fine continuous inped tubular pores; slightly porous; few very fine roots throughout; frequent medium strongly weathered shale fragments; no biological activity; clear irregular boundary to
2CR	90 - 120 cm	Strong brown (7.5YR 5/6, moist) clay; sticky, slightly plastic, friable; few very fine roots throughout; frequent medium strongly weathered rotten shale fragments; no biological activity

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
			µm																			
Ah	0 - 15	-	0	1	1	5	12	19	19	20	40	42	-	0.73	54	42	36	32	31	27	19	17
Bt1	15 - 40	-	0	1	1	8	9	18	12	30	41	40	-	-	-	-	-	-	-	-	-	-
	40 - 70	-	1	1	2	6	11	21	12	30	41	38	-	1.30	46	43	39	36	36	33	33	25
2Bt2	70 - 90	-	1	2	3	13	10	29	16	36	52	19	-	-	-	-	-	-	-	-	-	-
2CR	90 - 120	-	1	4	7	18	17	48	11	29	40	13	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.1	3.3	-	3.09	0.18	0.8	0.0	0.1	0.0	0.9	8.2	7.9	15.3	37	10.8	9.1	6	52	0.05
Bt1	4.2	3.3	-	0.60	0.06	0.2	0.0	0.0	0.0	0.2	5.2	4.9	6.5	16	2.1	5.4	3	75	0.02
	4.2	3.4	-	0.36	0.05	0.2	0.0	0.0	0.0	0.2	3.5	3.4	8.8	23	1.3	3.7	2	39	0.02
2Bt2	4.4	3.7	-	0.14	0.04	0.2	0.0	0.0	0.0	0.2	2.4	2.2	3.7	19	0.5	2.6	5	59	0.01
2CR	4.4	4.0	-	0.05	0.02	0.2	0.0	0.0	0.0	0.2	1.6	1.4	2.5	20	0.2	1.8	8	56	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	CHLO	KAOL	MIX	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah	4	1	2	4	3	2	1.6	0.3	0.6
Bt1	4	2	3	4	3	3	1.9	0.3	0.0
	4	3	3	4	3	3	2.0	0.3	0.0
2Bt2	4	2	3	4	2	3	1.7	0.2	0.0
2CR	4	2	2	4	2	4	1.6	0.2	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 30 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrochrept, fine, mixed, thermic (1975 : Typic Dystrochrept)
CSTC (1991) : Yellowic para-red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Wengyuan, Wengchen, 3km on road Wengchen-Shaoguan
Latitude : 24°26′ 0′′ N Longitude : 113°16′ 0′′ E Altitude : 150 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : intermontane basin Topography : undulating
PHYSIOGRAPHIC UNIT : broad smooth interfluve
SLOPE Gradient : 4% Aspect : SSW Form : convex
POSITION OF SITE : middle slope
MICRO RELIEF Kind : terracettes Pattern : linear Height : 50 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : nil
Slope stability : stable

PARENT MATERIAL : unconsolidated deposits derived from Quaternary clay
Texture : clayey
Weathering degree : high Resistance :

EFFECTIVE SOIL DEPTH : 225 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : moderate; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 60 cm dry 60 - 225 cm moist

LAND USE : afforestation of Masson pine with grass undergrowth
VEGETATION Type : evergreen woodland Status : secondary

ADDITIONAL REMARKS :
On a 20 m higher plateau (distance 1 km from site) 2-3 m red Quaternary clay lies over an unconsolidated conglomerate.

Slide nos. of the ISRIC collection: 13922-13928 (landscape, profile, profile details, vegetation, erosion features).

CLIMATE : Köppen: Cw
Station: JIEKOU 23 52 N/113 32 E 68 m a.s.l. 67 km SE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	24	50	50	62	74	97	104	136	126	113	99	77	62	1050
pan evaporation	mm	20	103	86	100	111	148	157	204	188	184	177	148	118	1722
precipitation	mm	24	56	76	132	277	470	415	225	245	144	85	41	37	2201
no. of raindays		24	10	13	17	17	21	21	18	18	13	7	6	7	167
T mean	°C	24	11.4	12.7	16.8	21.1	25.0	26.7	28.1	27.7	26.2	22.3	17.7	13.5	20.8
T max	°C	24	17.0	17.6	21.2	25.3	29.3	31.0	33.0	32.8	31.1	28.1	23.8	19.6	25.9
T min	°C	24	7.6	9.4	13.6	18.0	21.9	23.7	24.7	24.4	22.7	18.3	13.6	9.3	17.3
relative humidity	%	24	71	77	82	83	84	85	81	83	79	74	70	70	78
windspeed(at 2m)	m/s	24	1.9	1.8	1.5	1.4	1.3	1.2	1.2	1.0	1.2	1.5	1.8	1.8	1.5
bright sunshine	h/d	24	3.9	2.9	2.3	2.4	3.7	4.2	7.0	6.4	6.3	6.1	6.0	5.0	4.7

ISIS 4.0 data sheet of reference soil CN 30 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Deep, well drained, yellowish red clay derived from Quaternary clay deposits. The topsoil has weakly to moderately developed (sub-)angular blocky structures while the subsoil is strong to very strong angular blocky. Organic carbon content is low and the soil reaction is strongly acid throughout. The dry soil breaks into enormous angular elements.

Ah1	0 - 10 cm	Reddish yellow (5YR 6/8, moist; 7.5YR 7/8, dry) clay loam; weak medium angular blocky structure; slightly sticky, slightly plastic, very friable, hard; few fine continuous exped-inped tubular pores; moderately porous; common very fine and fine roots throughout; few worm channels; abrupt wavy boundary to
2Ah2	10 - 18 cm	Yellowish red (5YR 5/8, moist) to reddish yellow (7.5YR 6/8, dry) clay loam; moderate medium to coarse subangular blocky structure; slightly sticky, slightly plastic, very friable, slightly hard; common fine to medium continuous exped-inped interstitial pores; highly porous; common very fine and fine roots throughout; few worm channels; clear irregular boundary to
2Bt1	18 - 60 cm	Yellowish red (5YR 4/8, moist; 5YR 5/8, dry) clay; strong coarse angular blocky parting to moderate medium angular blocky structure; sticky, plastic, firm, hard; patchy thin clay cutans on pedfaces; common fine continuous exped-inped tubular pores; moderately porous; few very fine and fine roots throughout; few mammal and worm channels; gradual smooth boundary to
2Bt2	60 - 100 cm	Yellowish red (5YR 5/8, moist) clay; very strong coarse to very coarse angular blocky parting to strong medium to coarse angular blocky structure; sticky, plastic, firm; continuous moderately thick clay cutans on pedfaces; few to common, fine continuous exped-inped tubular pores; moderately porous; few very fine roots throughout; few worm channels; gradual smooth boundary to
2Bt3	100 - 150 cm	Yellowish red (5YR 4/8, moist) clay; strong coarse to very coarse angular blocky parting to moderate to strong angular blocky structure; very sticky, very plastic, firm; broken moderately thick clay cutans on pedfaces; few to common, fine continuous exped-inped tubular pores; moderately porous; few very fine roots throughout; no biological activity
Auger	150 - 225 cm	Yellowish red (5YR 4/8, moist) clay; sticky, plastic, firm; moderately porous

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah1	0 - 10	-	1	2	8	16	6	33	8	15	23	44	9.4	-	-	-	-	-	-	-	-	-
2Ah2	10 - 18	-	1	2	8	16	9	35	8	13	21	44	4.4	1.39	45	42	36	31	29	28	26	25
2Bt1	18 - 40	-	0	2	7	18	7	34	7	14	21	45	5.9	1.33	47	44	40	35	32	30	26	24
	40 - 60	-	0	1	7	16	10	34	7	14	22	44	4.6	-	-	-	-	-	-	-	-	-
2Bt2	60 - 100	-	1	1	7	16	6	31	9	15	24	45	6.2	1.17	48	47	40	33	31	30	26	25
2Bt3	100 - 150	-	0	1	6	15	9	32	8	13	21	47	7.6	1.24	47	47	41	35	33	31	28	26
Auger	175 - 200	-	0	1	7	18	7	34	4	17	21	45	7.4	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah1	4.8	4.1	-	0.53	0.06	0.8	0.3	0.1	0.0	1.2	1.5	1.4	5.1	12	1.9	2.7	24	27	0.03
2Ah2	4.8	4.0	-	0.77	0.07	0.6	0.3	0.1	0.0	1.0	1.8	1.6	5.4	12	2.7	2.8	19	30	0.02
2Bt1	4.7	4.1	-	0.26	0.04	0.4	0.0	0.0	0.0	0.4	1.4	1.1	4.4	10	0.9	1.8	9	25	0.01
	4.6	4.2	-	0.20	0.04	0.2	0.0	0.1	0.0	0.3	1.3	1.1	4.8	11	0.7	1.6	6	23	0.01
2Bt2	4.6	4.2	-	0.15	0.04	0.2	0.0	0.0	0.0	0.2	1.3	1.1	4.8	11	0.5	1.5	4	23	0.01
2Bt3	4.5	4.1	-	0.15	0.04	0.2	0.0	0.0	0.0	0.2	1.9	1.8	5.0	11	0.5	2.1	4	36	0.01
Auger	4.6	4.0	-	0.21	0.04	0.4	0.0	0.1	0.0	0.5	1.9	1.8	4.8	11	0.7	2.4	10	38	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al Si Mn (by Na dith. (d)) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	KAOL	MIX	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah1	2	4	4	4	2	2	2.7	0.7	0.2
2Ah2	2	4	4	4	2	2	2.7	0.7	0.4
2Bt1	2	4	4	4	2	2	2.4	0.6	0.1
	2	4	4	4	2	2	2.4	0.6	0.2
2Bt2	2	4	4	4	2	2	2.5	0.6	0.2
2Bt3	2	4	4	4	2	2	2.6	0.6	0.0
Auger	2	4	4	4	2	2	2.1	0.5	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, GIBB gibbsite, GOET goethite. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 31 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Eutri-Haplic Nitisol (Chromic) (1974 : Chromic Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludalf, fine, mixed, thermic (1975 : Mollic Hapludalf)
CSTC (1991) : Luvic brown limestone soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon; nitic properties
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Lianping, Beitou, 1km south of main road Wengyuan-Lianping
Latitude : 24°23' 0'' N Longitude : 114°17' 0'' E Altitude : 250 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : mountain Topography : mountainous
PHYSIOGRAPHIC UNIT : tower karst mountains
SLOPE Gradient : 100% Aspect : ENE Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : rocky Stoniness : very few stones
Form : (sub)rounded Average size : 10 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : nil
Slope stability : stable

PARENT MATERIAL : residual material derived from limestone (grey marble)
Texture : clayey
Weathering degree : slight Resistance : very high

EFFECTIVE SOIL DEPTH : 165 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : high; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : slow
MOISTURE CONDITIONS PROFILE : 0 - 50 cm dry 50 - 165 cm moist

LAND USE : (semi-)natural vegetation; some isolated fir and pine trees
VEGETATION Type : evergreen shrub Status : degraded

ADDITIONAL REMARKS :
LANDFORM: steep mountains (tower karst-like) with a great variety in soil depth. Rock outcrops occur alongside deep soils. In the soil great boulders of marble occur. They have a typical solution surface with smooth curves. The soil itself doesn't seem to have free carbonates.
The lower slope has hardly any colluvial material and the is a sharp transition from the straight slope to the flat intermontane basin.
SOILS: apart from the dominant red coloured soils some browner ones occur on the lower slopes. Also a violet B horizon was found next to a red soil. Apart from an irregular depth also the content of stones varies from place to place.

Slide nos. of the ISRIC collection: 13934-13944 (landscape, profile, profile details, monolith taking).

CLIMATE : Köppen: Cw
Station: WENGYUAN 24 22 N/114 29 E 215 m a.s.l. 20 km ENE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	26	43	46	61	74	92	101	131	125	105	90	68	54	990
pan evaporation	mm	26	79	67	80	98	116	124	174	163	151	139	112	88	1388
precipitation	mm	27	51	81	131	219	327	334	183	195	115	61	36	41	1773
no. of raindays		27	10	13	16	17	21	20	17	18	12	7	6	8	163
T mean	°C	27	10.1	11.6	15.7	20.2	23.9	25.7	27.1	26.8	25.1	20.9	16.2	12.0	19.6
T max	°C	27	16.4	16.9	20.6	24.8	28.4	30.3	32.7	32.4	30.6	27.1	22.8	18.6	25.1
T min	°C	27	6.0	8.0	12.2	16.9	20.7	22.6	23.3	23.2	21.3	16.5	11.7	7.6	15.9
relative humidity	%	27	73	78	81	82	84	85	81	82	80	75	72	72	79
windspeed(at 2m)	m/s	27	1.3	1.3	1.1	1.0	0.9	0.9	1.0	0.8	1.0	1.2	1.4	1.4	1.1
bright sunshine	h/d	26	4.0	3.0	2.6	2.8	3.4	4.1	6.8	6.6	5.8	5.6	5.5	4.8	4.6

ISIS 4.0 data sheet of reference soil CN 31 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Deep, well drained, dark reddish brown clay derived from grey marble. The thin but dark coloured topsoil has a strongly developed subangular blocky structure, while in the remaining soil strong angular blocky structures prevail. The organic carbon content is medium, averaged over the first 25 cm. Soil reaction is acid in the first 50 cm, becoming slightly acid below and neutral to slightly alkaline near the only slightly altered rock.

Ah 0 - 5 cm Dark brown (10YR 3/3, moist; 10YR 4/3, dry) slightly gravelly clay loam; strong very fine to fine subangular blocky structure; sticky, plastic, very firm, very hard; common fine to medium continuous exped vesicular pores; highly porous; many fine roots throughout and common medium roots between peds; very few fine fresh marble fragments; frequent worm channels and coprogenic elements; clear smooth boundary to

AB 5 - 24 cm Yellowish red (5YR 4/6, moist) to strong brown (7.5YR 4/6, dry) slightly gravelly clay; moderate to strong medium to coarse angular blocky parting to strong fine to medium angular blocky structure; very sticky, very plastic, very firm, extremely hard; patchy thin clay cutans on pedfaces; common fine continuous inped tubular pores; moderately porous; common fine and medium roots throughout; very few medium fresh marble fragments; frequent worm channels; gradual smooth boundary to

Bt1 24 - 51 cm Dark reddish brown (5YR 3/4, moist; 5YR 3/6, dry) slightly stony clay; very strong coarse angular blocky parting to strong fine to medium angular blocky structure; very sticky, very plastic, very firm, extremely hard; continuous thick clay cutans on pedfaces; few very fine to fine continuous inped tubular pores; slightly porous; common fine and medium roots throughout; few medium fresh marble fragments; few worm channels; gradual smooth boundary to

Bt2 51 - 120 cm Dark reddish brown (5YR 3/6, moist) bouldery clay; very strong coarse angular blocky parting to strong fine to medium angular blocky structure; very sticky, very plastic, very firm; continuous thick clay cutans on pedfaces; few very fine to fine continuous inped tubular pores; slightly porous; few fine roots throughout; few extremely coarse fresh marble fragments; few worm channels

Auger 120 - 165 cm Dark yellowish brown (5YR 3/6, moist) bouldery clay; very sticky, very plastic, very firm; slightly porous; no roots

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 5	-	2	2	3	5	6	17	9	28	37	46	16.5	-	-	-	-	-	-	-	-	-
AB	5 - 24	-	4	2	2	5	4	17	11	20	31	52	29.8	1.35	46	44	40	37	36	34	33	28
Bt1	24 - 51	-	2	2	2	3	4	13	8	22	31	57	35.8	1.31	43	41	37	34	33	32	31	27
Bt2	51 - 75	-	5	3	2	4	3	18	7	20	27	56	37.2	-	-	-	-	-	-	-	-	-
	75 - 120	-	5	3	2	3	4	17	7	18	25	57	32.8	1.53	41	40	40	38	37	36	31	29
Auger	130 - 165	-	9	12	7	4	1	33	9	19	28	39	34.7	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	6.1	5.7	-	4.22	0.34	20.1	1.0	0.3	0.0	21.4	0.0	0.0	24.8	54	14.8	21.4	86	0	0.20
AB	4.9	4.0	-	1.60	0.17	7.6	0.3	0.1	0.0	8.0	1.4	1.1	16.3	31	5.6	9.4	49	7	0.06
Bt1	5.2	4.1	-	0.80	0.13	8.0	0.0	0.1	0.0	8.1	0.7	0.5	15.8	28	2.8	8.8	51	3	0.03
Bt2	5.5	4.6	-	0.71	0.13	10.1	0.0	0.1	0.0	10.2	0.1	0.0	14.9	27	2.5	10.3	68	0	0.02
	5.9	5.0	-	0.65	0.11	10.9	0.0	0.1	0.0	11.0	0.0	0.0	15.4	27	2.3	11.0	71	0	0.03
Auger	7.6	6.8	2.3	0.71	0.12	41.6	0.3	0.1	0.2	42.2	0.0	0.0	21.0	54	2.5	42.2	201	0	0.20

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACT. Fe Al Si (by Na dith. (d) & amm. oxal. (o) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	CHLO	KAOL	GOET	TALC	Fe_d %	Al_d %	Fe_o %	Al_o %	Si_o %	AVAIL. P mg/kg
Ah	-	1	6	4	2	1	2.5	0.4	0.6	0.3	0.0	0.7
AB	-	1	6	4	2	1	2.7	0.5	0.4	0.3	0.0	0.1
Bt1	-	1	6	4	2	1	3.1	0.5	0.4	0.3	0.0	0.0
Bt2	-	1	6	4	2	1	2.9	0.4	0.4	0.3	0.0	0.1
	-	1	6	4	2	1	3.0	0.5	0.4	0.3	0.0	0.0
Auger	4	4	3	6	2	1	3.6	0.5	0.4	0.3	0.0	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, CHLO chlorite, KAOL kaolinite, GOET goethite, TALC talc. Extr. Fe Al Si: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 32 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Orthic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludox, clayey, kaolinitic (allic), thermic (1975 : Tropeptic Haplorthox)
CSTC (1991) : Haplic latored soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, oxic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Conghua, Wenquan, 2 km on road Jiekou-Fengsheng (Xinfeng)
Latitude : 23°39' 0'' N Longitude : 113°39'30'' E Altitude : 250 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : hill Topography : steeply dissected
PHYSIOGRAPHIC UNIT : rounded hills
SLOPE Gradient : 25% Aspect : SW Form : convex
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : present
Slope stability : stable

PARENT MATERIAL : residual material derived from coarse-acid igneous rock (biotite granite)
Texture : sandy clay
Weathering degree : high Resistance : low

EFFECTIVE SOIL DEPTH : 150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : high; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 50 cm dry 50 - 250 cm moist

LAND USE : (semi-) natural vegetation (bamboo, Masson pine, Chinese fir)
VEGETATION Type : evergreen forest Status : secondary

ADDITIONAL REMARKS :
LANDFORM: rounded hills with a convex slope form. Hardly any accumulation of material on the lower slope. Therefore a sharp knickpoint towards the flat valley floors / SOIL: about 20cm of colluvial material on top of material. A fully developed Ah horizon is present in this material. No clear reason why colluvium is present.

Slide nos. of the ISRIC collection: 13945-13950 (landscape, profile, profile details).

CLIMATE : Köppen: Cw
Station: JIEKOU 23 52 N/113 32 E 68 m a.s.l. 29 km NNE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	24	50	50	62	74	97	104	136	126	113	99	77	62	1050
pan evaporation	mm	20	103	86	100	111	148	157	204	188	184	177	148	118	1722
precipitation	mm	24	56	76	132	277	470	415	225	245	144	85	41	37	2201
no. of raindays		24	10	13	17	17	21	21	18	18	13	7	6	7	167
T mean	°C	24	11.4	12.7	16.8	21.1	25.0	26.7	28.1	27.7	26.2	22.3	17.7	13.5	20.8
T max	°C	24	17.0	17.6	21.2	25.3	29.3	31.0	33.0	32.8	31.1	28.1	23.8	19.6	25.9
T min	°C	24	7.6	9.4	13.6	18.0	21.9	23.7	24.7	24.4	22.7	18.3	13.6	9.3	17.3
relative humidity	%	24	71	77	82	83	84	85	81	83	79	74	70	70	78
windspeed(at 2m)	m/s	24	1.9	1.8	1.5	1.4	1.3	1.2	1.2	1.0	1.2	1.5	1.8	1.8	1.5
bright sunshine	h/d	24	3.9	2.9	2.3	2.4	3.7	4.2	7.0	6.4	6.3	6.1	6.0	5.0	4.7

PROFILE DESCRIPTION :
Deep, well drained, dark brown to yellowish red gravelly clay derived from biotite granite covered by a dark (yellowish) brown colluvial layer of about 20 cm thick. The colluvial layer has a high content in organic carbon and exhibits weakly to moderately developed subangular blocky structures. The subsoil dominantly has moderately to strongly developed medium angular blocky structures. The buried A horizon still has a medium content in organic carbon. The soil reaction is strongly acid throughout.

ISIS 4.0 data sheet of reference soil CN 32 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

Ah	0 - 8 cm	Dark yellowish brown (10YR 4/6, moist) to yellowish brown (10YR 5/4, dry) slightly gravelly sandy clay loam; leaves, not decomposed; weak to moderate medium subangular blocky structure; slightly sticky, slightly plastic, friable, very hard; many fine to coarse continuous exped-inped vesicular pores; highly porous; many very fine to coarse roots throughout; frequent worm channels; clear wavy boundary to
AB	8 - 20 cm	Dark brown (7.5YR 4/4, moist) to strong brown (7.5YR 4/6, dry) gravelly sandy clay; moderate medium subangular blocky structure; sticky, plastic, firm, hard; common fine to very fine continuous exped-inped tubular pores; moderately porous; many very fine to coarse roots throughout; frequent worm channels; clear smooth boundary to
2Ah	20 - 36 cm	Dark yellowish brown (10YR 3/4, moist; 10YR 4/4, dry) gravelly sandy clay; moderate medium to coarse subangular blocky structure; sticky, plastic, friable, very hard; many fine to coarse continuous exped-inped tubular pores; highly porous; common very fine to coarse roots throughout; frequent worm channels; clear wavy boundary to
2AB	36 - 55 cm	Strong brown (7.5YR 4/6, moist; 7.5YR 5/6, dry) gravelly clay; moderate medium angular blocky structure; very sticky, very plastic, firm, very hard; patchy thin clay cutans on pedfaces; common fine to very fine continuous exped-inped tubular pores and few medium random continuous exped-inped tubular pores; highly porous; few fine and coarse roots throughout; few channels; gradual smooth boundary to
2Bt1	55 - 75 cm	Yellowish red (5YR 5/6, moist) gravelly clay; moderate to strong medium angular blocky structure; very sticky, very plastic, firm; broken thin clay cutans on pedfaces; common fine to very fine continuous exped-inped tubular pores and few medium random continuous exped-inped tubular pores; moderately porous; few very fine and fine roots throughout; few channels; gradual smooth boundary to
2Bt2	75 - 130 cm	Yellowish red (5YR 5/8, moist) very gravelly clay; moderate to strong angular blocky structure; very sticky, very plastic, firm; continuous moderately thick clay cutans on pedfaces; common fine to very fine continuous exped-inped tubular pores; moderately porous; few very fine roots throughout; clear irregular boundary to
2CR	130 - 250 cm	Yellow (10YR 7/8, moist) highly weathered biotite granite

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 8	-	12	17	9	6	2	46	1	17	18	36	-	-	-	-	-	-	-	-	-	-
AB	8 - 20	-	15	13	7	5	2	42	2	16	18	40	-	-	-	-	-	-	-	-	-	-
2Ah	20 - 36	-	9	11	8	5	2	35	1	17	17	48	-	-	-	-	-	-	-	-	-	-
2AB	36 - 55	-	13	15	8	5	2	43	2	15	17	40	-	-	-	-	-	-	-	-	-	-
2Bt1	55 - 75	-	18	10	5	4	1	38	3	13	15	47	-	1.29	46	43	39	36	35	34	34	29
2Bt2	75 - 130	-	14	8	5	4	3	33	3	15	18	49	-	-	-	-	-	-	-	-	-	-
2CR	130 - 160	-	12	13	10	11	4	51	7	18	25	25	-	-	-	-	-	-	-	-	-	-
	200 - 220	-	14	20	14	11	7	66	7	17	24	10	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.3	3.8	-	2.91	0.23	0.8	0.3	0.3	0.0	1.4	3.5	3.2	10.5	29	10.2	4.9	13	30	0.08
AB	4.3	3.9	-	1.36	0.09	0.4	0.0	0.1	0.0	0.5	3.8	3.6	6.9	17	4.8	4.3	7	52	0.04
2Ah	4.3	4.0	-	0.96	0.09	0.2	0.0	0.2	0.0	0.4	3.3	3.2	6.9	14	3.4	3.7	6	46	0.02
2AB	4.4	3.9	-	0.58	0.07	0.2	0.0	0.2	0.0	0.4	3.6	3.4	6.9	17	2.0	4.0	6	49	0.02
2Bt1	4.5	3.9	-	0.48	0.06	0.2	0.0	0.2	0.0	0.4	3.3	3.2	6.9	15	1.7	3.7	6	46	0.02
2Bt2	4.6	4.0	-	0.39	0.05	0.2	0.0	0.2	0.0	0.4	3.6	3.4	6.9	14	1.4	4.0	6	49	0.01
2CR	4.5	4.0	-	0.12	0.02	0.2	0.0	0.1	0.0	0.3	6.8	6.2	8.8	35	0.4	7.1	3	70	0.01
	4.8	4.0	-	0.04	0.01	0.2	0.0	0.1	0.1	0.4	7.4	5.7	9.4	90	0.1	7.8	4	63	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	GIBB	GOET	Fe %	Al %	AVAIL. P mg/kg
Ah	2	3	-	8	1	1	1.4	0.2	3.0
AB	2	3	-	8	1	1	1.5	0.2	0.0
2Ah	3	3	-	8	1	1	1.4	0.3	0.0
2AB	3	3	-	8	1	1	1.5	0.3	0.0
2Bt1	3	3	-	8	1	1	1.5	0.3	0.0
2Bt2	3	3	-	8	1	1	1.6	0.3	0.0
2CR	3	3	3	6	1	1	1.7	0.3	0.0
	3	-	4	4	1	1	0.7	0.1	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, GIBB gibbsite, GOET goethite. Extr. Fe Al Si Mn: weight %. Available P (Bray-1): mg/kg.

ISIS 4.0 data sheet of reference soil CN 33 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

FAO/UNESCO (1988) : Proto-Thionic Fluvisol, anthraquic phase (1974 : Thionic Fluvisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Sulfaquent, fine-loamy, mixed, thermic (1975 : Typic Sulfaquent)
CSTC (1991) : Acid-sulphatic paddy soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon; fluvic and gleyic properties, sulfidic materials
USDA/SCS (1992) : ochric epipedon; aquic conditions, sulfidic materials
Soil moisture regime : aquic
Soil temperature regime : thermic

LOCATION : Guangdong Province, Nanhai, Pingzhou, (city limit), next to road Guangzhou-Foshan
Latitude : 23° 3'30'' N Longitude : 113°11'30'' E Altitude : 1 m a.s.l.
AUTHOR(S) : Luo Guobao / Van Engelen, V. / Zhang Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : alluvial plain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : Pearl River delta
SLOPE Gradient : 1% Form : straight
POSITION OF SITE : flat
MICRO RELIEF Kind : levees (artificial) Pattern : reticulate Height : 30 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : large cracks Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : stable

PARENT MATERIAL : stratified clayey alluvium over sandy loam

EFFECTIVE SOIL DEPTH : 200 cm

WATER TABLE Depth : 80 cm Kind : groundwater table
Estimated highest level : 45 cm Estimated lowest level : 100 cm
DRAINAGE : poor
PERMEABILITY : slow; no slowly permeable layer(s)
FLOODING Frequency : yearly, fresh water Run off : ponded
MOISTURE CONDITIONS PROFILE : 0 - 45 cm moist 45 - 200 cm wet

LAND USE : medium level arable farming; crops : rice; paddy; rotation : monoculture
Land use/vegetation remarks : irrigation/drainage channels, 2 crops/year

ADDITIONAL REMARKS :
LANDFORM: the sequence clay over sandy loam indicates possibly a levee deposit of one of the branches of the Pearl river. The construction of paddy fields has eliminated original height differences if any / SOIL: very coarse prismatic structure of the clay is hardly visible due to the moist condition of the soil. However, the few ped faces in the Cg1 horizon are completely oxidized and have a colour of 5YR 5/8 / LAND USE: the paddy field will be urbanized within the next year.

Slide nos. of the ISRIC collection; 13951-13957 (landscape, land use, profile, profile details).

CLIMATE : Köppen: Cw
Station: GUANGZHOU 23 0 N/113 13 E 18 m a.s.l. 8 km S of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm		55	56	72	81	110	121	147	144	131	121	89	76	1203
precipitation	mm	41	27	65	101	185	256	292	264	249	149	49	51	34	1722
no. of raindays			7	12	14	18	17	20	17	17	12	6	6	7	153
T mean	°C	53	13.6	14.2	17.2	21.6	25.6	27.3	28.8	28.2	27.2	24.0	19.7	15.7	21.9
T max	°C	14	17.2	17.2	20.6	25.0	30.0	31.1	32.8	32.8	31.7	28.3	25.0	20.6	26.1
T min	°C	14	9.4	11.1	12.8	18.9	23.3	24.4	25.6	25.6	24.4	19.4	15.6	12.2	18.3
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
windspeed(at 2m)	m/s		2.1	2.0	1.8	1.8	1.7	1.6	1.8	1.7	1.7	1.9	1.9	1.9	1.8
bright sunshine	h/d		4.0	2.8	2.7	2.7	5.0	5.1	6.9	6.9	6.8	6.7	6.4	5.1	5.1

ISIS 4.0 data sheet of reference soil CN 33 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 16/12/94

PROFILE DESCRIPTION :
Deep, poorly drained, dark brown to greyish brown clay loam derived from recent alluvial deposits containing materials rich in sulphur. Soil reaction of the upper 45 cm is slightly acid to neutral, turning extremely acid between 45 and 68 cm. The soil is strongly mottled throughout, showing brownish to reddish coloured redox concentrations. The topsoil has a high content in organic carbon and is only (very) weakly structured.

Ap	0 - 10 cm	Dark yellowish brown (10YR 4/5, moist) clay; weak coarse prismatic parting to weak subangular blocky structure; very sticky, very plastic, firm; common fine distinct clear brownish yellow (10YR 6/8) mottles; common very fine to fine continuous exped-inped tubular pores; moderately porous; common very fine and fine roots throughout; frequent worm channels; clear smooth boundary to
Ag1	10 - 25 cm	Dark brown (10YR 4/3, moist) clay (lab: loam); very weak very coarse prismatic parting to very weak coarse angular blocky structure; very sticky, very plastic, very firm; many fine distinct clear brownish yellow (10YR 6/8) mottles; few very fine to fine continuous exped-inped tubular pores; slightly porous; common very fine roots throughout; few worm channels; gradual smooth boundary to
Ag2	25 - 45 cm	Dark brown (10YR 4/3, moist) clay; very weak very coarse prismatic parting to very weak coarse angular blocky structure; very sticky, very plastic, very firm; many medium distinct clear strong brown (7.5YR 5/8) mottles; few very fine to fine continuous exped-inped tubular pores; slightly porous; few very fine roots throughout; few worm channels; clear wavy boundary to
Cg1	45 - 68 cm	Greyish brown (2.5Y 5/2, moist) clay loam; very weak very coarse prismatic parting to very weak coarse angular blocky structure; sticky, plastic, firm; many fine prominent sharp strong brown (7.5YR 5/8) and common medium prominent clear red (2.5YR 5/8) mottles; few very fine to fine random continuous exped-inped tubular pores; slightly porous; few very fine roots throughout; no biological activity; abrupt smooth boundary to
Cg2	68 - 110 cm	Light olive brown (2.5Y 4/1, moist) sandy loam; weakly coherent; slightly sticky, slightly plastic, very friable; few fine prominent clear strong brown (7.5YR 5/8) mottles; few very fine continuous exped-inped tubular pores; slightly porous; few very fine roots throughout; no biological activity
Auger	110 - 200 cm	Light olive brown (2.5Y 4/1, moist) sandy loam

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
			µm																			
Ap	0 - 10	-	1	1	1	3	3	10	24	29	54	37	-	0.89	64	62	55	51	49	46	37	30
Ag1	10 - 25	-	1	1	2	21	25	51	17	12	29	20	-	-	-	-	-	-	-	-	-	-
Ag2	25 - 45	-	0	1	1	2	5	8	12	44	56	37	-	-	-	-	-	-	-	-	-	-
Cg1	45 - 68	-	0	0	0	6	17	23	20	33	52	25	-	1.16	55	55	54	52	52	49	38	32
Cg2	68 - 110	-	0	0	0	15	52	68	12	10	22	11	-	-	-	-	-	-	-	-	-	-
Auger	150 - 200	-	3	2	2	3	4	13	8	23	30	56	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	5.6	5.2	-	2.65	0.25	14.3	1.3	0.1	0.2	15.9	0.0	0.0	18.9	51	9.3	19.6	84	0	0.52
Ag1	6.5	6.1	0.7	1.71	0.17	15.9	1.7	0.1	0.1	17.8	0.0	0.0	17.7	87	6.0	19.0	101	0	0.42
Ag2	6.3	5.7	-	1.21	0.13	12.4	2.0	0.1	0.3	14.8	0.0	0.0	15.1	41	4.2	16.6	98	0	0.32
Cg1	3.1	3.0	-	2.20	0.13	9.9	2.6	0.1	0.2	12.8	8.9	6.5	13.1	52	7.7	21.6	98	50	2.40
Cg2	4.8	4.5	-	1.41	0.08	11.3	4.3	0.1	0.3	16.0	0.3	0.0	9.9	89	4.9	15.5	162	0	1.80
Auger	6.8	6.8	0.9	2.13	0.10	21.2	3.0	0.1	0.3	24.6	0.0	0.0	13.7	24	7.5	22.7	180	0	1.40

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACTABLE Fe Al (by Na dith.) / AVAILABLE P (Bray)

Hor.	MICA /ILL	VERM	CHLO	KAOL	QUAR	FELD	Fe %	Al %	AVAIL. P mg/kg
Ap	4	4	4	6	1	1	2.1	0.2	7.4
Ag1	4	4	4	4	1	1	2.2	0.2	4.2
Ag2	5	4	4	6	1	1	2.4	0.2	1.2
Cg1	5	4	4	5	1	1	1.6	0.1	0.1
Cg2	4	3	3	4	1	-	1.7	0.1	0.7
Auger	-	2	6	4	-	2	1.6	0.1	0.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, CHLO chlorite, KAOL kaolinite, QUAR quartz, FELD feldspar. Extr. Fe Al: weight %. Available P (Bray-1): mg/kg.

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FAO/UNESCO (1988) : Silti-Chromic Cambisol (Eutric) (1974 : Chromic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Ustochrept, fine-silty, mixed, mesic (1975 : Typic Ustochrept)
CSTC (1991) : Haplic cinnamon soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : ustic
Soil temperature regime : mesic

LOCATION : Liaoning Province, Chaoyang
Latitude : 41°27′ N Longitude : 120°28′ E Altitude : 200 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : hill Topography : rolling
PHYSIOGRAPHIC UNIT : dissected slope
SLOPE Gradient : 10% Aspect : W Form : straight
POSITION OF SITE : middle slope
MICRO RELIEF Kind : level
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet and severe gully Aggradation : present
Slope stability : stable

PARENT MATERIAL : slope wash derived from eolian deposits overlying truncated soil derived from same eolian deposits
Texture : silty

EFFECTIVE SOIL DEPTH : 150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : moderate; no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 150 cm dry

LAND USE : low level arable farming; crops : maize; no irrigation; rotation : continuous crop rotation; improvements : terracing
Land use/vegetation remarks : see additional remarks

ADDITIONAL REMARKS :
PARENT ROCK: profile consists of a characteristic deposit of about 100 year old colluvia on top of the truncated loess. HYDROLOGY: run off is zero during less important showers due to small ridges perpendicular to the slope; heavy showers may result in important run off. As a consequence aggradation occurs only in combination with heavy showers. LAND USE: crops also include sorghum. VEGETATION: original vegetation was cut completely about 100 years ago. It consisted of broad leave forest.

CLIMATE : Köppen: Dwx
Station: CHAOYANG 41 33 N/120 27 E 169 m a.s.l. 11 km N of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	29	27	38	78	131	185	164	149	132	112	85	50	31	1183
pan evaporation	mm	29	42	65	145	279	389	300	233	194	178	151	86	46	2109
precipitation	mm	29	2	3	4	19	35	80	161	109	43	22	7	3	486
no. of raindays		29	2	2	2	5	7	12	14	11	7	4	2	1	69
tot.glob.rad.	MJ/m2	28	435.4	447.9	519.1	523.3	594.5	540.0	506.6	502.4	523.4	498.2	435.4	418.6	5941.2
T mean	°C	29	-10.6	-7.2	0.7	10.5	18.3	22.2	24.6	23.0	17.3	9.7	0.0	-8.0	8.4
T max	°C	29	-2.7	0.9	8.4	17.9	25.5	28.6	30.1	29.0	24.8	17.4	7.5	-0.5	15.6
T min	°C	29	-17.4	-14.7	-6.7	2.8	10.9	16.2	19.7	17.6	10.3	2.7	-6.5	-14.4	1.7
relative humidity	%	29	44	40	38	38	41	60	73	74	64	55	50	46	52
windspeed(at 2m)	m/s	29	2.2	2.5	3.0	3.5	3.4	2.6	2.1	1.6	1.8	2.2	2.4	2.1	2.4
bright sunshine	h/d	29	6.8	7.8	8.2	8.4	9.1	8.5	7.7	7.9	8.5	7.8	6.9	6.5	7.8

Remarks: other climate stations available in ISIS with reference to this soil are: JINGZHOU (41 8 N/121 7 E; altitude 66 m a.s.l.; 65 km SE of site; relevance: moderate) and JIANPING YEBAISOU (41 23 N/119 42 E; altitude 422 m a.s.l,; 65 km WSW of site; relevance: moderate).

ISIS 4.0 data sheet of reference soil CN 34 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

PROFILE DESCRIPTION :
Deep, well drained, (dark) reddish brown silt loam derived from slope wash materials overlying at 65 cm depth a truncated soil developed in loess deposits. The topsoil has very weakly developed crumb structures and a plough pan can be observed. Its organic carbon content is low. The subsoil dominantly shows prismatic and angular blocky structures. Soil reaction is slightly alkaline to alkaline and some calcium carbonate is present.

Ap	0 - 15 cm	Strong brown (7.5YR 4/6, dry) silt loam; very weak medium crumb structure; sticky, slightly plastic, very friable, slightly hard; no mottles; no cutans; many micro pores and many fine to coarse pores; common very fine and fine roots; very few very fine weathered fragments of various nature; plough pan present; few worm channels; non calcareous (10% HCl); abrupt smooth boundary to
B	15 - 65 cm	Dark reddish brown (5YR 3/4, moist) and strong brown to yellowish red (6.2YR 5/8, dry) silt loam; weak very coarse prismatic parting to moderate coarse subangular blocky structure; sticky, slightly plastic, friable, slightly hard; no mottles; patchy thin clay and sesquioxide cutans; many very fine inped tubular pores; common very fine and fine roots; locally strongly calcareous (10% HCl); gradual smooth boundary to
2Bt	65 - 150 cm	Yellowish red (5YR 4/8, moist) and dark brown (7.5YR 4/6, dry) silt loam; weak to moderate coarse angular blocky parting to strong fine to very fine angular blocky structure; sticky, slightly plastic, very friable, slightly hard; common fine distinct sharp yellowish brown (10YR 5/6) and very few fine prominent sharp black (N 2/0) mottles; continuous moderately thick clay and sesquioxide cutans on pedfaces and few uncoated silt and very fine sand coatings; many very fine to fine inped tubular pores and few medium vertical continuous tubular pores; common very fine roots; few worm channels; locally slightly calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 15	-	0	1	1	2	12	16	35	20	55	30	-	1.29	49	48	44	35	33	22	18	15
B	15 - 40	-	0	0	0	1	10	11	32	23	56	33	-	-	-	-	-	-	-	-	-	-
	40 - 65	-	0	0	0	1	12	14	31	21	53	34	-	1.30	47	45	39	32	31	25	23	18
2Bt	65 - 105	-	0	0	0	1	14	15	32	19	52	34	-	1.38	44	41	36	31	30	25	23	19
	105 - 140	-	0	0	0	1	17	18	30	19	49	33	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	7.4	6.5	1.0	0.68	0.08	20.3	2.4	0.6	0.1	23.4	-	-	19.2	65	2.4	23.4	122	-	0.26
B	8.0	7.1	0.8	0.28	0.05	25.2	2.1	0.4	0.1	27.8	-	-	19.7	59	1.0	27.8	141	-	0.20
	8.2	7.3	2.5	0.29	0.05	48.8	2.4	0.4	0.2	51.8	-	-	18.4	54	1.0	51.8	282	-	0.16
2Bt	8.3	7.3	1.5	0.19	0.04	41.0	2.4	0.4	0.3	44.1	-	-	19.2	57	0.7	44.1	230	-	0.18
	8.4	7.2	1.1	0.10	0.03	25.6	2.4	0.3	0.4	28.7	-	-	18.4	55	0.4	28.7	156	-	0.16

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	QUAR	AVAIL. P mg/kg
Ap	3	3	4	3	2	7.5
B	3	3	5	3	2	2.1
	3	3	5	3	2	7.2
2Bt	3	3	5	3	2	13.1
	3	3	4	3	2	16.8

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, QUAR quartz. Available P (Olsen): mg/kg.

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FAO/UNESCO (1988) : Orthi-Haplic Phaeozem, phreatic phase (1974 : Haplic Phaeozem, phreatic phase)
USDA/SCS SOIL TAXONOMY (1992) : Cumulic Hapludoll, fine, mixed, mesic (1975 : Cumulic Hapludoll)
CSTC (1991) : Haplic thermo-black soil

DIAGNOSTIC CRITERIA FAO (1988) : mollic A horizon
USDA/SCS (1992) : mollic epipedon
Soil moisture regime : udic
Soil temperature regime : mesic

LOCATION : Shenyang Province, Daoshuzi, 3 km W of Xinchengzi
Latitude : 42° 1′ N Longitude : 123°29′ E Altitude : 50 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : alluvial plain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : higher part of alluvial plain
SLOPE Gradient : 1% Form : straight
POSITION OF SITE : flat
MICRO RELIEF Kind : level
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : small cracks Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : alluvium

EFFECTIVE SOIL DEPTH : 120 cm

WATER TABLE Depth : 160 cm Kind : perched
Estimated highest level : 120 cm Estimated lowest level : ?
Depth : 10 m Kind : groundwater table
DRAINAGE : well
PERMEABILITY : slow; no slowly permeable layer(s) within 100 cm
FLOODING Frequency : irregular, fresh water Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 120 cm moist 120 - 150 cm wet

LAND USE : medium level arable farming; crops : maize; no irrigation; rotation : crop rotation continuous; improvements : none

ADDITIONAL REMARKS :
SOIL MOISTURE REGIME: because of the presence of a perched water table, the soil profile is assumed to be longer moist than the atmospheric data suggest. Hence the soil moisture regime is considered to be udic instead of ustic.

CLIMATE : Köppen: Dwx
Station: XINCHENGZI 42 1 N/123 31 E 50 m a.s.l 3 km E of site Relevance: good
SHENGYANG 41 46 N/123 26 E 42 m a.s.l 28 km SSW of site Relevance: moderate

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
XINCHENGZI														
pan evaporation mm	24	30	50	100	190	310	240	160	150	145	110	50	30	1606
precipitation mm	24	5	8	10	36	56	91	181	139	62	45	13	6	651
T mean °C	24	-13.2	-9.7	-0.6	8.6	16.6	21.2	24.0	22.5	16.5	8.4	-1.0	-9.7	7.0
relative humidity %	24	62	58	56	58	58	70	82	80	72	68	66	62	66
bright sunshine h/d	24	6.0	6.9	7.5	7.9	7.9	8.4	6.7	7.4	7.9	6.7	6.0	5.6	7.1
SHENYANG														
ETo (PenMon) mm	30	19	27	60	107	154	146	136	127	106	73	40	24	1018
pan evaporation mm	29	21	36	87	182	255	211	179	155	133	99	50	25	1432
precipitation mm	30	7	8	13	40	56	89	196	169	82	45	20	11	734
no. of raindays	30	4	4	5	7	9	12	15	12	9	7	5	4	89
tot.glob.rad. MJ/m2	30	217.7	291.1	455.7	549.6	641.7	600.0	555.1	521.5	469.8	363.4	235.0	189.9	5091.0
T mean °C	30	-12.0	-8.4	0.1	9.3	16.9	21.5	24.6	23.5	17.2	9.4	0.0	-8.5	7.8
T max °C	30	-5.6	-2.1	5.8	15.7	23.3	27.0	29.2	28.3	23.6	15.9	5.6	-2.6	13.7
T min °C	30	-17.3	-13.8	-5.0	3.2	10.6	16.3	20.5	19.2	11.8	4.0	-4.6	-13.3	2.6
relative humidity %	30	64	58	54	53	55	68	78	79	72	68	65	64	60
windspeed(at 2m) m/s	30	2.4	2.6	3.1	3.5	3.3	2.6	2.2	2.1	2.2	2.5	2.6	2.3	2.6
bright sunshine h/d	30	5.5	6.6	7.5	8.1	8.7	8.2	7.1	7.3	8.0	6.9	5.7	5.0	7.1

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PROFILE DESCRIPTION :
Deep, well drained, very dark grayish brown clay loam overlying a strongly mottled, slightly altered subsoil. The soil is derived from alluvial deposits and has a fluctuating groundwater level which reaches to about 120 cm below the surface. The general structure is crumb, however, angular blocky structures dominate in the surface horizons. A plough pan has formed below the arable surface layer. The soil has a medium content in organic matter and a neutral reaction.

Ap1 0 - 25 cm Dark brown (7.5YR 3/2, moist) loam; weakly coherent porous massive and moderate fine to very fine angular blocky structure; sticky, plastic, very friable, slightly hard; no mottles; many very fine interstitial and tubular pores; few fine and medium roots; non calcareous (10% HCl); abrupt smooth boundary to

Ap2 25 - 35 cm Very dark grayish brown (10YR 3/2, moist) clay loam; moderate medium crumb and moderate fine angular blocky structure; slightly sticky, plastic, friable; no mottles; many very fine interstitial and tubular pores; few fine and medium roots; non cemented discontinuous plough pan; non calcareous (10% HCl); clear smooth boundary to

Ah1 35 - 72 cm Very dark grayish brown (10YR 3/2, moist) clay loam; weakly coherent porous massive parting to weak medium crumb structure; slightly sticky, plastic, friable; many very fine to fine interstitial and tubular pores; moderately porous; fine and medium roots; non calcareous (10% HCl); diffuse smooth boundary to

Ah2 72 - 120 cm Very dark grayish brown (10YR 3/2, moist) clay loam; weakly coherent porous massive parting to weak medium crumb structure; slightly sticky, plastic, friable; many very fine to fine interstitial pores and few fine to medium vertical continuous exped-inped tubular pores; moderately porous; fine and medium roots; non calcareous (10% HCl); gradual smooth boundary to

Cg 120 - 150 cm Yellowish brown (10YR 5/6, moist) clay loam; weak to moderate porous massive parting to moderate fine angular blocky structure; slightly sticky, slightly plastic, very friable; many coarse faint clear very dark grayish brown (2.5Y 3/3) and common medium faint sharp light olive brown (2.5Y 5/8) mottles; many very fine to fine tubular pores; no roots; non calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap1	0 - 25	-	0	0	0	0	7	8	29	33	62	30	-	1.29	47	44	39	35	34	31	29	21
Ap2	25 - 35	-	0	0	0	0	4	4	24	31	55	41	-	-	-	-	-	-	-	-	-	-
Ah1	35 - 72	-	0	0	0	0	9	10	32	26	58	33	-	1.35	45	45	42	39	39	36	29	19
Ah2	72 - 120	-	0	0	0	0	7	8	28	26	54	39	-	1.28	47	46	43	40	40	36	31	22
Cg	120 - 150	-	0	0	0	0	11	11	30	25	55	34	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap1	6.3	5.4	-	1.19	0.14	19.1	4.5	0.6	0.2	24.4	-	-	24.1	80	4.2	24.4	101	-	0.21
Ap2	6.8	5.5	1.2	1.14	0.12	22.2	6.0	0.6	0.1	28.9	-	-	27.4	66	4.0	28.9	105	-	0.08
Ah1	7.0	5.7	1.1	1.14	0.10	20.7	5.6	0.4	0.1	26.8	-	-	24.7	76	4.0	26.8	109	-	0.07
Ah2	7.0	5.8	1.2	1.07	0.10	24.6	7.4	0.5	0.2	32.7	-	-	29.8	77	3.7	32.7	110	-	0.09
Cg	7.0	5.4	1.2	0.29	0.04	18.6	5.9	0.4	0.2	25.1	-	-	23.8	70	1.0	25.1	105	-	0.07

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	AVAIL. P mg/kg
Ap1	3	2	5	3	3	2	44.5
Ap2	4	2	5	3	2	2	4.6
Ah1	3	2	4	3	3	2	9.1
Ah2	3	2	5	3	3	2	16.2
Cg	3	3	5	3	3	2	19.0

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz. Available P (Olsen): mg/kg.

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FAO/UNESCO (1988) : Silti-Chromic Luvisol (1974 : Chromic Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Udic Haplustalf, fine-silty, mixed, mesic (1975 : Udic Haplustalf)
CSTC (1991) : Argillic brown soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : ustic
Soil temperature regime : mesic

LOCATION : Liaoning Province, Dongling District, Ynda
Latitude : 41°50′ N Longitude : 123°39′ E Altitude : 80 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : pediplain Topography : rolling
PHYSIOGRAPHIC UNIT : undulating plain about 10 m above valley bottom
SLOPE Gradient : 4% Aspect : S Form : concave
POSITION OF SITE : upper slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : loess-like lacustrine sediments
Depth lithological discontinuity : 105 cm

EFFECTIVE SOIL DEPTH : 70 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency :
MOISTURE CONDITIONS PROFILE : 0 - 30 cm moist 30 - 140 cm dry

LAND USE : low level arable farming; crops : maize; no irrigation; rotation : crop rotation continuous

CLIMATE : Köppen: Dwx
Station: DONGLING 41 45 N/123 40 E 80 m a.s.l 15 km S of site Relevance: good
Station: SHENGYANG 41 46 N/123 26 E 42 m a.s.l 20 km WSW of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
DONGLING															
precipitation	mm	24	5	8	13	40	54	89	170	167	68	45	17	8	685
T mean	°C	24	-13.0	-9.1	0.2	9.5	17.1	21.6	24.5	23.3	16.8	8.8	-0.1	-9.3	7.5
bright sunshine	h/d	24	5.5	6.6	7.6	8.1	8.8	8.3	7.0	9.0	8.1	6.9	5.5	5.0	7.2
SHENGYANG															
ETo (PenMon)	mm	30	19	27	60	107	154	146	136	127	106	73	40	24	1018
pan evaporation	mm	29	21	36	87	182	255	211	179	155	133	99	50	25	1432
precipitation	mm	30	7	8	13	40	56	89	196	169	82	45	20	11	734
no. of raindays		30	4	4	5	7	9	12	15	12	9	7	5	4	89
tot.glob.rad.	MJ/m2	30	217.7	291.1	455.7	549.6	641.6	600.0	555.1	521.5	469.8	363.4	235.0	189.9	5091.0
T mean	°C	30	-12.0	-8.4	0.1	9.3	16.9	21.5	24.6	23.5	17.2	9.4	0.0	-8.5	7.8
T max	°C	30	-5.6	-2.1	5.8	15.7	23.3	27.0	29.2	28.3	23.6	15.9	5.6	-2.6	13.7
T min	°C	30	-17.3	-13.8	-5.0	3.2	10.6	16.3	20.5	19.2	11.8	4.0	-4.6	-13.3	2.6
relative humidity	%	30	64	58	54	53	55	68	78	79	72	68	65	64	60
windspeed(at 2m)	m/s	30	2.4	2.6	3.1	3.5	3.3	2.6	2.2	2.1	2.2	2.5	2.6	2.3	2.6
bright sunshine	h/d	30	5.5	6.6	7.5	8.1	8.7	8.2	7.1	7.3	8.0	6.9	5.7	5.0	7.1

ISIS 4.0 data sheet of reference soil CN 36 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

PROFILE DESCRIPTION :
Deep, moderately well drained, light brown to yellowish brown silty clay loam derived from loess-like lacustrine deposits overlying red, very gravelly sandy clay loam. The dark yellowish brown to strong brown topsoil shows weakly developed crumb and platy structures and is low in organic carbon. The subsoil dominantly shows strongly developed prismatic and angular blocky structures. Soil reaction is neutral to slightly acid.

Ap	0 - 17 cm	Dark yellowish brown (10YR 3/4, moist) to yellowish brown (10YR 5/4, dry) loam; weakly coherent porous massive and weak fine to medium crumb structure; very friable; many very fine interstitial pores; common very fine and medium roots; non calcareous (10% HCl); abrupt smooth boundary to
EB	17 - 30 cm	Strong brown (7.5YR 5/6, moist) loam; weakly coherent porous massive parting to weakly coherent fine to medium platy structure; very friable; patchy thin clay cutans on pedfaces; many very fine interstitial pores and few medium vertical continuous tubular pores; common very fine and medium roots; non calcareous (10% HCl); clear smooth boundary to
Bt1	30 - 70 cm	Light brown to reddish yellow (7.5YR 6/5, moist) to strong brown (7.5YR 4/6, dry) clay loam; moderate to strong medium to coarse prismatic parting to very strong fine to medium angular blocky structure; firm, slightly hard; many coarse clear dark brown (7.5YR 4/4) mottles; continuous thick clay cutans on pedfaces; many very fine tubular pores; very fine and fine roots; non calcareous (10% HCl); diffuse smooth boundary to
Bt2	70 - 105 cm	Yellowish red (5YR 4/7, moist) to strong brown (7.5YR 5/6, dry) clay loam; moderate to strong medium to coarse prismatic parting to very strong fine to medium angular blocky structure; firm, slightly hard; many coarse clear dark brown (7.5YR 4/4) mottles; continuous thick clay cutans on pedfaces; many very fine tubular pores; no roots; non calcareous (10% HCl); clear wavy boundary to
2C	105 - 140 cm	Red (2.5YR 4/8, moist) to orange (2.5YR 7/8, dry) very gravelly clay; structureless; no mottles; patchy moderately thick sesquioxide cutans on pedfaces; few very fine tubular and interstitial pores; no roots; very frequent fine angular quartz fragments; non calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ap	0 - 17	-	3	4	4	3	6	19	33	26	59	22	-	-	-	-	-	-	-	-	-	-
EB	17 - 30	-	1	1	1	1	5	7	20	37	57	36	-	1.45	42	41	39	36	36	33	29	19
Bt1	30 - 70	-	1	1	0	0	5	7	28	32	59	34	-	1.48	40	37	35	33	32	30	30	21
Bt2	70 - 105	-	1	1	1	1	4	8	25	32	57	36	-	-	-	-	-	-	-	-	-	-
2C	105 - 120	-	27	15	7	5	2	55	6	9	15	30	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	6.5	5.8	1.0	1.29	0.14	16.0	2.7	0.2	0.3	19.2	-	-	16.1	75	4.5	19.2	119	-	0.30
EB	7.3	5.8	1.0	0.26	0.06	13.4	3.8	0.0	0.4	17.6	-	-	14.4	40	0.9	17.6	122	-	0.10
Bt1	6.5	4.8	1.0	0.18	0.05	14.4	5.6	0.1	0.3	20.4	-	-	16.4	48	0.6	20.4	124	-	0.14
Bt2	5.9	4.2	-	0.20	0.04	13.1	5.2	0.1	0.6	19.0	-	-	16.2	46	0.7	19.0	117	-	0.08
2C	5.6	4.3	-	0.06	0.02	8.8	3.8	0.1	0.4	13.1	-	-	12.2	41	0.2	13.1	107	-	0.09

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	AVAIL. P mg/kg
Ap	3	3	3	3	2	-	18.3
EB	4	4	4	3	2	2	3.8
Bt1	4	4	4	4	2	1	8.4
Bt2	4	4	4	4	2	2	29.2
2C	4	1	4	5	2	1	12.6

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz. Available P (Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 37 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

FAO/UNESCO (1988) : Hypoglossi-Albic Luvisol (Siltic) (1974 : Albic Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Ultic Glossoboralf, fine, mixed (1975 : Ultic Glossoboralf)
CSTC (1991) : Haplic dark brown soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, albic E, argic B horizon; interfingering
USDA/SCS (1992) : ochric epipedon, albic horizon, argillic horizon; interfingering of albic materials
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Jilin Province, Antu County, Changbaishan Forest
Latitude : 42°24′ N Longitude : 128° 6′ E Altitude : 750 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : plateau Topography : rolling
PHYSIOGRAPHIC UNIT : gently sloping foot of volcano
SLOPE Gradient : 3% Aspect : N Form : straight
POSITION OF SITE : middle slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : stable

PARENT MATERIAL : loamy loess

EFFECTIVE SOIL DEPTH : 110 cm

WATER TABLE : no watertable observed
DRAINAGE : imperfect-moderately well
PERMEABILITY : slow; slowly permeable layer at 33 cm depth
FLOODING Frequency :
MOISTURE CONDITIONS PROFILE : 0 - 150 cm wet

LAND USE : (semi-)natural vegetation
VEGETATION Type : closed forest Status : primary
Land use/vegetation remarks : mixed broad-leaf/coniferous forest (Korea pine / broad-leaved species mixed forest: main species Korean pine (*Pinus koreaensis*), Amur linden (*Tilia amuriensis*), painted mono maple (*Acer mono*), Manchurian ash, white elm (*Ulmus* sp.) and Mongolian wallnut, with locally birch (*Betula* sp.) and Mongolian oak (*Quercus mongolica*).

ADDITIONAL REMARKS :
PARENT MATERIAL: below the parent material (loess) basaltic material is present at several m depth. MOISTURE CONDITIONS: as a consequence of rains the profile was nearly saturated with water at the moment of description and sampling. CSTC (1991) CLASSIFICATION: the soil belongs to the Udic Siallisols, Dark brown soils (frigid STR, eutric umbrihumic epipedon, eutric brown B horizon and pH 5-7). The subgroup of Haplic dark brown soils lacks an albic horizon with a discontinuous wavy or gradual boundary, gleyic evidence in the surface horizon and redoxic features between 50 and 100 cm depth. As the lower boundary of the albic horizon present in this soil is gradual and smooth, the soil does not fit the concept of "Albic dark brown soil". Therefore the soil has been retained as "Haplic dark brown soil".

CLIMATE : Köppen: Dbw
Station: CHANGBAI 42 24 N/128 06 E 750 m a.s.l. 2 km W of site Relevance: very good
FUNSONG DONGGANG 42 6 N/127 34 E 774 m a.s.l.

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
CHANGBAI															
precipitation	mm	6	21	21	35	79	89	116	169	191	97	32	41	13	904
T mean	°C	6	-14.6	-10.9	-2.6	7.3	14.2	18.3	21.8	21.2	14.6	7.5	-1.8	-10.6	5.4
FUNSONG DONGGANG															
ETo (PenMon)	mm	24	17	20	42	82	127	118	119	106	86	63	32	18	830
pan evaporation	mm	24	19	30	63	136	215	177	168	139	117	90	42	21	1216
precipitation	mm	24	11	12	21	53	77	116	186	167	83	47	32	14	817
no. of raindays		24	12	10	13	12	14	17	19	17	14	11	12	12	163
T mean	°C	24	-16.0	-13.2	-5.0	4.9	12.2	16.3	20.1	18.8	12.3	5.3	-4.0	-12.5	3.3
T max	°C	24	-9.4	-6.5	0.6	10.9	18.8	22.4	25.4	24.3	19.0	12.0	1.9	-6.5	9.4
T min	°C	24	-22.2	-19.8	-10.8	-1.0	5.3	10.4	15.3	14.1	6.2	-0.9	-9.6	-18.4	-2.6
relative humidity	%	24	66	62	59	55	56	73	79	82	75	64	66	67	67
windspeed(at 2m)	m/s	24	2.0	2.2	2.6	3.0	2.9	2.1	1.8	1.7	1.8	2.2	2.3	2.2	2.2
bright sunshine	h/d	24	5.9	6.8	7.3	7.5	8.2	7.6	7.0	6.6	7.2	6.6	5.6	5.2	6.8

Remarks: extensive climatic data are also available in ISIS for ANTU (SONGJIANG) (42 32 N/128 15 E, 591 m a.s.l., about 19 km NE of site, relevance good).

ISIS 4.0 data sheet of reference soil CN 37 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

PROFILE DESCRIPTION :
Very deep, imperfectly to moderately well drained, brown to light yellowish brown clay loam derived from loess. The soil shows, apart from the obvious clay-sesquioxide cutans in the Bt1 (and to a lesser extent in the Bt2), important whitish quartz silt coatings on pedfaces, especially visible when the soil is dry. The Bt2 and Btg horizons show distinct pressure faces/slickensides. Very few earthworms occur down to 75 cm. Organic carbon content is very high and the soil reaction is acid throughout.

O	2 - 0 cm	Leaves, slightly decomposed; abrupt smooth boundary to
Ah	0 - 15 cm	Dark brown (7.5YR 2/1, moist) silt loam; weak to moderate medium to coarse crumb structure; slightly sticky, slightly plastic, friable; many very fine interstitial pores; common very fine to coarse roots throughout; non calcareous (10% HCl); abrupt smooth boundary to
E	15 - 33 cm	Pale brown (10YR 6/3, moist) silt loam; moderately coherent porous massive structure; slightly sticky, slightly plastic, firm; few coarse distinct diffuse yellowish red (5YR 5/8) mottles; many very fine and few fine tubular pores; few fine and medium roots; non calcareous (10% HCl); gradual smooth boundary to
Bt1	33 - 85 cm	Brown (7.5YR 5/4, moist) clay loam; weak very coarse prismatic parting to moderate to strong coarse angular blocky structure; non sticky, non plastic, firm; many coarse distinct clear light yellowish brown (10YR 6/4) and few coarse distinct diffuse yellowish red (5YR 5/8) mottles; continuous thick clay and sesquioxide cutans throughout; common very fine inped tubular pores and few fine tubular pores; few very fine and fine roots; non calcareous (10% HCl); diffuse smooth boundary to
Bt2	85 - 110 cm	Light yellowish brown (10YR 6/4, moist) clay loam; weak very coarse prismatic parting to moderate to strong coarse angular blocky structure; non sticky, non plastic, firm; common coarse distinct clear light yellowish brown (10YR 6/4) mottles; continuous thick clay and sesquioxide cutans throughout; common very fine inped tubular pores; few very fine roots; non calcareous (10% HCl); gradual broken boundary to
Btg	110 - 150 cm	Dark brown (7.5YR 3/4, moist) clay; strong coarse angular blocky structure; non sticky, non plastic, very firm; common medium distinct clear yellowish red (5YR 5/8) mottles; continuous thick clay and sesquioxide cutans throughout; many very fine inped tubular pores; no roots; non calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 15	-	0	1	2	1	1	6	14	48	62	32	9.2	-	-	-	-	-	-	-	-	-
E	15 - 33	-	0	3	4	2	1	10	12	56	68	22	12.5	1.43	41	39	37	36	36	35	30	17
Bt1	33 - 85	-	0	0	1	1	1	2	8	36	44	54	29.0	1.42	44	44	43	42	41	41	40	34
Bt2	85 - 110	-	0	0	0	1	0	1	6	40	46	53	25.6	-	-	-	-	-	-	-	-	-
Btg	110 - 150	-	0	0	0	1	0	1	9	43	52	47	23.0	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	5.6	4.9	-	11.31	0.99	29.7	5.2	1.2	0.2	36.3	-	-	51.0	157	39.6	36.3	71	-	0.26
E	5.3	3.8	-	0.42	0.07	3.7	1.4	0.0	0.1	5.2	2.4	2.1	10.7	49	1.5	7.6	49	20	0.02
Bt1	4.9	3.4	-	0.24	0.04	11.1	5.7	0.2	0.4	17.4	11.4	10.7	29.6	55	0.8	28.8	59	36	0.02
Bt2	5.0	3.5	-	0.17	0.05	13.3	6.8	0.3	0.3	20.7	7.9	7.0	27.9	53	0.6	28.6	74	25	0.03
Btg	5.2	3.5	-	0.96	0.09	13.4	6.0	0.2	0.4	20.0	5.1	4.6	30.8	65	3.4	25.1	65	15	0.03

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	QUAR	AVAIL. P mg/kg
Ah	3	3	4	3	2	9.6
E	2	4	3	3	2	1.2
Bt1	3	3	5	3	2	3.5
Bt2	4	3	8	3	2	10.3
Btg	3	3	6	3	2	16.9

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, QUAR quartz. Available P (Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 38 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

FAO/UNESCO (1988) : Silti-Stagnic Solonetz (1974 : Orthic Solonetz)
USDA/SCS SOIL TAXONOMY (1992) : Natriboralf, fine, montmorillonitic (1975 : Natriboralf)
CSTC (1991) : Haplic solonetz

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, natric B horizon
USDA/SCS (1992) : ochric epipedon, natric horizon
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Heilongjiang Province, 7 km S of Zhaodong
Latitude : 46° 2′ N Longitude : 125°55′ E Altitude : 150 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : lacustrine plain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : very flat plain
SLOPE Gradient : 0%
POSITION OF SITE : flat
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : slaked
Salt : slight Alkali : moderate
SLOPE PROCESSES Soil erosion : severe wind and severe sheet Aggradation : nil

PARENT MATERIAL : clayey lacustrine sediments with small snail shells

EFFECTIVE SOIL DEPTH : 60 cm

WATER TABLE : no watertable observed
DRAINAGE : poor
PERMEABILITY : slow; slowly permeable layer from 14 to 35 cm
FLOODING Frequency : Run off : ponded
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : semi-natural grassland, grazed
VEGETATION Type : short, alkali-tolerant grassland Status : degraded

ADDITIONAL REMARKS :
LAND USE: the area is used for communal extensive grazing (ox, sheep, horse). Although used for extensive grazing, overgrazing can be observed. During the cultural revolution part of these soils has been irrigated with little success (1st year maize yield 3750 kg/ha (500 jin/mu), decreasing rapidly in next years. Nearby Chernozems yield 9000 kg/ha (1200 jin/mu). An abandoned irrigation canal is present close to site.
The Btn horizon of these soils is used for the roofs of houses (good protection against rain due to its loss of structure upon wetting). Both overgrazing and digging for Btn soil material cause severe wind and some water erosion of these soils. Moreover, the destruction of the plant cover through gathering of medicinal herbs and cutting of grass for fuel (there are very few trees in the area) adds to the erosion.

CLIMATE : Köppen: Dwx
Station: ZHAODONG 46 4 N/125 58 E 147 m a.s.l 7 km S of site Relevance: good
Station: HARBIN 45 41 N/126 37 E 172 m a.s.l 67 km SE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ZHAODONG															
precipitation	mm	22	2	3	6	16	35	65	140	94	53	18	4	3	438
T mean	°C	22	-20.4	-16.0	-5.1	5.8	14.3	20.2	22.9	20.8	14.1	4.8	-7.0	-17.1	3.1
HARBIN															
ETo (PenMon)	mm	30	10	16	47	99	154	149	141	125	99	68	31	14	952
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
precipitation	mm	30	4	5	11	24	38	78	161	97	66	28	7	6	523
no. of raindays		30	6	6	6	7	10	13	16	13	11	8	6	6	107
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
tot.glob.rad.	MJ/m2	30	183.4	260.3	419.8	495.5	570.6	587.4	569.7	514.4	418.6	311.0	199.4	148.8	4679.4
T mean	°C	30	-19.4	-15.4	-4.8	6.0	14.3	20.0	22.8	21.1	14.4	5.6	-5.7	-15.6	3.6
T max	°C	30	-13.2	-8.6	1.5	12.7	21.1	25.9	28.0	26.4	20.7	11.8	-0.1	-9.9	9.7
T min	°C	30	-24.8	-21.5	-10.9	-0.3	7.4	14.1	18.1	16.2	8.9	0.3	-10.5	-20.5	-2.0
windspeed(at 2m)	m/s	30	2.9	3.0	3.6	4.3	4.0	3.1	2.7	2.6	3.0	3.4	3.5	3.1	3.3
bright sunshine	h/d	30	5.8	7.0	7.9	7.9	8.5	8.7	8.1	7.9	7.6	6.6	5.8	5.1	7.2

Additional climatic data are available in ISIS for the weather station of ANDA (46 23 N/125 19 E; 149 m a.s.l.; 61 km NW of site; relevance: moderate) (see CN 39).

ISIS 4.0 data sheet of reference soil CN 38 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

PROFILE DESCRIPTION :
Very deep, poorly drained, dark brown to light yellowish brown silty clay loam derived from clayey lacustrine sediments. The soil has a very high amount of exchangeable sodium and a strongly alkaline soil reaction throughout. It occurs in close association with Gleyic Solonetz and Gleysols. No regular pattern can be found; slight differences in topography may result in a different soil type.

Ah	0 - 1 cm	
E	1 - 14 cm	Very dark brown (7.5YR 2/2, moist) silt loam; weakly coherent; sticky, plastic, very friable, slightly hard; common very fine tubular pores; many very fine roots; non calcareous (10% HCl); clear smooth boundary to
Btn	14 - 35 cm	Very dark brown (7.5YR 2/3, moist) silty clay loam; weak fine to medium prismatic parting to weak to moderate fine to medium angular blocky structure; sticky, plastic, very friable; common medium prominent sharp pale brown (10YR 6/3) mottles; patchy thin clay and humus cutans on pedfaces; many very fine and very few medium continuous tubular pores; few very fine roots; slightly calcareous (10% HCl); clear smooth boundary to
BC1	35 - 60 cm	Dark brown (7.5YR 3/3, moist) silty clay loam; weak to moderate coarse subangular blocky parting to moderate medium crumb structure; sticky, plastic, very friable; patchy thin clay and humus cutans on pedfaces; many very fine and very few medium continuous tubular pores; very fine roots; calcareous (10% HCl); gradual smooth boundary to
BC2	60 - 90 cm	Dark brown (7.5YR 4/3, moist) silty clay loam; moderately coherent parting to moderate fine to medium crumb structure; sticky, plastic, very friable; common coarse prominent diffuse brownish gray (7.5YR 4/1) mottles; patchy thick clay and humus cutans on pedfaces; many very fine tubular pores; no roots; calcareous (10% HCl); gradual smooth boundary to
C	90 - 160 cm	Light yellowish brown (10YR 6/4, moist) silty clay loam; moderately coherent; sticky, plastic, very friable; few coarse prominent diffuse brownish black (7.5YR 3/1) mottles; patchy thin clay and humus cutans; common very fine tubular pores; no roots; calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
E	1 - 14	-	0	0	0	1	24	26	27	16	43	32	9.3	1.05	54	52	48	39	36	32	27	20
Btn	14 - 35	-	0	0	0	1	21	23	25	16	41	36	27.4	1.30	49	49	49	49	49	48	37	32
BC1	35 - 60	-	0	0	0	0	16	17	30	14	44	40	37.9	1.32	53	53	53	53	53	50	39	31
BC2	60 - 90	-	0	0	0	0	13	14	27	19	47	40	39.7	-	-	-	-	-	-	-	-	-
C	90 - 160	-	0	0	0	0	9	9	28	23	51	40	27.3	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
						cmol(+)/kg													
E	8.7	7.2	1.1	3.06	0.32	39.1	3.5	0.3	5.8	48.7	-	-	31.7	99	10.7	48.7	154	18	0.46
Btn	9.6	7.8	2.8	2.04	0.24	44.0	4.9	0.2	16.2	65.3	-	-	29.3	80	7.1	65.4	223	55	0.94
BC1	10.0	8.2	6.1	0.78	0.09	37.0	7.7	0.3	21.0	66.0	-	-	24.3	61	2.7	66.0	272	86	1.10
BC2	9.9	8.3	8.5	0.44	0.05	35.3	9.9	0.1	16.8	62.1	-	-	21.9	55	1.5	62.1	284	77	1.00
C	9.6	8.0	7.8	0.35	0.04	39.9	11.2	0.1	9.1	60.3	-	-	19.2	48	1.2	60.3	314	47	0.66

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	FELD	AVAIL. P mg/kg
E	3	3	6	3	2	1	2.1
Btn	3	3	6	3	2	1	3.4
BC1	3	3	6	3	2	1	1.3
BC2	3	3	4	4	3	2	0.4
C	3	3	6	4	2	2	1.2

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP exchangeable sodium percentage. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, QUAR quartz. Available P (Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 39 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

FAO/UNESCO (1988) : Haplic Chernozem (1974 : Haplic Chernozem)
USDA/SCS SOIL TAXONOMY (1992) : Pachic Haploboroll, fine, montmorillonitic (1975 : Cumulic Haploboroll)
CSTC (1991) : Haplic chernozem

DIAGNOSTIC CRITERIA FAO (1988) : mollic A horizon; soft powdery lime
USDA/SCS (1992) : mollic epipedon; soft powdery lime
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Heilongjiang Province, 14 km S of Zhaozhou
Latitude : 46° 3′ N Longitude : 125°47′ E Altitude : 150 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : plain Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : plain, locally slightly undulating
SLOPE Gradient : 5% Form : convex
POSITION OF SITE : upper slope
MICRO RELIEF Kind : level
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight wind
Slope stability : stable

PARENT MATERIAL : loamy loess

EFFECTIVE SOIL DEPTH : >150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : high; no slowly permeable layer(s)
FLOODING Frequency :
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist
Remarks : freezing depth 2 m

LAND USE : low level arable farming; crops : maize; no irrigation; rotation : monoculture
Land use/vegetation remarks : see additional remarks

ADDITIONAL REMARKS :
EROSION: soil erosion is stopped by windbreaks some 500 m apart. LAND USE: Main crop is maize (9000 kg/ha; 1200 jin/mu) on government contracts. This crop is more or less collectively grown, although each family knows which rows of maize it has to cultivate. Ploughing is done by tractor; weeding and harvesting by hand. Fertilization: N (urea) ca 225 kg/ha (30 jin/mu), P ca 120 kg/ha (16 jin/mu), no K. Manure use is minimal. Rotation is hardly practised; at the site maize was grown continuously for more than 10 years. Additional crops: wheat (3000 kg/ha; 400 jin/mu; economically not interesting), locally some sunflower. Subsistence crops: soybean (2250 kg/ha; 300 jin/mu), potato, bean. Virtually no products are marketed locally.
Farmers in this area use solonetz (CN 38) for extensive grazing. Average size of farm 0.4 ha (6 mu) up to 0.7 ha (10 mu), exclusive of grazing land. In 1993 average annual income based on maize only was ca 3000 Y per family (about US$ 600).

CLIMATE : Köppen: Dwx
Station: ZHAODONG 46 4 N/125 58 E 147 m a.s.l 14 km S of site Relevance: good
Station: ANDA 46 23 N/125 19 E 149 m a.s.l 52 km NW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ZHAODONG															
precipitation	mm	22	2	3	6	16	35	65	140	94	53	18	4	3	438
T mean	°C	22	-20.4	-16.0	-5.1	5.8	14.3	20.2	22.9	20.8	14.1	4.8	-7.0	-17.1	3.1
ANDA															
ETo (PenMon)	mm	28	9	17	48	101	158	154	152	136	102	69	29	13	989
pan evaporation	mm	28	10	22	81	196	307	272	229	196	154	104	38	12	1620
precipitation	mm	28	2	2	7	15	32	65	137	94	58	14	4	4	433
no. of raindays		28	4	3	4	5	8	12	15	12	10	5	3	4	84
tot.glob.rad.	MJ/m2	28	199.4	279.8	461.3	530.5	618.7	631.1	603.9	556.2	451.0	336.5	212.7	156.2	5037.5
T mean	°C	28	-19.9	-15.9	-5.5	5.5	14.1	20.2	22.9	21.0	14.3	5.0	-6.7	-16.5	3.2
T max	°C	28	-13.2	-8.5	1.5	12.4	20.9	26.2	28.1	26.6	20.5	11.4	-0.8	-10.5	9.6
T min	°C	28	-25.5	-22.2	-12.1	-1.3	6.9	13.9	17.9	15.8	8.8	-0.4	-11.7	-21.5	-2.6
relative humidity	%	28	71	66	54	47	49	63	74	74	68	61	65	70	64
windspeed(at 2m)	m/s	28	2.6	2.9	3.5	4.2	4.1	3.1	2.8	2.6	3.0	3.4	3.2	2.8	3.2
bright sunshine	h/d	27	6.2	7.5	8.5	8.6	9.2	9.4	8.6	8.6	8.2	7.1	6.2	5.3	7.8

Remarks: additional climatic data are available in ISIS for the weather station of HARBIN (45 41 N/126 37 E; 172 m a.s.l.; 77 km SSE of site; relevance: moderate) (see CN 38).

ISIS 4.0 data sheet of reference soil CN 39 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 19/12/94

PROFILE DESCRIPTION :
Very deep, well drained, (very) dark brown to yellowish brown silty clay loam derived from loess. The soil has a clearly developed plough pan below the arable layer and has a medium amount of organic carbon to a depth of about 80 cm. Below 35 cm the soil becomes calcareous. Soil reaction is alkaline throughout.

Ap1	0 - 15 cm	Very dark brown (7.5YR 2/2, moist) silt loam; weak fine crumb structure; very friable; common to many micro pores; common very fine and few fine roots; non calcareous (10% HCl); abrupt smooth boundary to
Ap2	15 - 22 cm	Very dark brown (7.5YR 2/2, moist) silty clay loam; moderately coherent parting to weak to moderate medium platy structure; friable; common very fine tubular pores; common very fine and few fine roots; non-cemented continuous platy plough pan; non calcareous (10% HCl); gradual smooth boundary to
Ah	22 - 35 cm	Very dark brown (7.5YR 2/2, moist) silty clay loam; weakly coherent parting to weak to moderate fine to medium subangular blocky structure; very friable; many micro to very coarse tubular pores; common very fine and few fine roots; non calcareous (10% HCl); abrupt wavy boundary to
Ahk	35 - 80 cm	Dark brown (7.5YR 3/3, moist) silty clay loam; weakly coherent parting to weak to moderate fine to medium subangular blocky structure; very friable; many coarse prominent clear dark brown (7.5YR 4/4) mottles and common fine prominent sharp grayish white (N 8/0) mottles; many micro to very coarse tubular pores; few very fine and fine roots; frequent krotovinas and worm channels; strongly calcareous (10% HCl); gradual smooth boundary to
Ck	80 - 175 cm	Yellowish brown (10YR 5/4, moist) silty clay loam; weakly coherent; very friable; many coarse prominent clear dark brown (7.5YR 3/3) and common fine prominent sharp grayish white (N 8/0) mottles; many micro to very coarse tubular pores; few fine roots; frequent krotovinas and worm channels; strongly calcareous (10% HCl); gradual irregular boundary to
C	175 cm+	Yellowish brown (10YR 5/6, moist) silty clay loam; strongly calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap1	0 - 15	-	0	0	0	1	17	18	31	16	46	36	-	-	-	-	-	-	-	-	-	-
Ap2	15 - 22	-	0	0	0	1	17	18	29	17	46	37	-	1.23	48	45	41	38	36	33	26	20
Ah	22 - 35	-	0	0	0	1	17	18	29	17	46	37	-	-	-	-	-	-	-	-	-	-
Ahk	35 - 80	-	0	0	0	0	13	13	32	17	49	38	-	1.14	50	49	43	37	34	30	26	19
Ck	80 - 175	-	0	0	0	0	10	11	32	22	54	36	-	1.31	47	46	41	36	34	32	27	20
C	175 - 220	-	0	0	0	0	15	15	35	21	56	29	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap1	8.0	7.3	1.3	2.01	0.20	43.0	2.8	0.2	0.2	46.2	-	-	30.2	85	7.0	46.2	153	-	0.25
Ap2	8.1	7.3	0.7	1.82	0.18	42.7	3.2	0.2	0.3	46.4	-	-	30.7	83	6.4	46.4	151	-	0.14
Ah	8.1	7.3	1.0	1.61	0.15	42.9	2.8	0.1	0.3	46.1	-	-	30.1	82	5.6	46.1	153	-	0.18
Ahk	8.4	7.4	3.4	1.12	0.12	60.3	3.8	0.1	0.3	64.5	-	-	24.7	65	3.9	64.5	261	-	0.15
Ck	8.4	7.4	4.5	0.38	0.05	49.5	4.8	0.1	0.2	54.6	-	-	18.8	53	1.3	54.6	290	-	0.16
C	8.4	7.5	-	0.26	0.04	32.7	4.8	0.2	0.1	37.8	-	-	13.3	46	0.9	37.8	284	-	0.16

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	AVAIL. P mg/kg
Ap1	3	2	4	3	2	27.3
Ap2	3	1	6	3	2	12.8
Ah	3	3	8	3	2	5.5
Ahk	3	2	6	3	2	3.7
Ck	3	3	7	3	2	3.3
C	3	3	7	3	2	9.1

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, QUAR quartz. Available P (Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 40 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

FAO/UNESCO (1988) : Haplic Greyzem (1974 : Orthic Greyzem)
USDA/SCS SOIL TAXONOMY (1992) : Boralfic Argiustoll, fine, mixed, frigid (1975 : Boralfic Argiustoll)
CSTC (1991) : Luvic chernozem

DIAGNOSTIC CRITERIA FAO (1988) : mollic A, argic B horizon
USDA/SCS (1992) : mollic epipedon, argillic horizon
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Heilongjiang Province, Acheng County, Gaosheng, Yagou
Latitude : 45°28′ N Longitude : 127° 7′ E Altitude : 200 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : alluvial terrace Topography : hilly
PHYSIOGRAPHIC UNIT : slightly sloping terrace
SLOPE Gradient : 2% Form : straight
POSITION OF SITE : flat
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : not apparent
Slope stability : stable

PARENT MATERIAL : alluvium (fluvio-limnic)
Texture : loamy

EFFECTIVE SOIL DEPTH : 55 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well. There is obvious lateral internal drainage.
PERMEABILITY : slowly permeable layer below 180 cm
FLOODING Frequency : Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist
Remarks : the soil is frozen to a depth of 1.5 to 2 m each year.

LAND USE : low level arable farming; crops : maize; no irrigation; rotation : crop rotation continuous
Land use/vegetation remarks : crops cultivated: maize, soybean, sorghum, potato, sunflower. Crop rotation: two times maize, one time soybean.

ADDITIONAL REMARKS :
CLASSIFICATION: either ALBIC LUVISOL (if hydromorphism is clear enough) or HAPLIC GREYZEM (no hydromorphism allowed).
LAND USE: Gaoyuen (name of the village) means "fruit garden". The village is inhabited by Han and Korean people. Han people cultivate upland soils (CN 40), while the Korean people cultivate the valley floors (paddy 1 time/year). Many Koreans left the village and have hired mostly Han and some Koreans for tilling their paddy. The average size of farm is about 1.2 mu/caput (family 3 - 6 people). Annual income: 500 Y (US$ 100) per caput for the Han people, Koreans have in general 800 Y (US$ 160) per caput.
Maize, soybean and sorghum are cash crops (sold to state); potato and sunflower subsistence crops. Only in case of a (small) surplus products are sold on local market. Yields: maize 800 jin/mu (6000 kg/ha), soybean 500 jin/mu (3750 kg/ha), sorghum 600 jin/mu (4500 kg/ha), potato 800 jin/mu (6000 kg/ha). No mechanization; only man- and ox-power is used. Use of fertilizers: P about 40 jin/mu (300 kg/ha), N (urea) about 40 jin/mu (300 kg/ha). No K and manure is used.

CLIMATE : Köppen: Dwx
Station: ACHENG 45 31 N/126 57 E 174 m a.s.l 10 km ESE of site Relevance: good
Station: HARBIN 45 41 N/126 37 E 172 m a.s.l 50 km SE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ACHENG															
precipitation	mm	21	2	3	9	25	47	87	154	91	59	27	8	4	519
T mean	°C	21	-19.7	-15.8	-4.8	6.0	14.3	19.7	22.7	21.1	14.5	5.2	-5.9	-16.1	3.4
HARBIN															
ETo (PenMon)	mm	30	10	16	47	99	154	149	141	125	99	68	31	14	952
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
precipitation	mm	30	4	5	11	24	38	78	161	97	66	28	7	6	523
no. of raindays		30	6	6	6	7	10	13	16	13	11	8	6	6	107
tot.glob.rad.	MJ/m2	30	183.4	260.3	419.8	495.5	570.6	587.4	569.7	514.4	418.6	311.0	199.4	148.8	4679.4
T mean	°C	30	-19.4	-15.4	-4.8	6.0	14.3	20.0	22.8	21.1	14.4	5.6	-5.7	-15.6	3.6
T max	°C	30	-13.2	-8.6	1.5	12.7	21.1	25.9	28.0	26.4	20.7	11.8	-0.1	-9.9	9.7
T min	°C	30	-24.8	-21.5	-10.9	-0.3	7.4	14.1	18.1	16.2	8.9	0.3	-10.5	-20.5	-2.0
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
windspeed(at 2m)	m/s	30	2.9	3.0	3.6	4.3	4.0	3.1	2.7	2.6	3.0	3.4	3.5	3.1	3.3
bright sunshine	h/d	30	5.8	7.0	7.9	7.8	8.5	8.7	8.1	7.9	7.6	6.6	5.8	5.1	7.2

ISIS 4.0 data sheet of reference soil CN 40 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

PROFILE DESCRIPTION :
Moderately deep, moderately well drained, dark brown to brown silt loam to silty clay loam derived from silty alluvia. The soil has dominantly a weakly developed crumb structure over a strongly developed angular blocky structure. Organic carbon content is medium and the soil reaction is acid except for the neutral topsoil.

Ap	0 - 25 cm	Very dark brown (7.5YR 2/2, moist) to brown (7.5YR 4/2, dry) silt loam; weakly coherent parting to weak fine crumb structure; loose; common to many very fine tubular and interstitial pores; common very fine and fine roots throughout; non calcareous (10% HCl); abrupt smooth boundary to both Ah and E
Ah	25 - 40 cm	Dark brown (7.5YR 3/3, moist) silt loam; weak fine crumb structure; loose; common to many very fine tubular and interstitial pores; common very fine and fine roots throughout; non calcareous (10% HCl); clear broken boundary to
E	25 - 55 cm	Light yellowish brown (10YR 6/4, moist) silt loam; weak to moderate medium crumb and moderate fine angular blocky structure; very friable; fine faint diffuse yellowish brown (10YR 5/6) mottles; common to many, very fine tubular and interstitial pores; common very fine and fine roots; non calcareous (10% HCl); abrupt smooth boundary to
Bt1	55 - 100 cm	Reddish brown (5YR 4/3, moist) to yellowish red (5YR 5/6, dry) silty clay loam; very weak very coarse prismatic parting to strong medium angular blocky structure; firm; very few fine faint diffuse yellowish brown (10YR 5/6) and many coarse distinct clear pale brown (10YR 6/3) mottles; continuous thick dark reddish brown (5YR 3/6) clay and humus cutans on horizontal and vertical pedfaces; many very fine tubular pores and medium to coarse vertical continuous inped tubular pores; no roots; non calcareous (10% HCl); diffuse smooth boundary to
Bt2	100 - 180 cm	Brown (7.5YR 4/4, moist) to yellowish brown (10YR 5/6, dry) silty clay loam; moderate to strong medium to coarse angular blocky parting to strong fine angular blocky structure; firm; many coarse distinct clear pale brown to light yellowish brown (10YR 6/3.5) mottles; continuous thick dark reddish brown (5YR 3/6) clay and humus cutans on horizontal and vertical pedfaces; many very fine tubular pores and medium to coarse vertical continuous inped tubular pores; no roots; non calcareous (10% HCl)
Cg	180 - 220 cm	silty clay

Remarks : Ah horizon not sampled.

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 25	-	0	1	1	1	5	8	37	29	67	26	9.2	1.34	46	43	42	40	37	34	27	18
E	25 - 55	-	0	0	0	0	3	4	35	43	78	19	9.9	1.57	38	35	34	32	31	29	23	15
Bt1	55 - 100	-	0	0	0	0	1	2	29	33	62	37	10.5	1.58	39	37	37	36	35	34	33	27
Bt2	100 - 180	-	0	0	0	0	1	1	22	40	62	37	3.7	-	-	-	-	-	-	-	-	-
Cg	180 - 220	-	0	0	0	0	1	1	27	37	64	35	11.3	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	ESP	EC 2.5 mS/cm
						cmol(+)/kg														
Ap	6.7	6.3	1.1	1.77	0.17	20.8	2.4	0.1	0.1	23.4	-	-	20.4	80	6.2	23.4	115	-	0	0.11
E	5.5	3.9	-	0.17	0.04	6.6	1.7	0.1	0.4	8.8	-	-	10.5	56	0.6	8.8	84	-	4	0.04
Bt1	5.3	3.6	-	0.27	0.05	11.6	4.6	0.2	0.6	17.0	2.5	1.9	21.0	57	0.9	19.5	81	9	3	0.03
Bt2	5.2	3.6	-	0.17	0.04	14.5	5.6	0.3	0.8	21.2	0.8	0.5	21.2	58	0.6	22.0	100	2	4	0.02
Cg	5.7	4.1	-	0.20	0.04	13.1	4.9	0.3	0.7	19.0	-	-	21.9	63	0.7	19.0	87	-	3	0.03

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	AVAIL. P mg/kg
Ap	3	3	4	3	2	22.1
E	3	4	3	3	2	16.6
Bt1	3	4	5	3	2	20.2
Bt2	3	3	6	3	2	39.1
Cg	3	3	6	3	2	36.8

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. ESP exchangeable sodium percentage. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, QUAR quartz. Available P (Olsen): mg/kg.

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FAO/UNESCO (1988) : Fluvi-Haplic Phaeozem (Siltic) (1974 : Haplic Phaeozem)
USDA/SCS SOIL TAXONOMY (1992) : Pachic Udic Haploboroll, fine, montmorillonitic (1975 : Pachic Udic Haploboroll)
CSTC (1991) : Luvic chernozem

DIAGNOSTIC CRITERIA FAO (1988) : mollic A horizon
USDA/SCS (1992) : mollic epipedon
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Heilongjiang Province, Bangpu, km 38 along road Harbin - Suihua
Latitude : 46° 4′ N Longitude : 126°42′ E Altitude : 150 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : alluvial terrace Topography : flat or almost flat
PHYSIOGRAPHIC UNIT : nearly flat, plateau-like terrace
SLOPE Gradient : 1%
POSITION OF SITE : flat
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : Slaking/crusting : partly slaked
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : loamy loess

EFFECTIVE SOIL DEPTH : >150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : high; no slowly permeable layer(s)
FLOODING Frequency : Run off : slow
MOISTURE CONDITIONS PROFILE : 0 - 160 cm moist

LAND USE : low level arable farming; crops : potatoes; no irrigation; rotation : continuous crop rotation, usually maize/maize/soybean

ADDITIONAL REMARKS :
LAND USE : crops are maize (7.5 ton/ha), soybean (3 ton/ha), sorghum (7.5 ton/ha); these are cash crops sold to the state. Subsistence farming mainly comprises potato (3.5 ton/ha) and millet (3 ton/ha) of which only small quantities are sold on the local market. The village cultivates only upland soils (no paddy fields).
Fertilizers applied are P (100 kg/ha) and N (urea, 150 kg/ha for maize); K has been used by some farmers for a few years, however, no higher yields were obtained. Only small quantities of manure were applied. The level of mechanization is rather low, ploughing and seeding is done mechanically (tractors are village owned); few families have a small private tractor. Farm size is about 0.2 ha (3.5 mu) per capita, which means 0.9 - 1.2 ha (14 - 18 mu) per family (4 to 5 people). Average annual income 2000 Y (US$ 400) net per family.

CLIMATE : Köppen: Dwx
Station: HULAN 46 0 N/126 36 E 127 m a.s.l. 10 km NNE of site Relevance: good
Station: HARBIN 45 41 N/126 37 E 172 m a.s.l. 43 km SSW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
HULAN															
precipitation	mm	26	3	3	10	24	40	70	150	107	61	23	5	5	500
T mean	°C	26	-20.4	-16.4	-5.3	5.8	14.3	20.1	22.9	21.1	14.5	5.2	-6.3	-16.5	3.3
HARBIN															
ETo (PenMon)	mm	30	10	16	47	99	154	149	141	125	99	68	31	14	952
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
precipitation	mm	30	4	5	11	24	38	78	161	97	66	28	7	6	523
no. of raindays		30	6	6	6	7	10	13	16	13	11	8	6	6	107
tot.glob.rad.	MJ/m2	30	183.4	260.3	419.8	495.5	570.6	587.4	569.7	514.4	418.6	311.0	199.4	148.8	4679.4
T mean	°C	30	-19.4	-15.4	-4.8	6.0	14.3	20.0	22.8	21.1	14.4	5.6	-5.7	-15.6	3.6
T max	°C	30	-13.2	-8.6	1.5	12.7	21.1	25.9	28.0	26.4	20.7	11.8	-0.1	-9.9	9.7
T min	°C	30	-24.8	-21.5	-10.9	-0.3	7.4	14.1	18.1	16.2	8.9	0.3	-10.5	-20.5	-2.0
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
windspeed(at 2m)	m/s	30	2.9	3.0	3.6	4.3	4.0	3.1	2.7	2.6	3.0	3.4	3.5	3.1	3.3
bright sunshine	h/d	30	5.8	7.0	7.9	7.8	8.5	8.7	8.1	7.9	7.6	6.6	5.8	5.1	7.2

Remarks: absolute maximum temperature recorded for Harbin is 37.5 °C; absolute minimum -39.3 °C. Additional climatic data are available in ISIS for the weather station of SUIHUA (46 37 N/126 58 E; 180 m a.s.l; 65 km NW of site; relevance: moderate).

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PROFILE DESCRIPTION :
Very deep, well drained, very dark brown to dark brown silty clay loam derived from loess. The soil has dominantly a weakly to moderately developed crumb structure and a medium content in organic carbon. The soil reaction is neutral throughout.

Ap 0 - 30 cm Black (10YR 2/1, moist) and gray (10YR 4.5/1, dry) silt loam; very weak massive parting to weak to moderate fine crumb structure; friable, slightly hard; many very fine tubular pores; many very fine and common fine roots; non calcareous (10% HCl); clear smooth boundary to

Ah 30 - 70 cm Very dark brown (10YR 2/1.5, moist) silty clay loam; very weak massive parting to weak to moderate fine crumb structure; friable, slightly hard; few coarse prominent clear dark brown (7.5YR 4/3) mottles; many very fine tubular pores and fine to coarse vertical continuous tubular pores; many very fine and common fine roots; frequent krotovinas and worm channels; non calcareous (10% HCl); gradual wavy boundary to

A/C 70 - 110 cm Very dark brown (10YR 2/1.5, moist) and dark brown (10YR 3/3, moist) silty clay loam; weak to moderate medium subangular blocky structure; friable, slightly hard; common coarse distinct diffuse dark brown (7.5YR 4/4) mottles; patchy thin clay and humus cutans; many very fine tubular pores and fine to coarse vertical continuous tubular pores; very fine and fine roots; frequent krotovinas; non calcareous (10% HCl); diffuse smooth boundary to

C 110 - 160 cm Brown (7.5YR 4/4, moist) silty clay loam; weak to moderate medium to coarse subangular blocky structure; friable, slightly hard; common coarse distinct diffuse dark brown (10YR 3/3) mottles; clay and humus cutans; many very fine tubular pores and medium to coarse vertical continuous tubular pores; very fine roots; few krotovinas; non calcareous (10% HCl)

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 30	-	0	0	0	0	7	8	28	26	54	38	-	1.30	46	42	41	38	36	34	31	25
Ah	30 - 70	-	0	0	0	0	6	7	32	21	53	41	-	1.23	50	44	42	38	35	33	30	23
A/C	70 - 110	-	0	0	0	0	4	4	30	29	60	36	-	1.41	45	42	41	38	36	35	32	23
C	110 - 150	-	0	0	0	0	2	2	30	38	68	30	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al cmol(+)/kg	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
Ap	6.5	5.5	1.3	1.67	0.16	23.7	6.6	0.6	0.4	31.3	-	-	25.6	68	5.8	31.3	122	-	0.13
Ah	6.6	5.3	0.7	1.25	0.10	23.3	6.3	0.3	0.2	30.1	-	-	32.0	78	4.4	30.1	94	-	0.05
A/C	6.5	4.9	0.7	0.58	0.06	20.1	6.0	0.3	0.5	26.9	-	-	25.7	71	2.0	26.9	105	-	0.01
C	6.0	4.6	-	0.31	0.04	18.6	4.9	0.3	0.4	24.2	-	-	21.6	72	1.1	24.2	112	-	0.08

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Olsen)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	FELD	AVAIL. P mg/kg
Ap	3	2	8	3	2	1	34.6
Ah	3	2	8	3	1	-	7.5
A/C	3	2	7	3	1	1	12.4
C	3	3	8	3	1	1	16.7

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, QUAR quartz, FELD feldspar. Available P (Olsen): mg/kg.

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FAO/UNESCO (1988) : Epiandi-Eutric Leptosol, skeletic phase (1974 : Eutric Regosol, petric phase)
USDA/SCS SOIL TAXONOMY (1992) : Typic Ustorthent, ashy-skeletal, mixed, frigid (1975 : Typic Ustorthent)
CSTC (1991) : Coarse andisol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon; andic properties
USDA/SCS (1992) : ochric epipedon; andic soil properties
Soil moisture regime : ustic
Soil temperature regime : frigid

LOCATION : Heilongjian Province, Wudalianchi, Heilungshan volcano
Latitude : 48°43′ N Longitude : 126° 8′ E Altitude : 400 m a.s.l.
AUTHOR(S) : Boerma, J.A.K. Date (mm/yy) : 6/93

GENERAL LANDFORM : volcano Topography : undulating
PHYSIOGRAPHIC UNIT : volcano on nearly level plain
SLOPE Gradient : 14% Aspect : S Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : little rocky Stoniness : stony
Form : angular irregular Average size : 50 cm
Cracking : nil Slaking/crusting : nil
SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL : 270 years old volcanic ejecta

EFFECTIVE SOIL DEPTH : 100 cm

WATER TABLE : no watertable observed
DRAINAGE : excessive
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 110 cm moist

LAND USE : (semi-)natural vegetation
VEGETATION Type : deciduous woodland Status : primary
Land use/vegetation remarks : open birch-larch forest, mosses, lichens

ADDITIONAL REMARKS :
The Heilungshan volcano erupted 1719-21, the years 58 - 60 of the reign of Qin emperor Kangsi. At the same time the Hoshoushan volcano, some 5 km to the NE, was active.
The Heilungshan volcano is situated on a relatively small basalt plateau (estimated 50 sqkm) of the same age. This basalt plateau is situated on a larger basalt plateau (some 1600 sq km in the geological map), consisting of three known sheets dating back 1.3, 0.8-0.9 and 0.3-0.65 million years (K/Ar dating). Its composition is of a rather rare type, having a relatively high K and Si content and a relatively low Ca content. These older basalts are covered by loess-like deposits. The disturbance of the drainage pattern by the basalt flow is reflected in the name Wu da lian chi: "five-large-interconnected-lakes", which refers to the lava-forced moving of the river to the east and creating a number of natural reservoirs.
Apart from the lava flow, ash was deposited. These ashes are rather coarse and are mainly found on the lava field. The loess-like deposits bordering the volcano have only been contaminated with (finer) ash materials in the upper part of the soil. This mixed layer may be the result of ploughing since ploughing to about 18 cm is combined with ridge and furrow cultivation of some 15 cm height.

CLIMATE : Köppen: Dwx
Station: DEDU 48 30 N/126 30 E 272 m a.s.l 15 km WNW of site Relevance: good
Station: BEIJAN 48 17 N/126 31 E 270 m a.s.l 56 km SE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
DEDU															
precipitation	mm	14	3	4	6	25	34	75	119	104	63	21	8	5	466
T mean	°C	14	-24.7	-20.3	-8.7	3.5	11.9	18.1	21.0	18.3	11.6	1.8	-10.9	-21.6	0.0
BEIJAN															
ETo (PenMon)	mm	22	7	9	34	79	131	137	129	112	83	51	18	5	794
pan evaporation	mm	22	10	21	81	195	314	265	219	186	149	105	36	11	1590
precipitation	mm	22	3	3	6	22	40	84	144	118	79	24	7	4	534
no. of raindays		22	5	5	6	7	10	14	15	14	12	6	6	7	107
T mean	°C	22	-24.1	-19.6	-8.1	3.4	11.8	18.0	20.7	18.6	11.8	2.3	-10.8	-21.4	0.2
T max	°C	22	-17.8	-12.3	-1.4	10.0	18.8	24.4	26.2	24.3	18.5	8.8	-4.7	-15.6	6.6
T min	°C	22	-29.4	-26.0	-14.5	-3.1	4.4	11.4	15.5	13.2	5.9	-3.3	-16.1	-26.5	-5.7
relative humidity	%	22	76	73	64	54	54	68	79	80	74	66	73	77	70
windspeed(at 2m)	m/s	22	1.7	1.9	2.7	3.5	3.4	2.6	2.3	2.2	2.4	2.7	2.2	1.7	2.4
bright sunshine	h/d	22	5.7	7.1	8.0	7.9	8.4	9.2	8.2	7.9	7.3	6.5	5.8	4.8	7.2

Remarks: additional climatic date are available in ISIS for the weather stations of KESHAN (48 3 N/125 53 E; 237 m a.s.l.; 77 km SW of site; relevance: poor to moderate) and NENJIANG (49 10 N/125 14 E; 242 m a.s.l.; 83 km NW of site; relevance: poor to moderate).

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PROFILE DESCRIPTION :
Deep, excessively drained, brown to black gravel derived from 270 years old volcanic ejecta. The volcanic soil material has been only slightly altered. The soil has a medium content in organic carbon and a neutral soil reaction throughout.

Ah	0 - 20 cm	Black (7.5YR 2/1, moist) and brown (7.5YR 5/2, dry) gravel; highly porous; very fine to coarse roots throughout; very frequent fine and medium weathered volcanic ash fragments; abrupt smooth boundary to
AC	20 - 50 cm	Brown (7.5YR 4/2, moist) gravel with some loamy coarse sand; light red (2.5YR 6/8) and very dusky red (2.5YR 2/2) mottles; highly porous; common very fine to coarse roots throughout; very frequent fine and medium weathered volcanic ash fragments; gradual smooth boundary to
C	50 - 110 cm	Black (N 1/0, moist) gravel with some coarse sand; red (2.5YR 4/6) and light red (2.5YR 6/8) mottles; highly porous; very frequent fine and medium fresh volcanic ash fragments; frequent mycelia

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 20	-	34	25	14	10	3	85	6	4	9	6	-	-	-	-	-	-	-	-	-	-
AC	20 - 50	-	30	28	14	9	6	87	6	3	9	4	-	-	-	-	-	-	-	-	-	-
C	60 - 110	-	39	28	12	9	4	92	4	2	6	2	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	Al SAT %	EC 2.5 mS/cm
Ah	6.8	6.3	0.4	1.66	0.12	7.9	2.0	0.7	0.3	10.9	-	-	10.5	172	5.8	10.9	104	-	0.15
AC	6.8	5.9	0.3	0.30	0.05	3.4	1.8	0.2	0.4	5.8	-	-	8.3	198	1.1	5.8	70	-	0.04
C	7.5	6.8	1.1	0.04	0.00	1.9	2.6	0.1	0.3	4.9	-	-	4.6	219	0.1	4.9	107	-	0.10

CLAY MINERALOGY (1 very weak → 8 very strong) / EXTRACT. Fe Al Si (by amm. oxal.) / AVAIL. P (Olsen) / P-RET. / pH NaF

Hor.	MICA /ILL	KAOL	MIX	QUAR	Fe	Al	Si	AVAIL. P mg/kg	P_{ret} %	pH NaF
					%---					
Ah	3	2	3	1	0.3	0.2	0.2	19.5	19	7.5
AC	-	-	-	-	0.2	1.2	0.8	8.5	60	8.1
C	-	-	-	-	0.1	0.3	0.3	21.8	33	7.5

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz. Extr. Fe Al Si: weight %. Available P (Olsen): mg/kg. P_{ret} (phosphate retention): weight %.

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FAO/UNESCO (1988) : Pachi-Haplic Lixisol (Chromic) (1974 : Ferric Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Mollic Kandiudalf, very-fine, mixed, mesic (1975 : Typic Paleudalf)
CSTC (1991) : Argillic red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : udic
Soil temperature regime : mesic

LOCATION : Yunnan Province, main road 324 to Luliang, km 2542.5; dirt road to Ma Se Shuo, km 2
Latitude : 24°52' 0'' N Longitude : 103°34' 0'' E Altitude : 1800 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : basin Topography : undulating
PHYSIOGRAPHIC UNIT : basin with steep limestone hills
SLOPE Gradient : 3% Aspect : SW Form : straight
POSITION OF SITE : slope
MICRO RELIEF Kind : ripples Pattern : linear Height : 10 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
Form : angular irregular Average size : 2 cm
Cracking : nil Slaking/crusting : partly slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : moderate rill and severe wind Aggradation : nil
Slope stability : stable

PARENT MATERIAL 1 : alluvium derived from : limestone
2 : colluvium derived from : limestone
Depth lithological discontinuity : 500 cm
Remarks : Quaternary red clay

EFFECTIVE SOIL DEPTH : 280 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well to well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 280 cm moist

LAND USE : medium level arable farming
Land use/vegetation remarks : potatoes intercropped with mulberry

ADDITIONAL REMARKS
CLASSIFICATION: it is assumed that the Bt2 horizon does not qualify for ferralic B horizon on the account of the mixed character of the clay mineralogy (--> more than 10% weatherable minerals in the 50-200 μm fraction). If ferralic B horizon is assumed, soil classifies according to FAO (1988) as Lixi-Haplic Ferralsol.

CLIMATE : Köppen: Cwa
Station: LULIANG 25 2 N/103 40 E 1840 m a.s.l 12 km W of site Relevance: good
Station: LUXI 24 32 N/103 44 E 1703 m a.s.l 41 km SSE of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
LULIANG															
ETo (PenMon)	mm	20	52	65	108	128	126	103	105	101	84	70	54	49	1045
pan evaporation	mm	20	196	195	255	251	216	148	161	166	141	139	159	190	2217
precipitation	mm	20	16	16	17	33	116	209	180	193	99	77	38	17	1011
T mean	°C	20	7.0	9.0	13.4	17.0	19.3	19.6	20.2	19.4	17.8	14.9	10.8	7.8	14.7
T max	°C	20	14.7	16.7	21.7	24.8	25.4	24.6	24.9	24.5	23.1	20.4	17.3	15.2	21.1
T min	°C	20	1.0	2.5	6.1	10.0	14.0	16.0	16.8	16.1	14.3	11.1	6.3	2.3	9.7
relative humidity	%	20	72	67	59	59	69	79	83	84	83	82	80	76	75
windspeed(at 2m)	m/s	20	2.4	2.9	3.2	3.1	2.6	2.2	1.8	1.5	2.1	1.8	1.9	2.1	2.2
bright sunshine	h/d	20	6.3	7.0	8.2	8.4	7.0	4.9	5.2	5.4	4.7	4.5	5.3	6.1	6.1
LUXI															
no. of raindays		23	8	7	6	8	13	18	22	21	16	14	9	6	146
tot.glob.rad.	MJ/m2		427.8	457.7	573.5	588.0	579.7	459.0	412.3	458.8	486.0	434.0	414.0	418.5	5709.3
bright sunshine	%	23	55	56	66	63	50	33	36	38	38	36	47	55	47

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PROFILE DESCRIPTION :
Very deep, well drained, red clay developed from alluvial and colluvial deposits derived from limestone. Moderately to strongly structured and highly porous. Manganiferous concretions are present in the subsurface horizon.

Ap 0 - 13 cm Dark red (2.5YR 3/6, moist) clay; moderate fine to medium granular structure; friable; many very fine continuous exped-inped tubular pores; highly porous; many fine and common medium roots throughout; few small irregular hard manganiferous concretions; very few fine weathered sand/limestone fragments; abrupt smooth boundary to

AB 13 - 35 cm Red (2.5YR 4/6, moist) clay; strong medium to coarse angular blocky to moderate medium columnar structure; firm; patchy thin clay cutans in root channels and pores; many very fine continuous exped-inped tubular pores; highly porous; common very fine and fine roots between peds; frequent small irregular hard manganiferous concretions; gradual smooth boundary to

Bt1 35 - 85 cm Red (2.5YR 4/8, moist) clay; strong medium to coarse angular blocky to strong medium columnar structure; firm; patchy thin clay cutans in root channels and pores; common very fine continuous exped-inped tubular pores; highly porous; few very fine roots between peds; frequent small irregular hard manganiferous concretions; abrupt wavy boundary to

Bt2 85 - 280 cm Red (2.5YR 4/8, moist) clay; strong medium angular blocky to strong medium to coarse columnar structure; firm; few very fine continuous exped-inped tubular pores; moderately porous; few medium weathered sand/limestone fragments and frequent fine weathered sand/limestone fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 13	-	1	2	4	9	6	21	7	12	19	60	33.8	1.18	50	48	42	35	33	31	28	26
AB	13 - 35	-	1	2	4	10	8	24	7	11	18	58	37.3	1.33	47	46	41	37	34	32	30	29
Bt1	35 - 85	-	1	1	1	2	2	7	6	15	20	73	2.1	1.13	56	55	50	45	43	41	38	36
Bt2	85 - -	-	1	1	1	2	1	6	4	5	9	86	1.1	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG C %	MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	Al	CEC soil	clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	6.8	5.7	0.7	1.12	0.12	16.2	1.4	0.4	0.2	18.2	-	-	8.1	13	3.9	18.2	225	-	0.23
AB	6.6	6.4	1.8	0.83	0.08	17.4	0.7	0.3	0.1	18.5	-	-	9.6	17	2.9	18.5	193	-	0.20
Bt1	6.5	5.8	-	0.25	0.04	6.8	0.3	0.2	0.1	7.4	-	-	7.8	11	0.9	7.4	95	-	0.11
Bt2	4.8	4.1	-	0.23	0.03	1.8	1.0	0.2	0.0	3.0	2.4	1.7	8.1	9	0.8	5.4	37	21	0.04

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	CHLO	KAOL	MIX	FELD	GIBB	GOET	AVAIL. P mg/kg Bray	Olsen
Ap	3	4	4	2	1	4	2	11.7	12.9
AB	3	4	4	2	1	4	2	3.6	11.8
Bt1	2	3	4	3	2	5	1	0.7	4.4
Bt2	3	3	4	3	2	4	1	0.8	3.5

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, FELD feldspar, GIBB gibbsite, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 44 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Fluventic Umbric Dystrochrept, fine, kaolinitic, hyperthermic
(1975) : Fluventic Umbric Dystrochrept
CSTC (1991) : Haplic latosol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : hyperthermic

LOCATION : Yunnan Province, Menglun, road cut along entrance road to Tropical Ecological Station
Latitude : 21°55' 0'' N Longitude : 101°14' 0'' E Altitude : 580 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaqing Date (mm/yy) : 7/93

GENERAL LANDFORM : valley Topography : hilly
PHYSIOGRAPHIC UNIT : upper slope of river valley
SLOPE Gradient : 16% Aspect : S Form : convex
POSITION OF SITE : upper slope
MICRO RELIEF Kind :
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil
Slope stability : locally unstable

PARENT MATERIAL 1 : stony alluvium derived from sandstone
Weathering degree : partial or moderate
2 : sandy limestone/sandstone
Weathering degree : partial or moderate Resistance : moderate
Depth lithological discontinuity : 400 cm
Remarks : 1 deposited on 2

EFFECTIVE SOIL DEPTH : 370 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 370 cm moist

LAND USE : woodland, grazed; crops : rubber
VEGETATION Type : evergreen woodland Status : modified
Land use/vegetation remarks : semi-natural vegetation grazed by cattle

ADDITIONAL REMARKS :
PARENT MATERIAL: the parent material at a depth of 370 cm consists of a 50 cm thick layer of gravel deposited by a side branch of the Lancang Jiang River (Me Kong). The river, at a distance of 100 m from the roadcut where the profile was described, has formed a deep valley and runs actually 50 m lower than the profile is situated. Under the alluvial deposits another type of parent material is found, limestone/sandstone.

CLIMATE : Köppen: Cwa
Station: (UNKNOWN) 21 52 N/101 4 E 553 m a.s.l 18 km SW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	27	55	69	101	117	126	110	108	107	102	85	64	54	1098
pan evaporation	mm	26	85	117	165	189	190	141	129	123	129	111	85	72	1535
precipitation	mm	27	23	11	21	47	137	190	221	244	142	94	43	24	1198
no. of raindays		27	18	7	5	10	17	21	23	24	17	16	17	20	193
T mean	°C	27	15.6	17.5	20.8	24.0	25.6	25.5	25.2	24.8	24.3	22.4	19.2	16.2	21.8
T max	°C	27	24.7	28.0	31.5	33.4	32.6	30.9	30.2	30.1	30.6	28.8	26.2	23.9	29.3
T min	°C	27	10.8	10.7	13.1	16.9	20.5	22.1	22.2	21.9	21.1	19.2	15.7	12.4	17.2
relative humidity	%	27	85	77	70	69	76	85	87	89	88	88	89	88	83
windspeed(at 2m)	m/s	27	0.2	0.4	0.5	0.6	0.6	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.4
bright sunshine	h/d	27	5.8	7.3	7.7	7.5	6.8	5.1	4.6	5.0	6.0	5.3	5.1	5.1	5.1

ISIS 4.0 data sheet of reference soil CN 44 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

PROFILE DESCRIPTION :
Very deep, well drained, reddish brown to red clay loam developed from alluvial deposits derived from sandstone.

Ah	0 - 40 cm	Dark reddish brown (5YR 3/4, moist) clay loam; leaves, moderately decomposed; moderate to strong fine granular structure; friable; common very fine exped-inped tubular pores; moderately porous; many fine and medium roots throughout; very frequent termite channels; gradual wavy boundary to
AB1	40 - 70 cm	Reddish brown (5YR 4/4, moist) clay loam; moderate fine granular and moderate fine subangular blocky structure; friable; common very fine exped-inped tubular pores; moderately porous; common fine roots throughout; very frequent termite channels; gradual wavy boundary to
AB2	70 - 98 cm	Reddish brown (5YR 4/4, moist) clay loam; moderate fine granular and moderate fine subangular blocky structure; friable; common very fine exped-inped tubular pores; moderately porous; common coarse roots throughout; gradual wavy boundary to
Bw	98 - 260 cm	Red (2.5YR 4/6, moist) clay loam; weak to moderate fine to medium subangular blocky medium subangular blocky structure; friable; few very fine exped-inped tubular pores; slightly porous; few fine roots throughout; gradual wavy boundary to
BC	260 - 370 cm	Red (2.5YR 4/6, moist) clay loam; moderate to strong medium wedge-shaped angular blocky structure; firm; abrupt smooth boundary to
C1	370 - 420 cm	gravelly loam; abrupt smooth boundary to
C2	420 cm +	stones

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 40	-	0	1	3	14	18	36	16	14	31	34	10.2	1.12	50	45	39	34	31	28	23	22
AB1	40 - 70	-	1	1	3	14	15	33	14	15	29	37	17.7	1.21	44	37	33	31	30	29	26	25
AB2	70 - 98	-	0	1	3	12	19	35	13	15	28	37	16.7	-	-	-	-	-	-	-	-	-
Bw	98 - 175	-	0	0	2	14	16	33	12	16	27	40	13.7	1.36	45	44	39	35	34	32	29	28
	175 - 260	-	0	1	2	11	18	32	13	15	28	40	5.4	-	-	-	-	-	-	-	-	-
BC	260 - 370	-	0	1	2	13	16	33	17	13	30	37	2.5	-	-	-	-	-	-	-	-	-
C1	370 - 420	-	0	2	8	23	12	45	8	35	43	12	0.0	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	3.9	3.6	-	1.57	0.15	0.0	0.0	0.1	0.0	0.1	8.2	7.9	8.0	24	5.5	8.3	1	99	0.11
AB1	4.4	3.6	-	0.58	0.08	0.2	0.0	0.0	0.0	0.2	8.2	7.3	5.3	14	2.0	8.4	4	138	0.03
AB2	4.3	3.6	-	0.65	0.08	0.4	0.0	0.0	0.1	0.5	8.1	7.3	6.6	18	2.3	8.6	8	111	0.04
Bw	4.5	3.7	-	0.39	0.07	0.2	0.0	0.0	0.2	0.4	6.3	5.9	4.3	11	1.4	6.7	9	137	0.02
	4.5	3.8	-	0.30	0.06	0.4	0.0	0.0	0.0	0.4	6.0	5.2	8.3	21	1.1	6.4	5	63	0.02
BC	4.7	3.7	-	0.15	0.04	0.2	0.0	0.0	0.2	0.4	6.0	5.4	8.2	22	0.5	6.4	5	66	0.01
C1	4.7	3.9	-	0.04	0.03	0.2	0.0	0.1	0.6	0.9	3.3	2.9	4.2	35	0.1	4.2	21	69	0.02

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	CHLO	SMEC	KAOL	MIX	QUAR	FELD	GOET	AVAIL. P mg/kg Bray	Olsen
Ah	2	2	-	7	6	1	1	2	2.1	6.8
AB1	2	2	-	7	6	1	1	2	0.7	0.6
AB2	2	2	-	7	7	1	1	2	0.7	0.6
Bw	2	2	-	7	7	1	1	2	0.7	0.6
	2	2	-	7	7	1	-	2	0.7	2.4
BC	2	2	-	6	6	-	-	2	0.0	2.4
C1	4	-	2	5	-	2	2	2	0.7	0.6

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 45 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

FAO/UNESCO (1988) : Rupti-Ferralic Cambisol (Rhodic), rudic phase (1974 : Ferralic Cambisol, stony phase)
USDA/SCS SOIL TAXONOMY (1992) : Dystric Eutrochrept, clayey-skeletal, kaolinitic, hyperthermic
(1975) : Typic Eutrochrept
CSTC (1991) : Haplic dry red soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : ustic
Soil temperature regime : hyperthermic

LOCATION : Yunnan Province, Yuanjiang, next to road through valley to sugar-cane institute
Latitude : 23°36' 0'' N Longitude : 102° 1' 0'' E Altitude : 380 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : valley Topography : undulating
PHYSIOGRAPHIC UNIT : hill within river valley
SLOPE Gradient : 3% Aspect : NW Form : straight
POSITION OF SITE : upper slope
MICRO RELIEF Kind : ripples Pattern : linear Height : 20 cm
SURFACE CHAR. Rock outcrop : little rocky Stoniness : very stony
Form : angular blocky Average size : 3 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet and slight rill Aggradation : nil
Slope stability : stable

PARENT MATERIAL : coarse-acid igneous rock (granite)
Texture : stony
Weathering degree : slight
Depth lithological discontinuity : 55 cm
Remarks : depth granite varies

EFFECTIVE SOIL DEPTH : 55 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : rapid
MOISTURE CONDITIONS PROFILE : 0 - 55 cm dry

LAND USE : medium level arable farming; crops : sugar cane; rotation : monoculture
Land use/vegetation remarks : rainfed sugarcane standing for 3 years

ADDITIONAL REMARKS :
Within the broad valley of the Yuan Jiang River different terraces are found at various levels. Partly they are composed of alluvial materials and for the other part consist of granite, which is also the parent material of the nearby bordering mountains. Both materials lead to the formation of dry red soils. The actual river streams at a lower level at about 1 km (?) from the profile site. On lower parts of the terrace hills the red soils are more eroded and as a consequence more shallow.
CLASSIFICATION: the Ap horizon is variable in depth. If this horizon becomes thicker, the soil classifies as Haplic Phaeozem (FAO, 1988) and as Ruptic-Lithic Haplustoll (USDA/SCS, 1992).

CLIMATE : Köppen: Cwa
Station: YUANJIANG 23 34 N/102 9 E 397 m a.s.l. 14 km WSW of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	36	79	106	155	156	165	138	138	128	115	101	81	70	1432
pan evaporation	mm	36	219	260	355	340	262	288	175	174	176	193	108	113	2664
precipitation	mm	36	12	15	18	41	93	126	118	136	78	64	49	20	770
no. of raindays		26	3	3	4	7	12	7	17	17	11	11	6	4	113
tot.glob.rad.	MJ/m2		378.2	418.1	548.7	570.0	489.8	477.0	514.6	489.8	378.0	372.0	345.0	471.2	5452.4
T mean	°C	36	16.8	19.0	22.8	26.0	28.4	28.6	28.6	27.6	26.6	24.0	20.4	17.0	23.8
T max	°C	34	24.1	27.0	31.2	33.9	35.0	34.1	33.9	33.3	32.3	30.2	27.1	24.2	30.5
T min	°C	34	11.9	13.5	17.0	20.3	23.3	24.6	25.0	24.0	22.8	20.2	16.2	12.4	19.3
relative humidity	%	36	65	61	58	59	63	70	72	77	75	74	73	71	68
windspeed(at 2m)	m/s	36	2.9	3.4	3.8	2.6	2.3	2.0	1.9	1.3	1.4	1.7	1.9	2.0	2.2
bright sunshine	h/d	36	5.7	7.5	7.8	7.5	7.1	5.1	5.1	5.8	5.8	5.3	5.7	6.0	6.2

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PROFILE DESCRIPTION :
Moderately deep, well drained, dark red clay derived from granite.

Ap	0 - 17 cm	Dark reddish brown (5YR 3/3, dry) very gravelly clay; moderate to strong fine to medium angular blocky and granular structure; very hard; many very fine inped tubular pores; highly porous; many fine and medium roots throughout; frequent very fine and fine fresh granite fragments; abrupt smooth boundary to
B	17 - 40 cm	Dark red (2.5YR 3/6, dry) very gravelly clay; moderate to strong fine to medium angular blocky structure; hard; common fine faint clear red (2.5YR 4/8) mottles; common very fine inped tubular pores; highly porous; common fine and medium roots throughout; frequent very fine and fine fresh granite fragments; clear irregular boundary to
BC	40 - 55 cm	Dark red (2.5YR 3/6, dry) gravelly clay; weak fine angular blocky structure; hard; common very fine inped tubular pores; moderately porous; few fine roots throughout; very frequent fine fresh granite fragments; clear irregular boundary to
C	55 - 80 cm	Red (2.5YR 4/8, dry) stony sandy clay; abrupt broken boundary to
R	80 cm +	granite

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 17	-	4	6	6	9	7	32	7	9	17	51	27.2	1.10	45	41	37	33	30	28	22	17
B	17 - 40	-	3	4	5	7	7	26	8	7	15	59	33.9	1.35	45	45	39	36	34	32	31	26
BC	40 - 55	-	6	6	6	7	6	31	8	9	17	53	32.0	1.39	43	42	37	33	31	30	27	23
C	55 - 80	-	12	11	8	9	7	47	6	10	15	38	25.1	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	6.2	4.8	-	1.41	0.13	10.2	2.7	0.7	0.3	13.9	-	-	13.2	26	4.9	13.9	105	-	0.04
B	6.4	4.7	-	0.58	0.07	10.3	2.8	0.4	0.4	13.9	-	-	13.7	23	2.0	13.9	101	-	0.03
BC	7.4	4.9	0.3	0.52	0.06	10.8	2.4	0.4	0.1	13.7	-	-	13.7	26	1.8	13.7	100	-	0.04
C	7.2	5.0	0.0	0.41	0.04	9.8	2.4	0.4	0.4	13.0	-	-	12.1	32	1.4	13.0	107	-	0.04

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	SMEC	KAOL	MIX	AVAIL. P mg/kg Bray	Olsen
Ap	4	3	6	3	1.8	2.5
B	4	3	6	3	0.0	0.6
BC	4	3	6	3	0.0	1.9
C	4	3	6	3	0.7	4.9

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 46 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

FAO/UNESCO (1988) : Chromi-Stagnic Luvisol (1974 : Chromic Luvisol)
USDA/SCS SOIL TAXONOMY (1992) : Aquic Haplustalf, fine, montmorillonitic, thermic (1975 : Aquic Haplustalf)
CSTC (1991) : Haplic red-cinnamon soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon; stagnic properties
USDA/SCS (1992) : ochric epipedon, argillic horizon; aquic conditions
Soil moisture regime : ustic
Soil temperature regime : thermic

LOCATION : Yunnan Province, Yuanmou, backyard of the Resources Nursery for Tropical Economic Crops
Latitude : 25°40′ 0′′ N Longitude : 101°51′ 0′′ E Altitude : 1150 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : badlands Topography : steeply dissected
PHYSIOGRAPHIC UNIT : highly dissected slope
SLOPE Gradient : 4% Aspect : WSW Form : straight
POSITION OF SITE : upper slope
MICRO RELIEF Kind : artificial terracing Pattern : linear Height : 20 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
Form : angular blocky Average size : 1 cm
Cracking : nil Slaking/crusting : slaked
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : severe rill and severe gully Aggradation : nil
Slope stability : locally unstable

PARENT MATERIAL : sandstone
Weathering degree : partial or moderate
Depth lithological discontinuity : 118 cm

EFFECTIVE SOIL DEPTH : 46 cm

WATER TABLE : no watertable observed
DRAINAGE : moderately well
PERMEABILITY : moderate Slowly permeable layer from 28 to 46 cm
FLOODING Frequency : nil Run off : very rapid
MOISTURE CONDITIONS PROFILE : 0 - 10 cm moist 10 - 140 cm dry

LAND USE : afforestation; improvements : terracing
Land use/vegetation remarks : *Leucaena* planted in 1991

CLIMATE : Köppen: Cwa
Station: YUANMOU 25 44 N/101 52 E 1118 m a.s.l. 1 km W of site Relevance: very good

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon) mm	20	92	113	167	192	192	144	141	126	112	96	77	73	1525
pan evaporation mm	20	263	326	478	544	530	353	299	235	228	205	195	202	3848
precipitation mm	20	3	3	4	10	41	115	135	141	89	63	23	6	634
no. of raindays	24	1	2	2	3	8	15	17	16	12	10	5	2	91
tot.glob.rad. MJ/m2		430.9	449.2	604.5	639.0	626.2	510.0	517.7	530.1	438.0	415.4	399.0	393.7	5953.7
T mean °C	20	15.0	18.1	21.8	25.2	27.0	26.2	26.3	25.2	24.1	21.3	17.3	14.5	21.5
T max °C	20	23.5	25.9	29.9	32.8	33.6	32.2	31.9	30.9	30.2	27.5	25.0	23.1	28.4
T min °C	20	8.2	10.0	14.3	18.9	21.6	22.2	22.4	21.5	20.3	17.1	11.9	8.2	16.5
relative humidity %	20	45	36	32	35	45	62	66	72	69	68	63	56	54
windspeed(at 2m) m/s	20	2.2	2.7	2.8	2.9	2.6	2.0	1.7	1.1	1.4	1.4	1.5	1.7	2.0
bright sunshine h/d	20	8.3	8.8	8.9	8.8	8.0	5.7	5.9	6.2	5.9	6.1	7.0	7.7	7.3

ISIS 4.0 data sheet of reference soil CN 46 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 21/12/94

PROFILE DESCRIPTION :
Deep, moderately well drained, reddish brown sandy clay loam to silty clay derived from sandstone. The soil has between 28 and 46 cm depth a slowly permeable layer as reflected by common low chroma mottles. It is uncertain if the topsoil is original or aggregated.

Ah 0 - 10 cm Reddish brown (5YR 5/4, moist) sandy clay loam; weak to moderate fine granular structure; common very fine exped-inped pores; moderately porous; many very fine to coarse roots throughout; very few fine fresh sandstone fragments; clear smooth boundary to

AB 10 - 28 cm Reddish brown (5YR 5/4, dry) clay loam; moderate medium angular blocky structure; hard; common very fine exped-inped pores; moderately porous; common fine and medium roots throughout; very few fine fresh sandstone fragments; clear wavy boundary to

Btg 28 - 46 cm Reddish brown (2.5YR 5/4, dry) clay; strong medium angular blocky to strong fine to medium columnar structure; very hard; common heterogeneous distinct clear gray (10YR 5/1) mottles; patchy thin unspecified cutans on pedfaces; common very fine exped-inped pores; moderately porous; common fine roots throughout; few powdery soft segregations; gradual wavy boundary to

BC 46 - 119 cm Reddish brown (2.5YR 5/4, dry) silty clay; very strong fine angular blocky parting to very strong coarse to very coarse columnar structure; extremely hard; few powdery soft segregations; gradual wavy boundary to

2C 118 - 150 cm Brownish yellow (10YR 6/6, dry) weathered sandstone

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 10	-	1	2	5	30	20	58	8	9	18	25	18.0	1.62	38	38	38	34	31	29	19	17
AB	10 - 28	-	2	2	4	19	14	40	9	18	27	33	23.0	-	-	-	-	-	-	-	-	-
Btg	28 - 46	-	2	2	2	4	4	13	4	28	32	55	36.5	1.47	46	45	41	39	37	35	32	30
BC	46 - 119	-	1	2	2	4	4	12	13	32	45	43	25.0	1.53	43	42	40	39	37	36	32	31

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	8.3	7.3	3.9	0.35	0.05	18.1	2.0	0.3	0.2	20.6	-	-	9.0	36	1.2	20.6	229	2	0.12
AB	8.5	7.2	1.0	0.28	0.05	18.1	3.7	0.3	0.5	22.6	-	-	13.3	40	1.0	22.6	170	4	0.14
Btg	8.2	6.9	1.6	0.18	0.05	17.6	6.6	0.3	1.0	25.5	-	-	22.5	41	0.6	25.5	113	4	0.17
BC	7.9	6.4	0.7	0.10	0.04	12.0	7.2	0.3	1.5	21.0	-	-	19.2	45	0.4	21.0	109	8	0.25

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	SMEC	KAOL	MIX	QUAR	GOET	AVAIL. P mg/kg Bray	Olsen
Ah	4	6	4	2	2	2	6.1	4.1
AB	4	6	4	2	2	2	2.2	5.7
Btg	4	6	4	2	2	2	15.4	3.4
BC	4	6	4	2	2	1	0.7	1.6

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. cat., CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 47 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

FAO/UNESCO (1988) : Alumi-Haplic Acrisol (1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992) : Typic Hapludult, clayey, mixed, mesic (1975 : Typic Hapludult)
CSTC (1991) : Argillic yellow soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, argic B horizon
USDA/SCS (1992) : ochric epipedon, argillic horizon
Soil moisture regime : perudic
Soil temperature regime : mesic

LOCATION : Guizhou Province, Pingba County, Lubacan village, Gaofeng municipality
Latitude : 26°23' 0'' N Longitude : 106°26' 0'' E Altitude : 1230 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : low hill Topography : undulating
PHYSIOGRAPHIC UNIT : lower hill, Pingba basin
SLOPE Gradient : 2% Aspect : N Form : convex
POSITION OF SITE : upper slope
MICRO RELIEF Kind : knobs Height : 10 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
Form : platy, flat Average size : 15 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet and slight rill Aggradation : nil
Slope stability : stable

PARENT MATERIAL : shale
Weathering degree : slight
Remarks : shale present at more than 2.5m depth

EFFECTIVE SOIL DEPTH : 150 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 110 cm moist 110 - 150 cm wet

LAND USE : low level arable farming; crops : tea
Land use/vegetation remarks : undergrowth of grasses eaten by cattle

ADDITIONAL REMARKS :
The soil is developed on shale, outcropping in the immediate surroundings as some low steep and bare mountains. Hills which are more gently sloping have a thick solum (yellow earth) and the parent material is at relatively great depth. In between the low mountains and hills, small valleys are found, filled with colluvium, where irrigated rice is grown. Nearby yellowish-red coloured soils on Quaternary clay (CN 48) are also classified as Yellow Soils within the Chinese classification system. The different geomorphological units form part of the broad Pingba basin.

CLIMATE : Köppen: Cwa
Station: PINGBA 26 25 N/106 16 E 1251 m a.s.l. 10 km WSW of site Relevance: good
Station: ANSHUN 26 15 N/105 55 E 1393 m a.s.l. 54 km WSW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
PINGBA															
precipitation	mm	21	18	19	32	123	202	264	179	169	120	104	50	24	1304
T mean	°C		3.9	5.5	10.7	15.4	18.4	20.6	22.4	21.6	18.9	14.8	10.1	6.1	14.1
T max	°C	21	8.1	10.0	16.2	21.0	23.0	24.7	26.7	26.5	24.0	19.1	14.2	10.2	18.6
T min	°C	21	1.2	2.4	7.1	11.4	15.3	17.5	19.3	18.4	15.5	11.9	7.4	3.4	10.9
relative humidity	%	21	83	83	80	79	81	82	83	84	83	84	83	84	82
bright sunshine	%	21	16	18	26	34	28	25	43	45	36	24	23	17	30
ANSHUN															
pan evaporation	mm	28	50	63	111	143	142	130	159	150	122	84	64	48	1265
precipitation	mm	30	18	20	29	92	228	265	241	181	119	103	44	24	1361
no. of raindays		30	15	14	14	16	20	19	19	17	14	17	14	14	193
tot.glob.rad.	MJ/m2		176.7	200.6	316.2	399.0	412.3	381.0	483.6	468.1	372.0	263.5	207.0	170.5	3850.5
windspeed(at 2m)	m/s	27	1.9	2.2	2.3	2.3	2.1	1.8	2.0	1.5	1.7	1.8	1.8	1.8	1.9
bright sunshine	h/d	27	1.9	2.3	3.5	4.6	3.9	3.7	5.5	5.4	4.4	3.0	2.6	1.9	3.6

ISIS 4.0 data sheet of reference soil CN 47 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

PROFILE DESCRIPTION :
Deep, well drained, strong brown clay to silty clay developed from solid rock derived from shale.

Ah 0 - 15 cm Dark yellowish brown (10YR 4/4, moist) clay; moderate fine subangular blocky to moderate medium granular structure; firm; common very fine inped pores; highly porous; many fine and medium roots throughout; very few small irregular hard and soft unspecified inclusions; frequent pedotubules; abrupt smooth boundary to

Bt1 15 - 50 cm Strong brown (7.5YR 5/8, moist) clay; moderate to strong fine to medium subangular blocky structure; firm; continuous clay and humus cutans on pedfaces; many very fine and common fine inped pores; highly porous; common fine and few medium roots between peds; few pedotubules; abrupt smooth boundary to

Bt2 50 - 110 cm Strong brown (7.5YR 5/8, moist) clay; moderate to strong fine to medium subangular blocky to moderate to strong medium columnar structure; friable; continuous clay and humus cutans in root channels and pores; many very fine and common fine inped pores; highly porous; few fine roots between peds; few pedotubules; clear wavy boundary to

BC 110 - 140 cm Reddish yellow (7.5YR 6/8, moist) silty clay; moderate medium columnar structure; non sticky, very friable; common medium distinct sharp reddish yellow (7.5YR 6/8) mottles; broken clay and humus cutans in root channels and pores; many very fine and fine inped pores; highly porous; few fine roots between peds; clear boundary to

C 140 cm + Yellow (10YR 7/6, moist) silty clay; weak to moderate medium columnar to weak to moderate medium subangular blocky structure; non sticky, very friable; many very fine and fine inped pores; moderately porous; few fine roots between peds

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 15	-	1	1	1	1	1	6	6	30	36	58	-	1.26	56	54	52	48	46	43	42	37
Bt1	15 - 50	-	0	0	0	0	1	2	2	29	31	67	-	1.09	62	61	60	58	58	57	49	44
Bt2	50 - 110	-	0	0	1	2	1	4	3	34	37	60	-	1.08	64	64	63	63	62	62	50	46
BC	110 - 140	-	0	1	2	2	1	6	3	39	42	53	-	-	-	-	-	-	-	-	-	-
C	140 - -	-	0	1	2	3	1	6	5	41	47	47	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	Al SAT %	EC 2.5 mS/cm
Ah	4.9	4.1	-	1.92	0.19	4.3	1.4	0.4	0.2	6.3	8.6	6.9	16.8	29	6.7	14.9	38	41	0.08
Bt1	5.1	4.0	-	0.56	0.09	2.9	0.7	0.2	0.0	3.8	9.8	8.1	14.7	22	2.0	13.6	26	55	0.03
Bt2	5.3	4.1	-	0.29	0.05	2.8	0.7	0.2	0.2	3.9	10.6	8.2	17.6	30	1.0	14.5	22	47	0.01
BC	5.4	4.1	-	0.16	0.06	1.3	0.4	0.2	0.2	2.1	10.4	8.7	14.6	28	0.6	12.5	14	60	0.04
C	5.3	4.0	-	0.15	0.06	1.2	0.3	0.3	0.1	1.9	10.6	8.5	15.4	33	0.5	12.5	12	55	0.04

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	MIX	GOET	AVAIL. P mg/kg Bray	Olsen
Ah	3	3	2	5	5	3	8.4	8.8
Bt1	3	3	2	5	5	3	0.0	1.6
Bt2	4	2	2	5	5	4	0.0	0.4
BC	4	2	2	5	4	4	0.0	1.8
C	4	2	2	5	4	4	0.0	1.9

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 48 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Fluventic Dystrochrept, very-fine, mixed, mesic (1975 : Fluventic Dystrochrept)
CSTC (1991) : Haplic yellow soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; ferralic properties
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : perudic
Soil temperature regime : mesic

LOCATION : Guizhou Province, Pingba County, 200 m NE of Gaofeng railway station
Latitude : 26°23' 0'' N Longitude : 106°26' 0'' E Altitude : 1260 m a.s.l.
AUTHOR(S) : Vogel, A.W., Wang Mingzhu, Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : low hill Topography : undulating
PHYSIOGRAPHIC UNIT : lower hill- Pingba basin
SLOPE Gradient : 4% Aspect : NNW Form : straight
POSITION OF SITE : middle slope
MICRO RELIEF Kind : knobs Pattern : isolated Height : 25 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
Form : angular blocky Average size : 20 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : nil
Slope stability : stable

PARENT MATERIAL 1 : alluvium derived from : limestone/shale
Texture : clayey
2 : colluvium derived from : limestone/shale
Remarks : Quaternary red clay

EFFECTIVE SOIL DEPTH : 250 cm

WATER TABLE : no watertable observed
DRAINAGE : well
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : low level mixed farming; crops : oil/protein crops, see remarks
Land use/vegetation remarks : oil/tea with cattle grazing

ADDITIONAL REMARKS :
The profile is a typical example of a Yellow Earth developed on Quaternary red clay. The colour, however, is yellowish red and is quite different compared to CN 47, an argillic yellow soil on shale. In both cases the soil is found on lower hills being part of the Pingba basin. This basin is surrounded by high, steep limestone mountains.
CLASSIFICATION : the Bw2 horizon may qualify for argic B horizon if the recorded clay increase from Bw1 to Bw2 occurs within 15 cm. In case an argic B horizon is present, the soil classifies as Haplic Alisol (FAO, 1988).

CLIMATE : Köppen: Cwa
Station: PINGBA 26 25 N/106 16 E 1251 m a.s.l. 10 km WSW of site Relevance: good
Station: ANSHUN 26 15 N/105 55 E 1393 m a.s.l. 54 km WSW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
PINGBA															
precipitation	mm	21	18	19	32	123	202	264	179	169	120	104	50	24	1304
T mean	°C		3.9	5.5	10.7	15.4	18.4	20.6	22.4	21.6	18.9	14.8	10.1	6.1	14.1
T max	°C	21	8.1	10.0	16.2	21.0	23.0	24.7	26.7	26.5	24.0	19.1	14.2	10.2	18.6
T min	°C	21	1.2	2.4	7.1	11.4	15.3	17.5	19.3	18.4	15.5	11.9	7.4	3.4	10.9
relative humidity	%	21	83	83	80	79	81	82	83	84	83	84	83	84	82
bright sunshine	%	21	16	18	26	34	28	25	43	45	36	24	23	17	30
ANSHUN															
pan evaporation	mm	28	50	63	111	143	142	130	159	150	122	84	64	48	1265
precipitation	mm	30	18	20	29	92	228	265	241	181	119	103	44	24	1361
no. of raindays		30	15	14	14	16	20	19	19	17	14	17	14	14	193
tot.glob.rad.	MJ/m2		176.7	200.6	316.2	399.0	412.3	381.0	483.6	468.1	372.0	263.5	207.0	170.5	3850.5
windspeed(at 2m)	m/s	27	1.9	2.2	2.3	2.3	2.1	1.8	2.0	1.5	1.7	1.8	1.8	1.8	1.9
bright sunshine	h/d	27	1.9	2.3	3.5	4.6	3.9	3.7	5.5	5.4	4.4	3.0	2.6	1.9	3.6

ISIS 4.0 data sheet of reference soil CN 48 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

PROFILE DESCRIPTION :
Very deep, well drained, red clay developed from alluvial and colluvial deposits derived from limestone/shale.

Ah 0 - 10 cm Yellowish red (5YR 4/6, moist) clay; sphagnum, highly decomposed; weak to moderate fine to medium granular to weak to moderate fine subangular blocky structure; friable; common very fine and many micro inped pores; highly porous; many very fine to coarse roots throughout; frequent termite channels; clear smooth boundary to

AB 10 - 38 cm Yellowish red (5YR 5/6, moist) clay; moderate medium subangular blocky and columnar structure; firm; patchy clay and humus cutans in root channels and pores; many very fine inped pores; highly porous; many very fine and fine roots throughout; frequent termite channels; clear wavy boundary to

Bw1 38 - 110 cm Red (2.5YR 4/8, moist) clay; moderate to strong medium columnar structure; firm; many very fine and few fine inped pores; highly porous; common fine roots throughout; very frequent termite channels; gradual wavy boundary to

Bw2 110 - 250 cm Red (2.5YR 5/8, moist) clay; moderate medium columnar to moderate medium subangular blocky structure; firm; patchy humus cutans in root channels and pores; many very fine and micro inped pores; highly porous; common fine roots; few termite channels; diffuse boundary to

BC 250 cm + clay; very few fine weathered red sandstone (?) fragments

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ah	0 - 10	-	0	0	0	0	0	1	6	19	25	75	-	1.17	55	54	53	49	47	45	38	36
AB	10 - 38	-	0	0	0	0	0	1	4	17	22	78	-	1.15	59	58	57	56	55	55	41	39
Bw1	38 - 110	-	0	0	0	1	0	2	13	11	24	74	-	1.11	61	60	59	59	58	58	41	39
Bw2	110 - 250	-	0	0	0	1	1	2	4	10	15	84	-	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC cmol(+)/kg	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	4.7	4.0	-	1.74	0.15	2.3	0.3	0.3	0.3	3.2	5.5	3.7	10.0	13	6.1	8.7	32	37	0.06
AB	4.9	4.2	-	0.52	0.08	1.1	0.4	0.1	0.2	1.8	3.7	2.6	9.6	12	1.8	5.5	19	27	0.01
Bw1	4.9	4.2	-	0.29	0.07	0.8	0.0	0.1	0.0	0.9	3.1	2.4	10.7	14	1.0	4.0	8	22	0.01
Bw2	5.0	4.2	-	0.26	0.06	0.0	0.0	0.1	0.0	0.1	4.2	3.1	20.8	25	0.9	4.3	0	15	0.01

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	CHLO	KAOL	GIBB	GOET	AVAIL. P mg/kg Bray	Olsen
Ah	2	5	4	4	3	0.7	1.6
Ab	2	5	4	4	3	0.0	0.6
Bw1	2	4	4	4	3	0.0	1.7
Bw2	3	4	4	4	3	0.0	1.7

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, GIBB gibbsite, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 49 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

FAO/UNESCO (1988) : Chromi-Luvic Phaeozem, rudic phase (1974 : Luvic Phaeozem, stony phase)
USDA/SCS SOIL TAXONOMY (1992) : Typic Argiudoll, very-fine, mixed, mesic (1975 : Typic Argiudoll)
CSTC (1991) : Haplic brown limestone soil

DIAGNOSTIC CRITERIA FAO (1988) : mollic A, argic B horizon
USDA/SCS (1992) : mollic epipedon, argillic horizon
Soil moisture regime : perudic
Soil temperature regime : mesic

LOCATION : Guizhou Province, Pingba County, Gaofeng municipality, about 2 km from village
Latitude : 26°23' 0'' N Longitude : 106°26' 0'' E Altitude : 1290 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 7/93

GENERAL LANDFORM : hill Topography : steeply dissected
PHYSIOGRAPHIC UNIT : limestone hill in Pingba Basin
SLOPE Gradient : 7% Aspect : NW Form : straight
POSITION OF SITE : lower slope
MICRO RELIEF Kind : knobs Pattern : isolated Height : 50 cm
SURFACE CHAR. Rock outcrop : extremely rocky Stoniness : exceedingly stony
Form : angular irregular Average size : 7 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : slight sheet Aggradation : nil
Slope stability : locally unstable

PARENT MATERIAL : limestone
Weathering degree : partial or moderate
Remarks : depth of limestone fluctuates

EFFECTIVE SOIL DEPTH : 90 cm

WATER TABLE : no watertable observed
DRAINAGE : (somewhat) excessive
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium
MOISTURE CONDITIONS PROFILE : 0 - 140 cm moist

LAND USE : non agricultural land
VEGETATION Type : short grassland Status : secondary
Land use/vegetation remarks : maize/soybeans/sunflower at 30m distance

ADDITIONAL REMARKS :
The steeply rising limestone hills as part of the Pingba basin show a completely other soil profile and land use than the lower hills with yellow soils developed from shale (CN 47) and quaternary clay (CN 48). The influencing factor is the parent material which as weathered material give rise to a Rendzina-like profile. However, due to the great soil depth of profile CN049 the soil is classified as Luvic Phaeozem. The second layer of the profile is described as a Bw horizon because of a change in colour and structure.

CLIMATE : Köppen: Cwa
Station: PINGBA 26 25 N/106 16 E 1251 m a.s.l. 10 km WSW of site Relevance: good
Station: ANSHUN 26 15 N/105 55 E 1393 m a.s.l. 54 km WSW of site Relevance: moderate

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
PINGBA															
precipitation	mm	21	18	19	32	123	202	264	179	169	120	104	50	24	1304
T mean	°C		3.9	5.5	10.7	15.4	18.4	20.6	22.4	21.6	18.9	14.8	10.1	6.1	14.1
T max	°C	21	8.1	10.0	16.2	21.0	23.0	24.7	26.7	26.5	24.0	19.1	14.2	10.2	18.6
T min	°C	21	1.2	2.4	7.1	11.4	15.3	17.5	19.3	18.4	15.5	11.9	7.4	3.4	10.9
relative humidity	%	21	83	83	80	79	81	82	83	84	83	84	83	84	82
bright sunshine	%	21	16	18	26	34	28	25	43	45	36	24	23	17	30
ANSHUN															
pan evaporation	mm	28	50	63	111	143	142	130	159	150	122	84	64	48	1265
precipitation	mm	30	18	20	29	92	228	265	241	181	119	103	44	24	1361
no. of raindays		30	15	14	14	16	20	19	19	17	14	17	14	14	193
tot.glob.rad.	MJ/m2		176.7	200.6	316.2	399.0	412.3	381.0	483.6	468.1	372.0	263.5	207.0	170.5	3850.5
windspeed(at 2m)	m/s	27	1.9	2.2	2.3	2.3	2.1	1.8	2.0	1.5	1.7	1.8	1.8	1.8	1.9
bright sunshine	h/d	27	1.9	2.3	3.5	4.6	3.9	3.7	5.5	5.4	4.4	3.0	2.6	1.9	3.6

ISIS 4.0 data sheet of reference soil CN 49 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

PROFILE DESCRIPTION :
Moderately deep, somewhat excessively drained, reddish brown clay derived from limestone which highly fluctuates with depth.

Ah 0 - 35 cm Dark brown (7.5YR 3/3, moist) gravelly silty clay; strong fine to medium granular and strong fine subangular blocky structure; very friable; many very fine inped pores; highly porous; many very fine to coarse roots throughout; frequent medium fresh limestone fragments; frequent worm channels; clear wavy boundary to

Bw 35 - 115 cm Reddish brown (5YR 4/4, moist) clay; moderate to strong medium subangular blocky structure; friable; patchy humus cutans in root channels and pores; common very fine and micro inped pores; moderately porous; common fine and medium roots between peds; very few medium fresh limestone fragments; gradual wavy boundary to

C 115 - 140 cm Reddish brown (5YR 5/3, moist) clay; moderate to strong fine subangular blocky parting to moderate to strong fine to medium columnar structure; firm; common micro pores; moderately porous; few fine roots between peds; frequent fine strongly weathered limestone fragments; clear wavy boundary to

R 140 cm + Pale brown (10YR 6/3, dry) limestone

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ah	0 - 35	-	2	2	2	2	2	10	7	37	44	46	-	1.15	57	56	53	49	45	42	38	33
Bw	35 - 115	-	1	1	1	2	2	7	2	21	23	70	-	1.19	55	54	52	50	49	48	39	35
C	115 - 140	-	1	1	1	2	2	7	3	20	24	70	-	1.26	57	56	55	54	53	52	44	42

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ah	6.5	6.2	-	3.66	0.44	29.3	10.3	0.3	0.2	40.1	-	-	33.7	74	12.8	40.1	119	-	0.20
Bw	7.0	6.3	1.1	1.07	0.15	13.8	8.2	0.3	0.2	22.5	-	-	19.5	28	3.7	22.5	115	-	0.14
C	7.4	6.3	1.5	0.76	0.11	15.5	8.5	0.4	0.2	24.6	-	-	20.5	29	2.7	24.6	120	-	0.14

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	CHLO	KAOL	MIX	QUAR	GOET	AVAIL. P mg/kg Bray	Olsen
Ah	2	4	4	3	2	1	0.8	2.0
Bw	2	4	4	3	2	1	0.0	0.6
C	3	4	4	4	-	2	0.0	0.6

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, CHLO chlorite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 50 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

FAO/UNESCO (1988) : Silti-Calcaric Cambisol (Chromic), lithic phase (1974 : Calcic Cambisol, lithic phase)
USDA/SCS SOIL TAXONOMY (1992) : Lithic Eutrochrept, fine-silty, mixed, thermic (1975 : Lithic Eutrochrept)
CSTC (1991) : Calcic purple soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; calcareous
USDA/SCS (1992) : ochric epipedon, cambic horizon; lithic contact
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Sichuan Province, Ziyang County, Songtao, 20m from weather station of SAAS fieldstation
Latitude : 30° 6′ 0′′ N Longitude : 104°45′ 0′′ E Altitude : 415 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 8/93

GENERAL LANDFORM : low hill Topography : hilly
PHYSIOGRAPHIC UNIT : low hill landscape of Sichuan Basin
SLOPE Gradient : 2% Aspect : N Form : straight
POSITION OF SITE : crest
MICRO RELIEF Kind : ripples Pattern : linear Height : 30 cm
SURFACE CHAR. Rock outcrop : nil Stoniness : very stony
Form : angular irregular Average size : 2 cm
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : moderate sheet and moderate rill Aggradation : nil
Slope stability : stable

PARENT MATERIAL : sandstone/shale
Texture : sandy clay
Weathering degree : partial or moderate
Depth lithological discontinuity : 40 cm

EFFECTIVE SOIL DEPTH : 55 cm

WATER TABLE : no watertable observed
DRAINAGE : somewhat excessive
PERMEABILITY : no slowly permeable layer(s)
FLOODING Frequency : nil Run off : medium

MOISTURE CONDITIONS PROFILE : 0 - 40 cm moist

LAND USE : low level arable farming; crops : wheat; no irrigation; rotation : not relevant; improvements : none
Land use/vegetation remarks : intercropping of five crops

CLIMATE : Köppen: Cwa
Station: ZIYANG 30 7 N/104 39 E 357 m a.s.l. 10 km W of site Relevance: good

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon) mm	24	33	32	58	82	102	104	117	119	79	57	39	30	852
precipitation mm	29	12	14	20	53	92	134	214	193	147	53	23	11	965
no. of raindays	29	7	9	10	12	15	17	15	14	17	16	11	7	149
tot.glob.rad. MJ/m2		192.2	203.4	306.9	360.0	415.4	420.0	514.6	499.1	315.0	226.3	183.0	167.4	3803.3
T mean °C	24	6.5	8.3	13.5	18.4	22.1	24.6	26.9	26.7	22.2	17.8	12.8	8.5	17.4
T max °C	24	10.2	12.2	18.3	23.6	26.9	29.2	31.4	31.5	26.2	21.4	16.4	12.0	21.6
T min °C	24	3.6	5.3	9.8	14.3	18.3	21.9	23.2	22.9	19.4	15.1	10.3	5.8	14.1
relative humidity %	29	81	80	74	73	73	78	82	81	84	84	83	83	80
windspeed(at 2m) m/s	24	0.6	0.7	1.0	1.1	1.2	1.0	0.9	0.9	0.9	0.7	0.7	0.6	0.9
bright sunshine h/d	29	1.7	2.1	3.4	4.4	4.3	4.3	5.3	6.0	3.1	2.2	2.0	1.7	3.4

ISIS 4.0 data sheet of reference soil CN 50 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

PROFILE DESCRIPTION :
Moderately deep, somewhat excessively drained, weak red to red silt loam derived from sandstone/shale. The effective soil depth is very much influenced by the land use. Ripples are made by man to cultivate sweet potatoes as one of the five crops.

Ap	0 - 25 cm	Weak red (10R 4/4, moist) gravelly silt loam; very strong fine granular to very strong medium granular structure; friable; many fine to coarse exped-inped pores; highly porous; many fine and medium roots throughout; frequent fine and medium weathered lime-sandstone fragments; frequent worm channels; clear smooth boundary to
B	25 - 40 cm	Weak red to red (10R 4/5, moist) stony silt loam; moderate to strong fine to medium subangular blocky structure; firm; many very fine and fine exped-inped pores; highly porous; common fine roots throughout; few medium fresh lime-sandstone fragments; frequent worm channels; abrupt wavy boundary to
R	40 cm +	Reddish brown (2.5YR 4/4, dry) sandstone/shale

ANALYTICAL DATA :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50 µm	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
Ap	0 - 25	-	2	2	2	4	11	21	19	34	53	26	18.8	1.48	39	37	33	31	30	28	24	20
B	25 - 40	-	2	3	4	6	8	22	14	38	52	26	14.3	1.43	41	35	30	27	26	25	22	19

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	8.3	7.1	13.6	0.32	0.06	49.8	1.0	0.3	0.1	51.2	-	-	22.2	85	1.1	51.2	231	-	0.16
B	8.2	7.1	15.7	0.13	0.04	46.3	0.7	0.3	0.2	47.5	-	-	22.2	86	0.5	47.5	214	-	0.26

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	FELD	GOET	AVAIL. P mg/kg Bray	Olsen
Ap	4	2	5	3	3	2	1	2	0.7	8.0
B	4	2	5	3	3	2	1	1	0.0	1.9

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: MICA/ILL mica/illite, VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar, GOET goethite. Available P (Bray-1 and Olsen): mg/kg.

ISIS 4.0 data sheet of reference soil CN 51 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

FAO/UNESCO (1988) : Silti-Calcaric Cambisol (Chromic), inundic phase (1974 : Calcic Cambisol)
USDA/SCS SOIL TAXONOMY (1992) : Oxyaquic Eutrochrept, fine-silty, mixed, thermic (1975 : Typic Eutrochrept)
CSTC (1991) : Calcic purple soil

DIAGNOSTIC CRITERIA FAO (1988) : ochric A, cambic B horizon; calcareous
USDA/SCS (1992) : ochric epipedon, cambic horizon
Soil moisture regime : udic
Soil temperature regime : thermic

LOCATION : Sichuan Province, Ziyang County, Songtao, valley bottom near SAAS fieldstation
Latitude : 30° 6' 0'' N Longitude : 104°45' 0'' E Altitude : 392 m a.s.l.
AUTHOR(S) : Vogel, A.W. / Wang Mingzhu / Huang Xiaoqing Date (mm/yy) : 8/93

GENERAL LANDFORM : valley Topography : hilly
PHYSIOGRAPHIC UNIT : valley bottom, low hill landscape
SLOPE Gradient : 0%
POSITION OF SITE : flat
MICRO RELIEF Kind : level
SURFACE CHAR. Rock outcrop : nil Stoniness : nil
Cracking : nil Slaking/crusting : nil
Salt : nil Alkali : nil
SLOPE PROCESSES Soil erosion : nil Aggradation : nil
Slope stability : stable

PARENT MATERIAL 1 : alluvium derived from : sandstone/shale
Texture : mixed
2 : colluvium derived from : sandstone/shale
Texture : mixed

EFFECTIVE SOIL DEPTH : 105 cm

WATER TABLE Depth : 10 cm Kind : flooded
DRAINAGE : very poor - poor
PERMEABILITY : slow Slowly permeable layer from 0 to 20 cm
FLOODING Frequency : irregular, fresh water Run off : ponded
MOISTURE CONDITIONS PROFILE : 0 - 120 cm wet

LAND USE : low level arable farming; crops : rice; seasonal irrigated; rotation : not relevant; improvements : terracing
Land use/vegetation remarks : paddy intercropped with soybeans

CLIMATE : Köppen: Cwa
Station: ZIYANG 30 7 N/104 39 E 357 m a.s.l. 10 km W of site Relevance: good

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
ETo (PenMon)	mm	24	33	32	58	82	102	104	117	119	79	57	39	30	852
precipitation	mm	29	12	14	20	53	92	134	214	193	147	53	23	11	965
no. of raindays		29	7	9	10	12	15	17	15	14	17	16	11	7	149
tot.glob.rad.	MJ/m2		192.2	203.4	306.9	360.0	415.4	420.0	514.6	499.1	315.0	226.3	183.0	167.4	3803.3
T mean	°C	24	6.5	8.3	13.5	18.4	22.1	24.6	26.9	26.7	22.2	17.8	12.8	8.5	17.4
T max	°C	24	10.2	12.2	18.3	23.6	26.9	29.2	31.4	31.5	26.2	21.4	16.4	12.0	21.6
T min	°C	24	3.6	5.3	9.8	14.3	18.3	21.9	23.2	22.9	19.4	15.1	10.3	5.8	14.1
relative humidity	%	29	81	80	74	73	73	78	82	81	84	84	83	83	80
windspeed(at 2m)	m/s	24	0.6	0.7	1.0	1.1	1.2	1.0	0.9	0.9	0.9	0.7	0.7	0.6	0.9
bright sunshine	h/d	29	1.7	2.1	3.4	4.4	4.3	4.3	5.3	6.0	3.1	2.2	2.0	1.7	3.4

ISIS 4.0 data sheet of reference soil CN 51 Country : PEOPLE'S REPUBLIC OF CHINA Print date (dd/mm/yy) : 22/12/94

PROFILE DESCRIPTION :
Deep, very poorly drained, reddish brown silty clay to silt loam developed in alluvial and colluvial deposits derived from sandstone/shale. Although completely saturated at time of description the soil does not show mottling or clear hydromorphic properties. The soil has a puddled structureless topsoil and a prismatic structure in the subsurface horizons where also iron and manganese concretions are observed.

Ap 0 - 20 cm Reddish brown (5YR 4/3, moist) silty clay; strongly coherent structure; slightly sticky, plastic; no macropores; many fine and medium roots throughout; clear smooth boundary to

Bw1 20 - 55 cm Reddish brown (5YR 4/4, moist) silty clay loam; strong coarse prismatic structure; non sticky, plastic; thin humus cutans in root channels and pores; many very fine and fine inped pores; highly porous; common fine roots between peds; frequent small hard manganiferous concretions and few small soft calcareous concretions; few channels; gradual smooth boundary to

Bw2 55 - 105 cm Reddish brown (5YR 4/4, moist) silt loam; strong coarse prismatic structure; non sticky, plastic; thin humus cutans in root channels and pores; many very fine and fine inped pores; highly porous; common fine roots between peds; frequent small hard manganiferous concretions and few small soft calcareous concretions; few channels; gradual smooth boundary to

C 105 cm + Dark reddish brown (5YR 3/4, moist) silt loam; moderate medium wedge-shaped angular blocky structure; slightly sticky, slightly plastic; thin humus cutans in root channels and pores; few very fine inped pores; moderately porous; few small hard manganiferous concretions and few small soft calcareous concretions

ANALYTICAL DATA (air-dry samples) :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ap	0 - 20	-	2	2	2	2	5	12	10	33	43	45	19.1	-	-	-	-	-	-	-	-	-
Bw1	20 - 55	-	1	2	2	3	12	19	17	30	47	35	14.4	1.44	50	50	49	48	47	44	33	29
Bw2	55 - 105	-	2	2	2	2	9	16	26	39	65	19	13.5	-	-	-	-	-	-	-	-	-
C	105 - -	-	2	2	2	3	16	23	24	27	51	25	12.5	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
						cmol(+)/kg													
Ap	8.2	7.1	8.9	1.04	0.12	49.0	2.4	0.5	0.1	52.0	-	-	23.0	52	3.6	52.0	226	-	0.24
Bw1	8.2	7.1	8.7	0.44	0.07	45.2	1.7	0.4	0.1	47.4	-	-	19.2	55	1.5	47.4	247	-	0.18
Bw2	8.3	7.1	9.6	0.23	0.05	43.8	1.7	0.3	0.2	46.0	-	-	17.4	92	0.8	46.0	264	-	0.13
C	8.2	7.2	9.4	0.19	0.05	42.6	1.7	0.3	0.1	44.7	-	-	16.8	67	0.7	44.7	266	-	0.13

CLAY MINERALOGY (1 very weak → 8 very strong) / AVAILABLE P (Bray & Olsen)

Hor.	VERM	SMEC	KAOL	MIX	QUAR	FELD	AVAIL. P mg/kg Bray	Olsen
Ap	3	5	3	3	2	2	9.4	22.9
Bw1	3	5	3	3	2	1	7.0	4.8
Bw2	3	5	3	3	2	1	0.0	9.1
C	3	5	3	3	2	1	1.8	0.6

ANALYTICAL DATA (field-moist samples) :

Hor.	Top - Bot	PARTICLE SIZE DISTRIBUTION (PSD) >2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2	DISP CLAY %	BULK DENS	pF 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
							µm															
Ap	0 - 20	-	2	2	2	2	5	12	13	30	43	45	23.9	-	-	-	-	-	-	-	-	-
Bw1	20 - 55	-	2	2	2	2	6	13	14	30	45	43	20.9	-	-	-	-	-	-	-	-	-
Bw2	55 - 105	-	2	2	2	3	17	25	24	27	50	25	14.8	-	-	-	-	-	-	-	-	-
C	105 - -	-	2	2	2	4	15	24	22	26	48	28	18.8	-	-	-	-	-	-	-	-	-

Hor.	pH H2O	pH KCl	CaCO3 %	ORG MAT C %	ORG MAT N %	EXCHANGEABLE BASES Ca	Mg	K	Na	sum	EXCH AC H+Al	EXCH AC Al	CEC soil	CEC clay	CEC OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm	AVAIL. P mg/kg Bray	Olsen
						cmol(+)/kg															
Ap	8.1	6.9	9.4	1.07	0.14	42.0	2.2	0.4	0.2	44.8	-	-	24.6	54	3.7	44.8	182	-	0.36	9.9	20.9
Bw1	8.5	7.1	9.6	0.60	0.10	40.7	1.9	0.3	0.2	43.1	-	-	22.3	52	2.1	43.1	193	-	0.18	0.8	1.9
Bw2	8.7	7.2	9.5	0.33	0.06	36.5	1.6	0.2	0.1	38.4	-	-	16.1	64	1.2	38.4	239	-	0.14	0.7	0.7
C	8.7	7.2	9.8	0.22	0.06	38.3	1.6	0.2	0.2	40.3	-	-	16.8	60	0.8	40.3	240	-	0.12	0.0	0.7

PSD: weight %. BULK DENS: Mg/m^3. pF: vol. %. $CaCO_3$, org. C, tot. N: weight %. Exch. bases, CEC: NH_4OAc pH 7. Exch. ac.: 1 *M* KCl. Clay mineralogy: VERM vermiculite, SMEC smectite, KAOL kaolinite, MIX mixed layer silicates, QUAR quartz, FELD feldspar. Available P (Bray-1 and Olsen): mg/kg.

APPENDIX 1 REFERENCES AND LITERATURE

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APPENDIX 2 DATA COLLECTION AND PRESENTATION

The soils are described in the field according to ISRIC's Guidelines for the description and coding of soil data (van Waveren & Bos, 1988; 1994). These guidelines follow closely those for soil description given by FAO (1977) and FAO-ISRIC (1990). Soil colours are determined using either the Munsell Soil Color Charts or the Revised Standard Soil Color Charts (Oyama & Takehara, 1967),

Soil columns are taken for monolith preparation using the methods described by van Baren & Bomer (1979). In addition, disturbed and undisturbed samples are collected for physical, chemical and mineralogical analyses and for thin section preparation, where possible using the guidelines for the sampling of soil horizons for a soil reference collection (NASREC Newsletter no. 1 (March, 1991).

Of all sites slides and photographs are taken showing the landscape, vegetation, land use, soil profile and important profile details. Furthermore, data are collected with each pedon on climate, land use history, crops and crop yields, soil management practices, etc.

Soils are classified according to the FAO-Unesco Legend of the Soil Map of the World (1974) and its Revised Legend (FAO, 1988). Soil subunit modifiers ("third level") were added using the proposals given by Nachtergaele *et al.* (1994). In addition soil were given their classification according to Soil Taxonomy (Soil Survey Staff, 1975; 1992) and the soil subgroup name of the newly developed Chinese soil classification (CSTC, 1991).

Climatological data presented in this report are derived from various Chinese sources (pers. comm.), or from FAO (1987). The pan evaporation given with a number of climatic stations are those for the standard Chinese evaporation pan, 10 cm in diameter and mounted above the soil surface. Where possible the evapotranspiration according to the Penman-Monteith method [ETo (PenMon)] is given, calculated using the CROPWAT programme version 5.7 (Smith, 1992). The figures represent the reference evapotranspiration of a standard crop canopy (grass) in mm/month. Windspeed measured at 10 m were recalculated to a height of 2 m using a correction factor of 0.8.

All data are stored in ISIS version 4.0 (ISRIC, 1994), ISRIC's soil pedon data management system for microcomputers. The information given on the soil data sheets in this publication have been generated from the ISIS files.

APPENDIX 3 ANALYTICAL METHODS[1]

Preparation
Each sample is air-dried, cleaned, crushed (not ground), passed through 2 mm sieve, homogenized. Moisture content is determined at 105°C.

pH-H_2O (1:2.5)
20 g fine earth is shaken with 50 ml of deionised water for 2 hours, electrode in upper part of suspension.

pH-KCl (1:2.5)
Likewise but shaken with 50 ml 1 *M* KCl.

pH-NaF (1:50)
1 g fine earth is shaken with 50 ml 1 *M* NaF and stirred for 1 minute. Electrode is then immersed in the upper part of suspension, stirring is continued and pH is measured 2 minutes after adding NaF solution.

EC
Conductivity measured in the 1:2.5 pH-H_2O suspension.

Particle-size distribution
Soil sample is treated with 15% hydrogen peroxide overnight in the cold. Subsequently, it is put on a water bath at about 80°C and then boiled on hot plate for 1 hour. Washings until dispersion. Dispersing agent is added (20 ml solution of 4% Na-hexametaphosphate and 1% soda) and suspension shaken overnight. Suspension sieved through 50 μm sieve. Sand fraction remaining on sieve is dried and weighed. Clay and silt are determined by pipetting from sedimentation cylinder. Fine clay (<0.2 μm) is determined after centrifuging.

Water-dispersable clay
By pipetting after shaking 20 g of soil overnight (16 hours) with deionized water.

Specific surface area
Saturation with ethylene glycol monoethyl ether (EGME), excess removal by vacuum suction. Mass of retained monomolecular layer of EGME is measure for surface area.

Exchangeable bases and CEC
Percolation with 1 *M* ammonium acetate pH7 using automatic extractor (if EC>0.5 mS sample is pre-leached with ethanol 80%). Cations are determined in the leachate by AAS.
CEC: saturation with sodium acetate 1 *M* pH7; washed with ethanol 80% and then leached with ammonium acetate 1 *M* pH7. Na determined by FES.

Exchangeable acidity and aluminium
The sample is extracted with *1 M* KCl solution and the exchangeable acidity (H+Al) titrated with NaOH. Al is measured by AAS.

Carbonate
Piper's procedure. Sample is treated with dilute acid and the residual acid is titrated.

Organic carbon
Walkley-Black procedure. The sample is treated with a mixture of potassium dichromate and sulphuric acid at about 125°C. The residual dichromate is titrated with ferrous sulphate. The result expressed in % carbon (because of incomplete oxidation a correction factor of 1.3 is applied).

Total nitrogen
Micro-Kjeldahl. Digested in H_2SO_4 with Se as catalyst. Then ammonia is distilled, trapped in boric acid and titrated with standard acid.

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[1] For full description see: Reeuwijk, L.P. van (ed.). 1993. *Procedures for soil analysis*. Fourth edition. Technical Paper no. 9. ISRIC, Wageningen, The Netherlands.

P-Bray 1
Phosphate is extracted with a mixture of 0.025 *M* HCl + 0.03 *M* NH_4F and determined colorimetrically.

P-Olsen
Phosphate is extracted with 0.5 *M* $NaHCO_3$ solution pH 8.5 and determined colorimetrically.

P-retention
Blakemore et al. procedure. Fine earth sample is shaken with a KH_2PO_4 + NaAc solution (1000 mg/l P, pH 4.6) for 16 hours. Determination of residual P colorimetrically after centrifuging.

Extractable iron, aluminium, manganese and silicon
1. "Free" Fe, Al, Mn: Holmgren-method: sample is shaken with sodium citrate (17%) + sodium dithionite (1.7%) solution for 16 hours.
2. "Active" Fe, Al, Si: sample is shaken with acid ammonium acetate 0.2 *M* pH 3 for 4 hours in the dark.
3. "Organically bound" Fe, Al: sample is shaken with sodium pyrophosphate 0.1 *M* for 16 hours.

All determinations by AAS.

Clay mineralogy
Clay is separated as indicated for particle-size analysis. About 10-20 mg of clay is brought on porous ceramic tile by suction of suspension and analyzed using a diffractometer.

Soluble salts
Measuring pH, EC, cations and anions in water extracts.
1. 1:5 extract. Shaking 30 g of fine earth + 150 ml of water for 2 hours.
2. saturation extract. Adding to 200-1000 g fine earth just enough water to saturate the sample. Standing overnight.

After filtration Ca, Mg, Na and K are measured by AAS. Cl with the Chlorocounter and SO_4 turbidimetrically.

Gypsum
To 10 g of fine earth 100 ml of water is added, shaken overnight and centrifuged.
Precipitation by adding acetone. Precipitate redissolved in water and determination of Ca by AAS.

Elemental composition
The fine earth or the separated clay fraction is dried and ignited, and then fused with lithium tetraborate. The formed bead is analyzed by X-ray fluorescence spectroscopy.

Moisture retention
Moisture determinations on undisturbed core samples on silt bath (pF 1.0, 1.5, 2.0) and kaolinite bath (pF 2.3, 2.7) respectively and on disturbed samples in high pressure pan (pF 3.4; 4.2).
Bulk density obtained from dry weight of core sample.

APPENDIX 4 SLIDE LIST OF THE REFERENCE PROFILES

This list contains details about the slides in the ISRIC collection for the profiles CN 01 to CN 17 and CN 25 to CN 33. Slides of other profiles have been taken but their particulars have not been processed to date. Slides from this list may be ordered from ISRIC at cost price plus administration- and shipping costs.

Ref. soil	Slide nr.	Subject	Remarks
CN 01	5805	miscellaneous	elongated calcareous concretions in loess excavation
CN 01	5806	profile	overview of sampling site
CN 01	5807	profile	prepared soil monolith before packing
CN 01	5808	landscape	valley floor with paddy fields
CN 01	5809	landscape	transition hill to valley floor
CN 01	5810	land use	soy bean
CN 01	5811	landscape	hill
CN 01	5812	profile	overview before preparation
CN 01	5813	profile details	close-up of 0-45 cm
CN 01	5814	profile details	close-up of 90-120 cm
CN 01	5815	profile details	close-up of 65-90 cm
CN 01	5816	profile details	close-up of 30-65 cm
CN 01	5826	profile	overview after preparation
CN 01	5827	landscape	transition hill to valley floor
CN 01	5828	landscape	valley floor with paddy fields
CN 01	5829	landscape	hill
CN 02	5817	profile	soil pit from above
CN 02	5818	land use	paddy rice
CN 02	5819	land use	paddy rice
CN 02	5820	land use	paddy rice
CN 02	5821	land use	paddy rice
CN 02	5822	profile	sampling site in rice field
CN 02	5823	land use	puddling and weeding of rice by hand
CN 02	5824	land use	puddling and weeding of rice by hand
CN 02	5825	land use	puddling and weeding of rice by hand
CN 03	5831	profile	overview of sampling site
CN 03	5832	landscape	farmed fields
CN 03	5833	profile	overview
CN 03	5834	land use	ploughed field
CN 03	5835	land use	maize
CN 03	5836	land use	maize - rice
CN 03	5837	land use	rice
CN 03	5838	profile	sampling site in farmed field
CN 03	5839	land use	farm
CN 03	5840	land use	duck / fish pond
CN 03	5841	land use	duck / fish pond
CN 03	5842	land use	vegetables
CN 04	5843	landscape	overview
CN 04	5844	landscape	overview
CN 04	5845	profile	overview
CN 04	5846	land use	afforestation / vegetables / paddy rice
CN 04	5847	land use	afforestation / vegetables / paddy rice
CN 04	5848	profile	overview of sampling site

CN 04	5849	land use	valleys with paddy fields
CN 04	5850	land use	afforestation
CN 04	5851	land use	afforestation
CN 04	5852	miscellaneous	soil monolith transport
CN 04	5853	miscellaneous	soil monolith transport
CN 05	5854	profile	overview
CN 05	5855	miscellaneous	preparing soil monolith box for transport
CN 05	5856	landscape	
CN 05	5857	vegetation	cocongrass
CN 05	5858	land use	vegetables/maize
CN 05	5859	land use	vegetables/maize
CN 06	5964	profile	overview before preparation
CN 06	5965	parent material	weathered limestone
CN 06	5966	landscape	paddy fields inbetween tower karst hills
CN 06	5967	landscape	transition footslope to tower karst hills
CN 06	5968	parent material	limestone outcrop
CN 06	5969	vegetation	
CN 06	5970	vegetation	
CN 06	5971	profile	overview after preparation
CN 06	5972	profile	overview of sampling site
CN 06	5973	landscape	
CN 06	5974	landscape	paddy fields inbetween tower karst hills
CN 07	5980	profile	overview of sampling site
CN 07	5981	profile	overview
CN 07	5983	landscape	paddy fields in valley
CN 07	5984	vegetation	close-up
CN 07	5985	vegetation	overview
CN 07	5986	profile details	surface erosion
CN 08	5988	miscellaneous	sign of Ding Hu Nature Reserve
CN 08	5989	landscape	
CN 08	5990	landscape	
CN 08	5991	landscape	
CN 08	5992	landscape	
CN 08	5993	vegetation	
CN 08	5994	profile	overview
CN 08	5995	landscape	
CN 08	5996	landscape	
CN 08	5997	landscape	
CN 08	5998	landscape	
CN 08	5999	miscellaneous	soil monolith transport
CN 08	6000	landscape	
CN 09	7690	erosion/conservation	loess terrace of Wei River basin
CN 09	7691	miscellaneous	one of numerous sites for digging loess
CN 09	7692	profile	site
CN 09	7693	profile	profile
CN 09	7694	profile	profile
CN 09	7695	profile details	close-up of topsoil
CN 09	7696	profile details	close-up of structure
CN 09	7697	profile details	close-up of fungus-like $CaCO_3$
CN 09	7698	profile details	close-up of $CaCO_3$ horizon
CN 09	7699	profile details	close-up: filled in earthworm channels
CN 09	7700	miscellaneous	digging loess

CN 09	7702	miscellaneous	village nearby site
CN 09	7703	land use	irrigation channel
CN 10	7713	profile	overview
CN 10	7714	profile	overview
CN 10	7715	profile details	close-up of topsoil
CN 10	7716	profile details	close-up of subsoil with white speckles
CN 10	7717	vegetation	
CN 10	7718	vegetation	
CN 10	7719	landscape	
CN 10	7720	land use	terraced landscape, irrigated
CN 10	7721	land use	
CN 10	7722	miscellaneous	ploughing
CN 10	7723	miscellaneous	ploughing
CN 11	7731	profile	
CN 11	7732	profile	Fujichrome slide
CN 11	7733	profile	Ektachrome slide
CN 11	7734	profile details	close-up of gravel layer
CN 11	7735	land use	land use / landscape
CN 11	7736	land use	land use / landscape
CN 11	7737	land use	irrigation channel (secondary)
CN 11	7738	land use	irrigation structure (split secondary and tertiary)
CN 11	7739	land use	irrigation structure (drop and split)
CN 11	7741	maps	relief map of the intermontane plain of Yu-Zhon
CN 11	7740	land use	irrigation structure, side look
CN 12	7748	profile	Fujichrome slide
CN 12	7749	profile	Ektachrome slide
CN 12	7750	profile details	close-up of topsoil
CN 12	7751	profile details	close-up of subsoil
CN 12	7752	profile details	close-up of soil surface (+ clods)
CN 12	7753	profile details	close-up of structure of the slaked topsoil
CN 12	7754	profile details	close-up
CN 12	7755	landscape	landscape and vegetation (Fujichrome slide)
CN 12	7756	landscape	landscape and vegetation (Ektachrome slide)
CN 12	7757	vegetation	landscape and vegetation: general overview
CN 12	7758	vegetation	landscape and vegetation: close-up flowering *Anabase*
CN 12	7759	vegetation	landscape and vegetation: herb
CN 13	7769	profile	
CN 13	7770	profile	
CN 13	7771	profile details	close-up of topsoil
CN 13	7772	profile details	close-up of subsoil (mottling or coating)
CN 13	7773	land use	
CN 13	7774	land use	irrigation canal (secondary)
CN 13	7775	land use	irrigation canal (secondary)
CN 13	7776	land use	irrigation canal and split structure
CN 13	7777	land use	irrigation canal and inlet to field (basin flooding)
CN 13	7778	land use	irrigation canal
CN 14	7785	profile	
CN 14	7786	profile	
CN 14	7787	profile details	close-up of topsoil: salt crust zone
CN 14	7788	profile details	close-up of subsoil
CN 14	7789	landscape	landscape and vegetation
CN 14	7790	landscape	landscape and vegetation

CN 14	7791	vegetation	*Alhagi* spp.
CN 15	7801	profile	
CN 15	7802	profile	
CN 15	7803	profile details	close-up of shallow subsoil
CN 15	7804	landscape	
CN 15	7805	landscape	
CN 15	7806	landscape	landscape nearby site
CN 15	7807	vegetation	
CN 15	7808	miscellaneous	monolith sampling (moistening of the sand)
CN 16	7809	profile	overview of site
CN 16	7810	profile	
CN 16	7811	profile	
CN 16	7812	landscape	landscape and vegetation
CN 16	7813	landscape	landscape and vegetation
CN 16	7814	miscellaneous	monolith sampling
CN 16	7815	miscellaneous	monolith sampling
CN 25	13891	landscape	abandoned rice terraces
CN 25	13892	landscape	rice fields
CN 25	13893	profile details	close-up of truncated B-horizon
CN 25	13894	profile details	close-up of Bt2 horizon, clay cutans
CN 25	13895	profile details	close-up of transition Ap - Bt1
CN 25	13896	profile details	close-up of Bt1 horizon
CN 26	13897	vegetation	*Tsuga tchekiangensis*
CN 26	13898	landscape	summit Wuyi Mountains
CN 26	13899	people	Huanggang Shan
CN 26	13900	profile	profile and rotten granite
CN 26	13901	profile	in situ weathering of granite
CN 26	13902	profile details	close-up of A and Bw horizons
CN 26	13903	profile details	close-up of transition BC and R horizons
CN 26	13904	vegetation	*Tsuga tchekiangensis* with bamboo undergrowth
CN 27	13905	landscape	valley bottom
CN 27	13906	landscape	V-shaped valley in fault line
CN 27	13907	landscape	V-shaped valley
CN 27	13908	landscape	valley bottom
CN 27	13909	profile	irregular soil depth
CN 27	13910	profile details	close-up of Ah and Bw horizons
CN 27	13911	profile details	close-up of transition soil - weathered granite
CN 27	13912	profile details	close-up of transition Bw - R horizons
CN 28	13913	landscape	lower mountains
CN 28	13914	landscape	lower mountains
CN 28	13915	profile details	close-up of stoneline
CN 28	13916	profile details	close-up of the two parent materials
CN 29	13917	landscape	upper part lower mountains on Devonian shale
CN 29	13918	landscape	upper part lower mountains on Devonian shale
CN 29	13919	people	monolith sampling
CN 29	13920	profile	irregular soil depth
CN 29	13921	profile details	close-up of pockets of weathered shale
CN 30	13922	land use	afforestation with *Pinus massoniana*
CN 30	13923	landscape	graves
CN 30	13924	erosion/conservation	stabilized gullies
CN 30	13925	profile	deep yellowish red soil
CN 30	13926	profile	deep yellowish red soil

CN 30	13927	profile details	close-up of A horizon
CN 30	13928	profile details	close-up of 2Bt2 horizon
CN 30	13929	people	ISS staff, provincial staff and casuals
CN 31	13934	landscape	tower karst
CN 31	13935	landscape	tower karst
CN 31	13936	landscape	tower karst
CN 31	13937	landscape	tower karst
CN 31	13938	landscape	tower karst
CN 31	13939	people	monolith sampling
CN 31	13940	people	monolith sampling
CN 31	13941	profile	irregular soil depth
CN 31	13942	profile	
CN 31	13943	profile details	close-up of clay cutans in Bt2
CN 31	13944	profile details	close-up of clay cutans in Bt1
CN 32	13945	landscape	rounded hills
CN 32	13946	landscape	rounded hills
CN 32	13947	profile	deep weathering
CN 32	13948	profile	deep weathering of granite
CN 32	13949	profile	
CN 32	13950	profile details	close-up of Bt2 horizon
CN 33	13951	landscape	rice paddy
CN 33	13952	people	
CN 33	13953	land use	horticulture
CN 33	13954	profile	old paddy soil
CN 33	13955	profile details	close-up of ground water transition zone
CN 33	13956	profile details	close-up of Ag1 horizon
CN 33	13957	profile details	close-up of oxidized ped face from Cg1 horizon

APPENDIX 5 CORRELATION BETWEEN THE CHINESE SOIL MAP LEGEND (1978) AND THE FAO (1988) SOIL UNITS (by Luo Guobao)

中国土壤类型与FAO名称对照表

Legend in China 1978	FAO Name 1990	Code	Phase
泥肉田	Mollic /Eutric Fluvisols	FLm/Fle	Anthraquic
油沙田	Eutric /Mollic Fluvisols	FLe/FLm	Anthraquic
潮泥田	Eutric /Dystric Fluvisols	FLe/FLd	Anthraquic
红黄泥田	Dystric /Gleyic Cambisols	CMd/CMg	Anthraquic
紫泥田	Eutric Cambisols	CMe	Anthraquic
青格田	Dystric /Eutric Gleyisols	GLd/GLe	Anthraquic
冷侵田	Umbric Gleyisols	GLu	Anthraquic
石灰泥田	Gleyic Luvisols	LVg	Anthraquic
咸酸田	Thionic Gleyisols	GLt	Anthraquic
鳝血田	Mollic Fluvisols	FLm	Anthraquic
淤泥田	Mollic Fluvisols	FLm	Anthraquic
青泥田	Eutric Gleyisols	GLe	Anthraquic
马肝泥田	Stagnic Luvisols	LVi	Anthraquic
北方水稻土	Gleyic Phaeozems	PHg	Anthraquic
黄刚土	Eutric Planosols	PLe	
黄僵土	Eutric Planosols	PLe	
黄堰土	Haplic Luvisols	LVh	
潮黄堰土	Haplic Luvisols	LVh	
黄垆土	Calcaric Cambisols/Luvisols	CMc/LVh	
潮黄垆土	Calcaric Cambisols/Luvisols	CMc/LVh	
油楼土	Cumulic Anthrosols	ATc	
立茬楼土	Cumulic Anthrosols	ATc	
垆楼土	Cumulic Anthrosols	ATc	
黑垆土	Calcic Kastanozems	KSk	
粘化垆土	Luvic Kastanozems	KSl	
黑焦土	Haplic Kastanozems	KSh	
潮黑垆土	Calcic Kastanozems	KSk	
黑麻土	Haplic Kastanozems	KSh	
海绵土	Aric Anthrosols	ATa	
黄绵土	Calcaric Cambisols	CMc	
厚层热黑土	Haplic Phaeozems	PHh	
中层热黑土	Haplic Phaeozems	PHh	
薄层热黑土	Haplic Phaeozems	PHh	
淤粘土	Calcaric/Eutric Fluvisol	FLc/FLe	
两合土	Calcaric/Eutric Fluvisol	FLc/FLe	
淤沙土	Calcaric/Eutric Fluvisol	FLc/FLe	
黑潮土	Mollic Fluvisols	FLm	
砂姜黑土	Calcic Vertisols/Calcaric Fluvisols	VRk/FLc	
盐潮土	Calcaric Fluvisols	FLc	Salic
湿潮土	Eutric Gleyisols	GLe	
潮沙泥土	Calcaric Fluvisols	FLc	
灌淤澄土	Cumulic Anthrosols	ATc	
灌淤潮土	Cumulic Anthrosols	ATc	
绿州白土	Cumulic Anthrosols	ATc	
绿州灰土	Cumulic Anthrosols	ATc	
绿州潮土	Cumulic Anthrosols/Calcaric Fluvisol	ATc/FLc	
砖红壤	Haplic Acrisols	ACh	
铁质砖红壤	Haplic Ferrallisols	FRh	

中国土壤类型与FAO名称对照表

黄色砖红壤	Haplic Alisols/Acrisols	ALh/ACh	
赤红壤	Haplic Acrisols /Alisols	ACh/ALh	
铁质赤红壤	Haplic Acrisols/Alisols	ACh/ALh	
红壤	Haplic Alisols/Haplic Acrisols	ALh/ACh	
黄红壤	Haplic Alisols	ALh	
褐红壤	Haplic Lixisols/Chromic Luvisols	LXh/LVx	
红壤性土	Dystric Leptisols	LPd	
燥红土	Haplic Lixisols/Ochromic Luvisols/Haplic Alisols	LXh/LVx/ALh	
黄壤	Haplic Alisols	ALh	
表潜黄壤	Stagnic Alisols	ALj	
黄壤性土	Eutric Leptisols	LPe	
黄棕壤	Ferric /Haplic Luvisols	LVf/LVh	
粘盘黄棕壤	Eutric Planosols	PLe	
棕壤	Haplic/Albic Luvisols	LVh/LVa	
	or Eutric/Dystric Cambisols	CMe/CMd	
褐土	Eutric Cambisols	CMe	
淋溶褐土	Haplic /Calcaric Luvisols	LVh/LVc	
碳酸盐褐土	Calcaric Cambisols	CMc	
灰褐土	Haplic Greyzems	GRh	
暗棕壤	Haplic Luvisols/Eutric Cambisols	LVh/CMe	
白浆化暗棕壤	Mollic Planosols/Albic Luvisols	PLm/LVa	
草甸暗棕壤	Haplic Phaeozems	PHh	
漂灰土	Haplic Podzols/Eutric or Dystric Podzoluvisols	PZh/PDe/d	
暗灰色森林土	Haplic Greyzems	GRh	
灰色森林土	Haplic Greyzems	GRh	
黑土	Haplic Phaeozems	PHh	
白浆化黑土	Stagnic Phaeozems	PHj	
草甸黑土	Gleyic Phaeozems	PHg	
白浆土	Eutric Planosols/Albic Luvisols	PLe/LVa	
草甸白浆土	Mollic Planosols	PLm	
黑钙土	Haplic Chernozems	CHh	
淋溶黑钙土	Luvic Chernozems	CHi	
草甸黑钙土	Gleyic Chernozems	CHg	
暗栗钙土	Haplic Kastanozems	KSh	
栗钙土	Calcic Kastanozems	KSk	
淡栗钙土	Calcic Kastanozems	KSk	
草甸栗钙土	Haplic /Gleyic Kastanozems	KSh/KSg	
棕钙土	Haplic Calcisols	CLh	
淡棕钙土	Haplic Calcisols	CLh	
灰钙土	Haplic Calcisols	CLh	
淡灰钙土	Haplic Calcisols	CLh	
草甸灰钙土	Haplic Calcisols	CLh	
灰漠土	Calcaric Cambisols	CMc	Yermic
盐化灰漠土	Calcaric Cambisols	CMc	Salic, Yermic
碱化灰漠土	Calcaric Cambisols	CMc	Natric, Yermic
草甸灰漠土	Calcaric Cambisols	CMc	Yermic
灰棕漠土	Calcaric Cambisols	CMc	Yermic
盐化灰棕漠土	Calcaric Cambisols	CMc	Yermic, Salic
石膏灰棕漠土	Haplic Gypsisols	CYh	Yermic

中国土壤类型与FAO名称对照表

棕漠土	Haplic Gypsisols	CYh	Yermic
石膏棕漠土	Haplic Gypsisols	CYh	Yermic
石膏盐盘棕漠土	Haplic Solonchaks	SCh	Yermic
暗色草甸土	Haplic Phaeozems	PHh	
草甸土	Haplic Phaeozems	PHh	
盐化暗色草甸土	Haplic Phaeozems	PHh	Salic
潜育暗色草甸土	Gleyic Phaeozems	PHg	
灰色草甸土	Calcaric Fluvisols	FLc	
盐化灰色草甸土	Calcaric Fluvisols	FLc	Salic
漠土化灰色草甸土	Calcaric Cambisols	CMc	Yermic
林灌灰色草甸土	Calcaric Fluvisols	FLc	Yermic
草甸沼泽土	Mollic/Eutric Gleyisols	GLm/GLe	
腐殖质沼泽土	Mollic/Eutric Gleyisols	GLm/GLe	
泥碳沼泽土	Mollic/Eutric Gleyisols	GLm/GLe	
残余泥碳沼泽土	Mollic/Eutric Gleyisols	GLm/GLe	
滨海盐土	Haplic Solonchaks	SCh	
草甸滨海盐土	Mollic Solonchaks	SCm	
沼泽滨海盐土	Gleyic Solonchaks	SCg	
盐土	Haplic Solonchaks	SCh	
草甸盐土	Mollic Solonchaks	SCm	
碱化盐土	Sodic Solonchaks	SCn	
内陆盐土	Haplic Solonchaks	SCh	
草甸内陆盐土	Mollic Solonchaks	SCm	
沼泽内陆盐土	Gleyic Solonchaks	SCg	
残余内陆盐土	Gypic/Calcic Solonchaks	SCy/SCk	
碱土	Solonetzs	SN	
磷质石灰土	Phosphatic-Eutric Regosols	RGe	
红色石灰土	Ferric/Haplic Lixisols/Rhodic Nitisols	LXf/Lxh/NTr	
棕色石灰土	Haplic Luvisols	LVh	
黑色石灰土	Rendzic Leptisols/Calcaric Phaeozems	LPk/PHc	
紫色土	Calcaric Regosols	RGc	
碳酸盐紫色土	Calcaric Regosols	RGc	
粗骨紫色土	Calcaric Regosols	RGc	Skeletic
龟裂土	Calcaric Regosols	RGc	Takyric
流动风沙土	Haplic Arenosols	ARh	
半固定风沙土	Cambic Arenosols	ARb	
固定风沙土	Calcaric Arenosols	ARc	
山地草甸土	Umbric Leptisols/Dystric Cambisols	LPu/CMd	
山地灌丛草原土	Haplic Calcisols	CLh	
黑毡土	Humic Cambisols	CMu	Tibet
棕毡土	Eutric Cambisols	CMe	Tibet
巴嘎土	Haplic Calcisols	CLh	Tibet
斑毡巴嘎土	Haplic Calcisols	CLh	Tibet
草毡土	Gelic Cambisols/Humic Cambisols	CMi/CMu	Tibet
莎嘎土	Haplic Calcisols	CLh	Tibet
斑毡莎嘎土	Haplic Calcisols/Humic Cambisols	CLh/CMu	Tibet
荒漠莎嘎土	Haplic Calcisols	CLh	Tibet
高山漠土	Haplic Gypisols	GYh	Tibet
寒漠土	Gelic Leptsols	LPi	Tibet