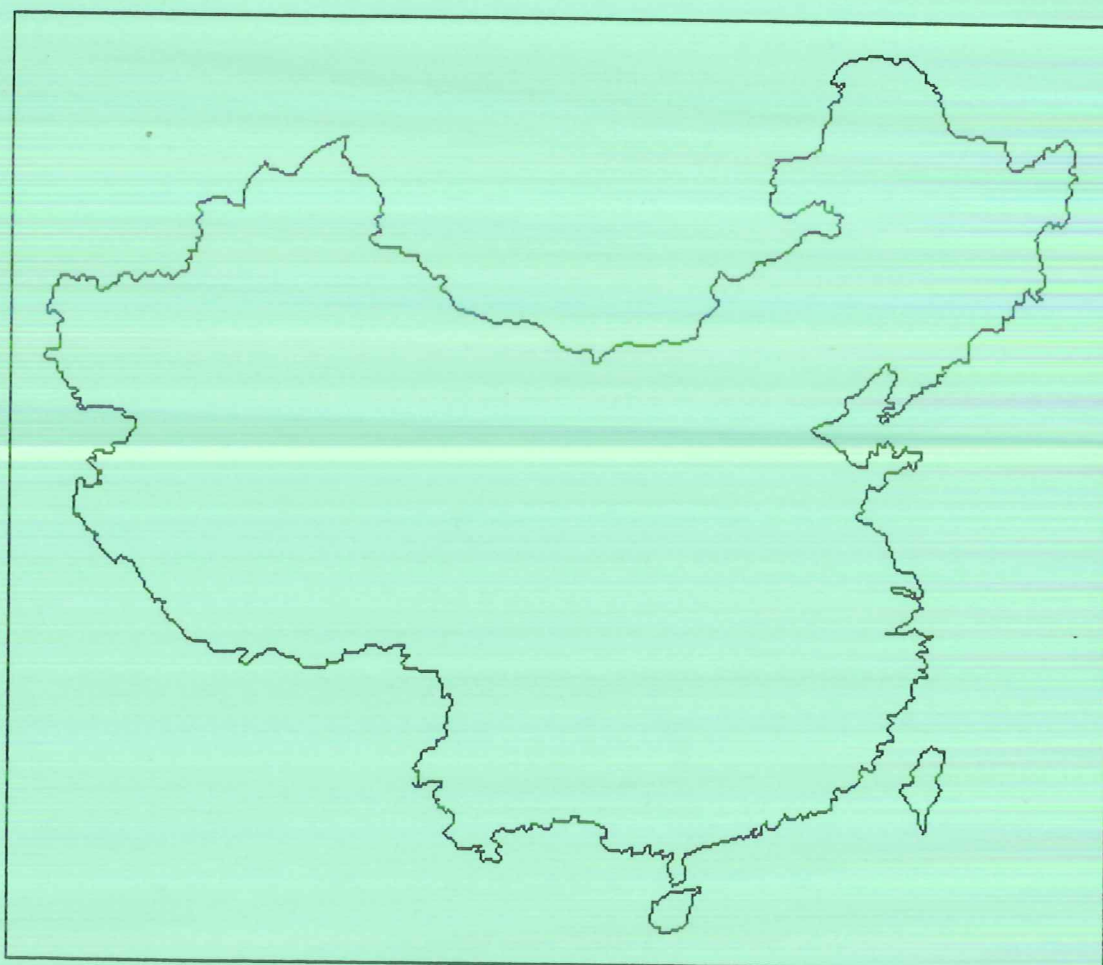


# Soil Reference Profiles of the People's Republic of China

## Field and Analytical Data



*ISSAS*



**ISRIC**

Institute of Soil Science - Academia Sinica  
International Soil Reference and Information Centre

July 1994

# Soil Reference Profiles of the People's Republic of China

## Field and Analytical Data

**Published by**

**Institute of Soil Science, Academia Sinica  
International Soil Reference and Information Centre**

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**July 1994**

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

Based upon fieldwork of

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

(ISS-AS)

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

(ISRIC)

Financial assistance provided by  
the Academia Sinica, the European Community, the Netherlands Directorate  
General for International Cooperation and the Royal Netherlands Academy  
of Sciences

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*Reference citation*

ISS-AS & ISRIC (1994). Soil reference profiles of the People's Republic of China. Field and analytical data. Country Report 2. (Gong Zitong, Luo Guobao, Zhang Ganlin, O.C. Spaargaren and J.H. Kauffman, compilers)

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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 ISS-AS 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.

At present the collection comprises 51 soil reference profiles. From each reference soil two undisturbed columns were taken, and specially preserved and prepared into monoliths, ready for exposition. The 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 ISS-AS' intention that the collection will become the "China's National Soil Reference and Information Centre".

A national collection existed already a long time. It needed, however, to be upgraded and updated. This could be realized in a series of cooperative projects of ISS-AS and ISRIC in the period 1983 to 1993. These projects were subsequently funded by the Academia Sinica, the Royal Netherlands Academy of 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), 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 the ISS-AS, the staff of the ISS-AS and ISRIC, and many institutions throughout the country which supported the fieldwork.

## 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 ISS-AS in their efforts to bring together a National Soil Reference Collection of China.

The collected information of the reference soil profiles is stored in ISRIC's 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 several publication series. 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. One of this series is the Country Reports.

The 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 (in press) is given on the back cover of this report. We are very pleased to release the draft Chinese Country Report at the occasion of the XVth World Congress of Soil Science.

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

Dr. L.R. Oldeman, Director ISRIC

Country Reports 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 please contact:

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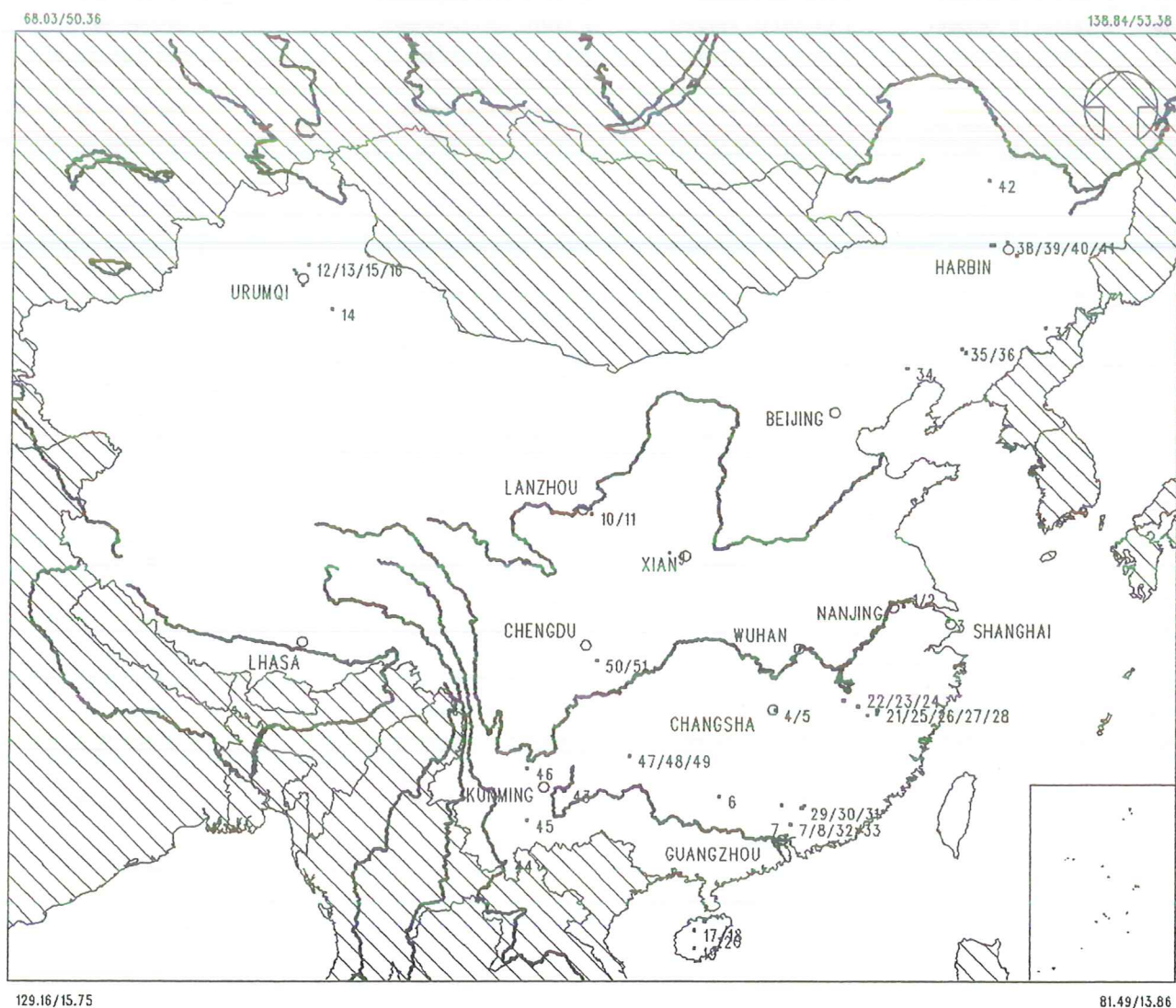
Telephone (31) (0)8370 71711  
Fax (31) (0)8370 24460  
E-mail ISRIC@RCL.WAU.NL

Telephone (86) (0)25 6633318  
Fax (86) (0)25 3353590  
Cable 1099



# China: Reference profile location map

- State boundary
- River
- Reference profile
- Town



Scale 1:28,000,000 Projection Albers May 1994

Table 1. Summarized information on the reference soils CN001 to CN051

ISIS_ID	FAO (1988)	FAO (1974)	USDA Soil Taxonomy (1992)	Parent material
CN001	Chromic Luvisol	Chromic Luvisol	Typic Hapludalf	loess
CN002	Calcaric Cambisol	Gleyic Cambisol	Oxyaquic Eutrochrept	alluvium
CN003	Stagnic Luvisol	Gleyic Luvisol	Aquic Hapludalf	alluvium
CN004	Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	alluvium
CN005	Calcaric Cambisol	Chromic Cambisol	Typic Eutrochrept	shale
CN006	Vertic Luvisol	Eutric Nitosol	Vertic Paleudalf	residual material
CN007	Ferralic Cambisol	Orthic Ferralsol	Inceptic Eutrudox	residual material
CN008	Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	residual material
CN009	Cumulic Anthrosol	Calcaric Regosol	Plaggept	loess
CN010	Haplic Gypsisol	Gypsic Xerosol	Cambic Gypsiorthid	loess
CN011	Calcaric Regosol	Calcaric Regosol	Fluventic Camborthid	loess
CN012	Haplic Gypsisol	Gypsic Xerosol	Cambic Gypsiorthid	loess
CN013	Cumulic Anthrosol	Calcaric Regosol	Anthropic Torrifluent	man-made
CN014	Sodic Solonchak	Orthic Solonchak	Aquollic Salorthid	colluvium
CN015	Haplic Arenosol	Eutric Regosol	Typic Torripsamment	eolian sand
CN016	Calcaric Regosol	Calcaric Regosol	Typic Torripsamment	colluvium
CN017	Haplic Acrisol	Ferric Acrisol	Typic Kandiodult	residual material
CN018	Geric Ferralsol	Acric Ferralsol	Anionic Acrudox	residual material
CN019	Haplic Acrisol	Ferric Acrisol	Typic Kandiodult	residual material
CN020	Ferralic Cambisol	Orthic Ferralsol	Typic Hapludox	residual material
CN021	Haplic Acrisol	Orthic Acrisol	Udic Kandistult	residual material
CN022	Ferric Alisol	Ferric Acrisol	Typic Paleustult	residual material
CN023	Dystric Cambisol	Dystric Cambisol	Dystric Ustochrept	residual material
CN024	Ferric Alisol	Ferric Acrisol	Anthraquic Hapludalf	residual material
CN025	Haplic Acrisol	Ferric Acrisol	Typic Paleudult	unconsolidated
CN026	Dystric Cambisol	Dystric Cambisol	Typic Dystrochrept	residual material
CN027	Dystric Cambisol	Dystric Cambisol	Typic Dystrochrept	residual material
CN028	Haplic Alisol	Ferric Acrisol	Typic Hapludult	colluvium
CN029	Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	colluvium
CN030	Ferralic Cambisol	Ferralic Cambisol	Typic Dystrochrept	unconsolidated
CN031	Haplic Nitisol	Chromic Luvisol	Typic Hapludalf	residual material
CN032	Ferralic Cambisol	Orthic Ferralsol	Typic Hapludox	residual material
CN033	Thionic Fluvisol	Thionic Fluvisol	Typic Sulfaquent	alluvium
CN034	Chromic Cambisol	Chromic Cambisol	Typic Ustochrept	slope wash
CN035	Haplic Phaeozem	Haplic Phaeozem	Cumulic Hapludoll	alluvium
CN036	Chromic Luvisol	Chromic Luvisol	Udic Haplustalf	lacustrine sediments
CN037	Albic Luvisol	Albic Luvisol	Eutric Glossoboralf	loess
CN038	Stagnic Solonetz	Orthic Solonetz	Natriboralf	lacustrine sediments
CN039	Haplic Chernozem	Haplic Chernozem	Pachic Haploboroll	loess
CN040	Haplic Greyzem	Orthic Greyzem	Boralfic Argiboroll	alluvium
CN041	Haplic Phaeozem	Haplic Phaeozem	Pachic Udic Haploboroll	loess
CN042	Eutric Leptosol	Eutric Regosol	Typic Ustorthent	volcanic ejecta
CN043	Haplic Acrisol	Ferric Acrisol	Typic Kandiodult	alluvium
CN044	Ferralic Cambisol	Ferralic Cambisol	Fluventic Umbric Dystrochrept	alluvium
CN045	Ferralic Cambisol	Ferralic Cambisol	Dystric Eutrochrept	residual material
CN046	Stagnic Luvisol	Chromic Luvisol	Aquic Haplustalf	residual material
CN047	Haplic Acrisol	Ferric Acrisol	Typic Hapludult	residual material
CN048	Ferralic Cambisol	Ferralic Cambisol	Fluventic Dystrochrept	alluvium
CN049	Luvic Phaeozem	Luvic Phaeozem	Typic Argiudoll	residual material
CN050	Calcaric Cambisol	Calcic Cambisol	Lithic Eutrochrept	solid rock
CN051	Calcaric Cambisol	Calcic Cambisol	Oxyaquic Eutrochrept	alluvium

Table 1. (continued)

Clim	Reg. landform	Land utilization type	Vegetation	Drainage	Alt
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
Ca	intermontane basin	fallow		well	45
Ca	intermontane basin	fallow		moderately well/well	40
Ca	plain	fallow		moderately well/well	50
Ca	plain	arable farming		imperf./moderately well	40
Ca	plain	low level arable farming		moderately well	30
Ca	mountain	(semi-) natural vegetation	semi-deciduous forest	well	1800
Ca	mountain	(semi-) natural vegetation	evergreen forest	well	700
Ca	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
Caw	basin	medium level arable farming		moderately well/well	1800
Am	valley	woodland, grazed	evergreen woodland	well	580
Caw	valley	medium level arable farming		well	380
Caw	badlands	afforestation		moderately well	1150
Caw	low hill	low level arable farming		well	1230
Caw	low hill	low level mixed farming		well	1260
Caw	hill	non-agricultural land	short grassland	(somewhat) excessive	1290
Caw	low hill	low level arable farming		somewhat excessive	415
Caw	valley	low level arable farming		very poor/poor	392

## SOILS OF CHINA

### The soil orders

The Chinese Soil Taxonomic Classification System (CSTC, 1st proposal, 1991) distinguishes in China 13 soil orders, viz. *Primarosols*, *Vertisols*, *Aridisols*, *Isohumisols*, *Spodisols*, *Siallisols*, *Ferrallisols*, *Fersiallisols*, *Aquisols*, *Halosols*, *Histosols*, *Anthrosols* and *Andosols*.

The *Primarosols* are soils without any diagnostic horizons or features. They are widespread in the country especially in the desert region, the Loess Plateau, the river basins and the strongly eroded regions. They cover about 4% of total land area of China. *Vertisols*, soils with vertic features, 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, Qinghai, 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 siallic properties ( $\text{SiO}_2/\text{Al}_2\text{O}_3 > 2.4$  in the clay fraction and a  $\text{CEC}/\text{clay} > 0.24$ ) mainly include Brown and Cinammon Soils (Drab Soils) in the Shandong and Liaodong peninsulas as well as hilly areas of North China. They cover about 10% of land area. The *Ferrallisols* (soils with ferrallic properties, i.e.  $\text{SiO}_2/\text{Al}_2\text{O}_3 < 2.4$  in the clay fraction and a  $\text{CEC}/\text{clay} < 0.24$ ) mainly includes Latosols, Latored soils and Red soils of (sub)tropical China. These soils occupy about 11% of 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 total land area. *Spodisols* (soils with 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*, i.e. soils with an aquic soil moisture regime and oxidation-reduction features, include Gley soils, Peat soils and Chao soils mostly in the plains of North China. They cover about 6% of the country. *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 Ruergai grasslands of Sichuan Province. They occupy about 1% of the China's land area.

*Anthrosols* have man-made epipedons and include Paddy soils, Warp 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, *Andosols*, 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 (1977) and the soil types of the traditional soil classification system (1978) in China.

### Soil distribution

From south to north the lateral 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.

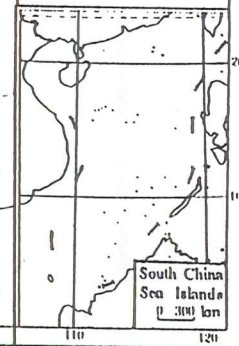
# DISTRIBUTION OF SOIL ORDERS IN CHINA

0 250 500 750 km

No Orders

- 1 PRIMARISOLS
- 2 VERTISOLS
- 3 ARIDISOLS
- 4 ISOHUMISOLS
- 5 SPodosOLS
- 6 SIALISOLS
- 7 FERSIALISOLS

- 8 FERRALLISOLS
- 9 AQUISOLS
- 10 HALOSOLS
- 11 HISTOSOLS
- 12 ANTHROSOLS
- ▲ ANDOSOLS
- 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 - Spodosols - (sub) Alpine meadow soils - Frozen soils - ice cap.

## Soil resources

Due to China's variety in topography and climatic conditions and its long cultivation history, a great number 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 "the roof of the world".

Mountainous and hill-side 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 land cultivated 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 supplies 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 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
Spodosols	tr
Aquisols	6
Halosols	2
Histosols	1
Anthrosols	5
Andosols	tr
Deserts	.5

Table 3. Correlation of soil types between China's traditional soil classification system (1978) and the FAO-Unesco Soil Map of the World (1978) (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, greydrab 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
Nitisols	Laterite, red earth, dry red earth
Ferralsols	Laterite
Histosols	Peat soil, bog soil

## MAJOR ECOLOGICAL REGIONS OF CHINA

China can be divided into the following 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 sealevel 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 of a forest-steppe and meadow-steppe type.

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 surrounding Da Hinggan Mountains in the west and the Xiao Hinggan and Changbai mountain ranges (2) in the east and southeast rise to altitudes of 1000 m asl 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.

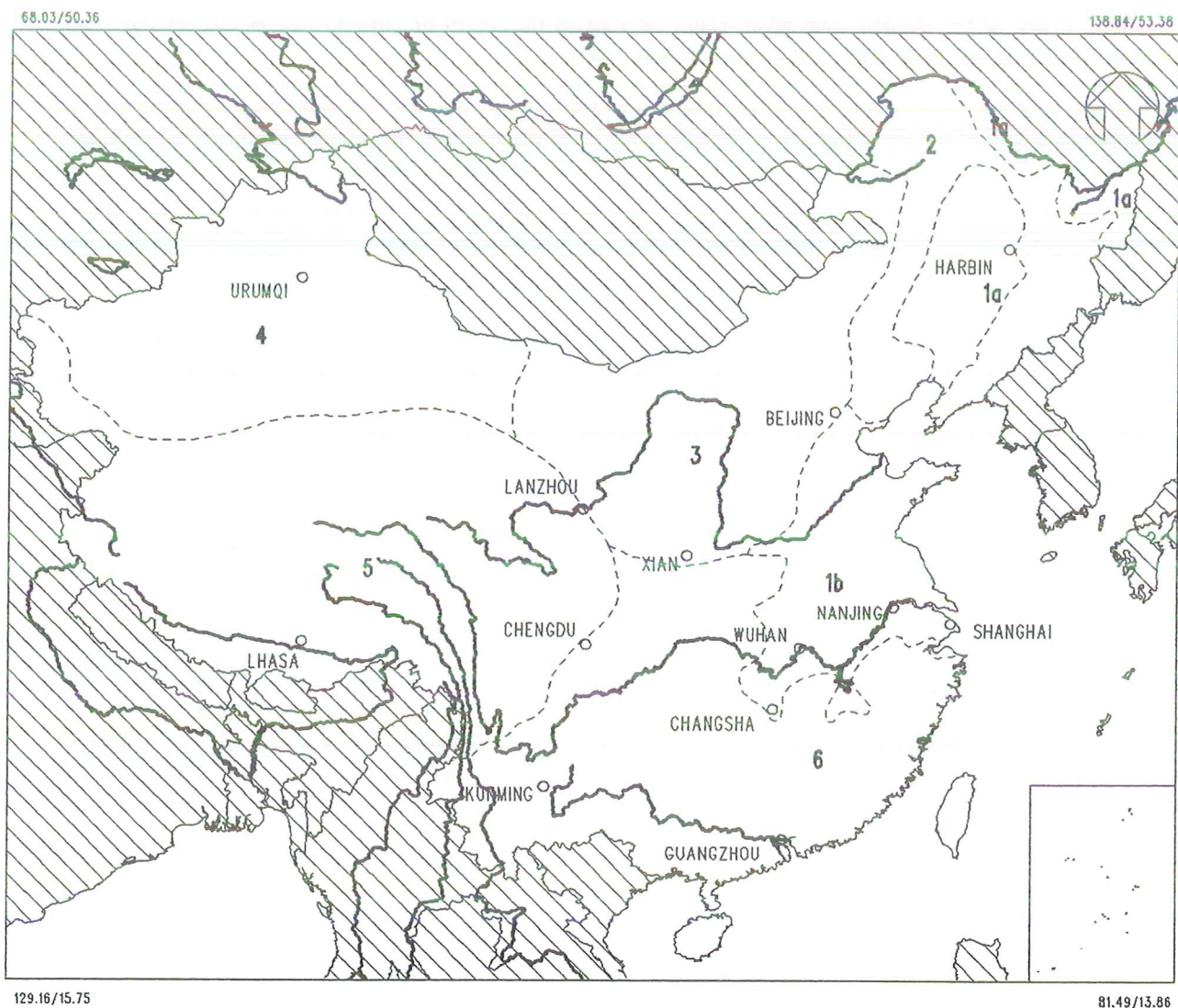
Annual precipitation is around 350-450 mm in the westernmost mountain range and varies from 450 mm in the Xiao Hinggan Mountains to more than 1300 mm in the Changbai Mountains. Mean annual temperatures are low, with a mean January temperature below about -20°C and a mean July temperature less than 19°C. 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.

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

# China: Major Ecological Zones

- State boundary
- River
- - - - Major agro-ecological zone
- o Town



Scale 1:28,000,000 Projection Albers May 1994

(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 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, 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 asl, 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 asl. 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. Lhasa (3650 m asl) for example 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 asl) and Dulan (Qaidam Basin; 3192 m asl) 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 sealevel in the south and east to altitudes of 1000-2000 m asl in the western Yunnan-Guizhu Plateau and to generally 2000-3000 m asl 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 asl. The Dongnan Hills subregion consists of a number of NE-SW trending ranges with elevations between 500 and 1000 m asl.

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 4.

Table 4 Chinese reference soil profiles as FAO's Major Soil Grouping versus Ecological Regions of China

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

## SOIL INFORMATION SHEETS

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

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

LOCATION : Yanjiang Commune, Huawa, Jiangsu Province  
 Latitude : 32°15' N Longitude : 118°42' E Altitude : 25 m a.s.l.  
 AUTHOR(S) : Spaargaren, O.C. Date (mm/yy) : 7/83

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  
 SLOPE PROCESSES Soil erosion : slight sheet Aggradation : nil  
 Slope stability : locally unstable

PARENT MATERIAL : Xia Shu loess

EFFECTIVE SOIL DEPTH : > 180 cm

WATER TABLE : not observed  
 DRAINAGE : moderately well  
 PERMEABILITY : no slowly permeable layers  
 FLOODING Frequency : nil Run off : medium  
 MOISTURE CONDITIONS PROFILE : 0 - 120 cm moist

LAND USE : medium level arable farming; no irrigation  
 CROPS : soya bean as part of continuous maize-soya bean rotation

#### 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 10m 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 04 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
relative humidity %		74	77	70	72	74	76	80	79	78	71	71	76	75
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
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

## 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 in thin sections common cutans of oriented clay. Most likely the soil has been truncated.

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

## ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT	50 20	TOT	<2	DISP	BULK DENS	pF-	---	---	---	---	---	---	---
			1000 500 250 100	50 SAND	20 2	SILT	μm			0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 7	-	0 0 0 0 1	2	32 35	67	31	-	1.56	38	37	36	33	30	29	25	21
2	7 - 19	-	0 0 0 0 1	2	30 36	66	32	-	1.52	39	38	34	32	30	29	28	24
3	19 - 38	-	0 0 0 0 2	2	31 34	65	33	-	1.60	37	37	35	33	32	31	30	26
4	38 - 73	-	0 0 0 0 1	1	31 35	65	34	-	1.59	37	36	34	32	31	30	31	26
5	73 - 104	-	0 0 0 0 1	1	29 36	65	34	-	1.66	35	35	34	32	31	31	33	28
6	104 - 120	-	0 0 0 0 1	1	30 36	66	33	-	-	-	-	-	-	-	-	-	-

Remarks (hor. 4 & 5): anomaly between pF 2.7 and 3.4 caused by sampling heterogeneity and different analytical procedures

Hor. no.	Top - Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	0 - 7	5.3	3.8	-	0.48	-	9.9	4.6	0.2	0.0	14.7	0.8	0.7	14.5	46	1.7	15.5	101	7	0.25
2	7 - 19	6.1	4.2	-	0.23	-	10.8	5.7	0.3	0.0	16.8	-	-	13.8	43	0.8	16.8	122	-	0.13
3	19 - 38	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
4	38 - 73	6.4	4.4	-	0.18	-	10.3	6.3	0.3	0.0	16.7	-	-	13.6	41	0.6	16.7	123	-	0.16
5	73 - 104	6.4	4.5	-	0.17	-	10.3	6.2	0.3	0.3	16.8	-	-	14.2	42	0.6	16.8	118	-	0.16
6	104 - 120	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 Mn (by AMM. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	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)
1	0 - 7	4	5	4	3	2	3	0.3	0.1	0.0	1.6	0.4	0.3	0.0	0.1	0.0
2	7 - 19	4	5	4	3	2	3	0.3	0.1	0.1	1.7	0.4	0.4	0.0	0.1	0.0
3	19 - 38	4	5	4	3	2	3	0.3	0.1	0.1	1.7	0.4	0.3	0.1	0.0	0.0
4	38 - 73	4	5	4	3	2	3	0.3	0.1	0.1	1.7	0.4	0.3	0.1	0.0	0.0
5	73 - 104	4	5	4	3	2	3	0.3	0.1	0.1	1.5	0.3	0.2	0.1	0.0	0.0
6	104 - 120	4	5	4	3	2	3	0.2	0.1	0.1	1.6	0.3	0.3	0.0	0.0	0.0

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

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) : 7/83

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 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
relative humidity	%		74	77	70	72	74	76	80	79	78	71	71	76	75
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
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

## PROFILE DESCRIPTION :

Very deep, poorly drained, strongly mottled yellowish brown silty clay loam in Holocene alluvial deposits derived from Pleistocene (Xiashu) 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 17	-	0	0	0	0	1	2	27	39	66	32	-	1.54	43	43	42	40	39	38	30	26
2	17 - 40	-	0	0	0	0	1	1	30	38	68	31	-	1.60	41	41	39	37	36	35	29	25
3	40 - 70	-	0	0	0	0	1	1	29	39	68	31	-	1.61	43	42	40	38	37	35	28	24
4	70 - 95	-	0	0	0	0	1	1	28	39	68	31	-	-	-	-	-	-	-	-	-	-
5	95 - 120	-	0	0	0	0	1	1	23	43	66	33	-	1.62	41	41	40	38	37	36	34	29

Hor. no.	Top - Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	Na sum	-----	EXCH H+Al	AC. Al	CEC soil	----- clay	OrgC	-----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	0 - 17	7.0	5.7	-	0.96	-	12.0	4.8	0.2	0.2	17.2	-	-	16.8	52	3.4	17.2	102	-	0.77
2	17 - 40	7.7	6.0	3.1	0.25	-	11.2	4.9	0.2	0.2	16.5	-	-	13.8	45	0.9	16.5	120	-	0.16
3	40 - 70	7.7	5.7	3.3	0.16	-	12.0	5.5	0.2	0.2	17.9	-	-	13.2	43	0.6	17.9	136	-	0.13
4	70 - 95	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
5	95 - 120	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. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	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)
1	0 - 17	4	6	4	3	2	3	0.6	0.1	0.1	1.3	0.2	0.1	0.0	0.1	0.0
2	17 - 40	4	5	4	3	2	3	0.2	0.1	0.0	1.5	0.3	0.1	0.1	0.0	0.0
3	40 - 70	4	5	4	3	2	3	0.3	0.1	0.1	1.4	0.2	0.1	0.1	0.0	0.0
4	70 - 95	4	5	4	3	2	3	0.4	0.1	0.1	1.4	0.2	0.2	0.1	0.0	0.0
5	95 - 120	4	6	4	3	2	3	0.5	0.1	0.0	1.5	0.2	0.1	0.1	0.0	0.0

FAO/UNESCO (1988) : Fluvi-Stagnic Luvisol, anthraquic phase (1974 : Gleyic Luvisol, phreatic 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

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 alluvial 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 10-20cm depth; infiltration is estimated at 1-10cm/day; surface drainage is controlled by ditches at various levels of importance. Human influences: ploughing, until 1982 puddling; the land has been banded in 1982 into parcels of about 2m wide; 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: ammoniumcarbonate, 2.25 ton/ha; K: KCl, 18.75 kg/ha; P: superphosphate, 262.5 kg/ha. In addition organic manure and straw is applied. Ammoniumphosphate is used as fertilizer for vegetables. The commune has 200 pigs, ducks and chicken for organic manure production and meat. There are waterbuffalos 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
EP Thorntwaite	mm	64	4	5	19	48	92	127	171	160	111	66	29	10	842
relative humidity	%		78	79	79	79	80	84	84	84	83	79	78	77	80
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
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

## 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 expd 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 expd 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 expd 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 21	-	0	0	0	0	0	1	26	47	73	26	-	1.32	48	47	45	44	42	41	27	23
2	21 - 27	-	0	0	0	0	1	1	25	49	74	25	-	1.41	46	45	44	42	41	40	25	22
3	27 - 52	-	0	0	0	0	0	1	22	52	73	26	-	1.49	41	41	39	38	37	36	26	22
4	52 - 65	-	0	0	0	0	0	0	13	51	64	36	-	1.56	42	41	39	38	37	35	34	29
5	65 - 102	-	0	0	0	0	0	0	10	49	59	41	-	1.49	46	45	44	43	42	41	39	32
6	102 - 120	-	0	0	0	0	0	0	11	47	58	42	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum cmol(+)/kg	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	0 - 21	7.2	6.4	-	1.11	-	14.0	3.8	0.3	0.2	18.3	-	-	16.1	61	3.9	18.3	114	-	0.29
2	21 - 27	7.5	6.6	2.7	0.77	-	12.7	3.7	0.3	0.2	16.9	-	-	15.1	61	2.7	16.9	112	-	0.34
3	27 - 52	7.8	6.3	2.0	0.44	-	11.9	4.1	0.3	0.4	16.7	-	-	14.9	57	1.5	16.7	112	-	0.18
4	52 - 65	8.0	6.4	2.3	0.47	-	14.0	6.0	0.3	0.4	20.7	-	-	18.6	52	1.6	20.7	111	-	0.16
5	65 - 102	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
6	102 - 120	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. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	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)
1	0 - 21	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
2	21 - 27	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
3	27 - 52	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
4	52 - 65	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
5	65 - 102	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
6	102 - 120	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

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

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
EP Thorntwaite	mm	14	4	6	26	61	118	154	191	182	131	71	32	9	985
relative humidity	%		84	87	85	84	83	81	78	76	79	79	82	81	82
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
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 expd 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
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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	Spec. surf. soil m2/g
1	0 - 6	-	0	1	1	2	6	10	13	38	51	39	20.4	1.35	46	44	40	34	32	28	23	20	-
2	6 - 25	-	0	1	1	2	5	8	13	40	53	39	2.0	1.41	45	44	41	34	33	30	24	21	-
3	25 - 39	-	0	1	1	2	5	9	12	42	54	37	0.0	1.43	44	43	39	34	33	30	24	21	-
4	39 - 60	-	0	1	1	2	5	8	11	40	51	41	0.0	1.53	42	41	39	35	34	32	27	24	-
5	60 - 80	-	0	1	1	2	5	8	13	41	54	38	0.5	-	-	-	-	-	-	-	-	-	-
6	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
7	113 - 130	-	0	1	1	2	6	10	13	40	53	38	1.0	-	-	-	-	-	-	-	-	-	-
8	130 - 150	-	0	1	1	2	7	11	14	38	52	37	1.0	-	-	-	-	-	-	-	-	-	48

Hor. no.	Top - Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH sum	AC. H+Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	0 - 6	4.9	3.9	-	1.20	-	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
2	6 - 25	4.9	3.9	-	0.55	-	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
3	25 - 39	5.0	3.9	-	0.16	-	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
4	39 - 60	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	60 - 80	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
6	80 - 113	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
7	113 - 130	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
8	130 - 150	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. no.	Top - Bot	SiO2	Al2O3	Fe2O3	CaO	MgO	K2O	Na2O	TiO2	MnO2	P2O5	IGN. LOSS	SiO2/Al2O3	SiO2/Fe2O3	SiO2/R2O3	Al2O3/Fe2O3
6	80 - 113	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
8	130 - 150	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. OXALATE(o), Na DITHION(d) &amp; PYROPH(p))

Hor. no.	Top - Bot	MICA /ILL	KAOL	MIX	QUAR	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
1	0 - 6	4	4	4	1	3	0.1	0.1	0.0	2.4	0.4	0.1	0.1	0.4	0.1
2	6 - 25	4	4	4	1	3	0.2	0.1	0.0	2.4	0.5	0.1	0.1	0.3	0.1
3	25 - 39	4	4	4	1	3	0.2	0.1	0.0	2.4	0.4	0.1	0.0	0.1	0.1
4	39 - 60	4	4	4	1	3	0.2	0.2	0.0	2.5	0.5	0.1	0.1	0.0	0.1
5	60 - 80	4	4	4	1	3	0.2	0.2	0.0	2.5	0.5	0.2	0.1	0.0	0.1
6	80 - 113	4	4	4	1	3	0.2	0.1	0.0	2.4	0.5	0.1	0.0	0.0	0.1
7	113 - 130	4	4	4	1	3	0.1	0.1	0.1	2.4	0.5	0.1	0.0	0.0	0.1
8	130 - 150	4	4	4	1	3	0.1	0.1	0.0	2.6	0.5	0.1	0.0	0.0	0.1

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

LOCATION : Qutang Commune, 25 km E of Changsha, Hunan Province  
 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
EP Thorntwaite	mm	14	4	6	26	61	118	154	191	182	131	71	32	9	985
relative humidity	%		84	87	85	84	83	81	78	76	79	79	82	81	82
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
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 :

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)

## ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT SAND	50 20	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 10	-	0 0 0 2 7	9	11 36	47	44	-	1.43	48	47	44	42	41	38	33	31
2	10 - 25	-	0 0 0 1 6	8	9 34	43	50	-	1.52	44	44	43	40	39	37	38	35
3	25 - 50	-	0 0 0 1 4	5	7 42	49	46	-	1.56	44	44	43	41	40	38	38	35
4	50 - 70	-	0 0 0 1 6	7	16 43	59	34	-	-	-	-	-	-	-	-	-	-

Remarks (hor. 2) : anomaly between pH 2.7 and 3.4 caused by sampling heterogeneity and difference in analytical procedure.

Hor. no.	Top	Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE SAT %	Al SAT %	EC 2.5 mS/cm
												sum	cmol(+)/kg								
1	0	10	8.0	6.9	5.5	0.53	-	36.0	1.0	0.4	0.0	37.4	-	-	23.1	53	1.9	37.4	162	-	0.22
2	10	25	8.2	6.9	6.0	0.41	-	35.5	1.1	0.4	0.0	37.0	-	-	24.0	48	1.4	37.0	154	-	0.22
3	25	50	8.2	6.5	3.5	0.23	-	34.2	1.6	0.4	0.0	36.2	-	-	24.2	53	0.8	36.2	150	-	0.15
4	50	70	8.5	6.9	8.4	0.08	-	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. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	SMEC	KAOL	MIX	QUAR	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
1	0 - 10	4	3	4	1	2	0.1	0.1	0.1	1.8	0.1	0.1	0.1	0.0	0.0
2	10 - 25	4	3	4	1	2	0.1	0.1	0.1	2.1	0.2	0.2	0.1	0.0	0.0
3	25 - 50	4	2	4	1	2	0.1	0.1	0.1	2.0	0.2	0.2	0.1	0.0	0.0
4	50 - 70	4	2	4	1	2	0.0	0.1	0.1	1.6	0.2	0.2	0.1	0.0	0.0

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

LOCATION : Fuli Commune, 5 km SE of Yangshuo, Guangxi Zhuang Autonomous Region  
 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
EP Thornthwaite	mm	5	9	13	28	70	119	155	178	167	140	94	40	21	1034
relative humidity	%		77	79	82	80	84	82	82	81	70	70	74	74	78
precipitation	mm	16	51	79	161	223	359	370	236	200	101	87	53	47	1967
no. of raindays			12	14	19	19	20	19	19	16	8	8	11	11	176
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
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

## 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 wedged-shaped) 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 wedged-shaped; 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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	7	-	1	1	1	2	1	5	5	22	26	69	-	-	-	-	-	-	-	-	-	-
2	7	20	-	1	1	1	1	1	5	5	19	24	72	-	-	-	-	-	-	-	-	-	-
3	20	44	-	0	1	1	1	1	3	1	16	17	80	-	-	-	-	-	-	-	-	-	-
4	44	62	-	0	0	0	1	0	2	2	11	13	85	-	-	-	-	-	-	-	-	-	-
5	66	97	-	0	0	1	1	1	2	2	11	13	85	-	-	-	-	-	-	-	-	-	-
6	97	120	-	0	0	1	1	1	3	2	11	13	85	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top	Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
								---	---	---	---	---	cmol(+)/kg	---	---	---	---	---	---	---	---
1	0	7	7.1	6.2	-	2.93	-	41.9	2.0	0.4	0.2	44.5	-	-	25.5	37	10.3	44.5	175	-	0.23
2	7	20	6.7	5.5	-	1.85	-	19.0	0.3	0.2	0.2	19.7	-	-	20.1	28	6.5	19.7	98	-	0.07
3	20	44	6.6	5.3	-	1.08	-	18.6	0.2	0.3	0.2	19.3	-	-	18.8	23	3.8	19.3	103	-	0.05
4	44	62	7.0	5.8	-	0.79	-	20.7	0.1	0.3	0.2	21.3	-	-	20.5	24	2.8	21.3	104	-	0.05
5	66	97	7.2	5.9	-	0.62	-	22.2	0.1	0.3	0.2	22.8	-	-	20.1	24	2.2	22.8	113	-	0.06
6	97	120	7.0	5.9	-	0.46	-	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. OXALATE(o), Na DITHION(d) &amp; PYROPH(p))

Hor. no.	Top - Bot	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)
1	0 - 7	1	6	6	2	4	2	0.4	0.3	0.0	4.5	0.9	0.1	0.2	0.1	0.1
2	7 - 20	2	5	6	2	4	2	0.3	0.3	0.0	4.8	1.0	0.1	0.2	0.3	0.1
3	20 - 44	2	5	6	2	4	2	0.2	0.2	0.0	4.8	1.2	0.2	0.2	0.4	0.1
4	44 - 62	2	4	6	2	4	2	0.1	0.3	0.0	5.0	1.1	0.2	0.1	0.2	0.1
5	66 - 97	2	4	6	2	4	2	0.1	0.2	0.0	5.0	1.1	0.2	0.1	0.2	0.1
6	97 - 120	2	4	6	2	4	2	0.1	0.2	0.0	5.1	1.1	0.1	0.1	0.2	0.1

FAO/UNESCO (1988) : Chromi-Ferralic Cambisol (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

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 : Logang Commune, approx. 30 km E of Guangzhou, Guangdong province  
 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 : Topography : rolling  
 PHYSIOGRAPHIC UNIT : hilly area  
 SLOPE Gradient : 10% Form : convex  
 POSITION OF SITE : middle slope  
 MICRO RELIEF Kind :  
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil  
 Cracking : nil Slaking/crusting : nil  
 SLOPE PROCESSES Soil erosion : slight sheet

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 Run off : rapid  
 MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

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 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
EP Thorntwaite	mm	14	20	22	44	84	152	164	178	171	148	103	59	34	1179
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
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
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 expd 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 expd tubular pores; few fine and medium roots; few very fine weathered quartz fragments; gradual wavy boundary to
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 expd 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 expd 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 expd 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 expd tubular pores; no roots; frequent very fine weathered quartz and few coarse strongly weathered granite fragments

## ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2	Spec. soil	surf. m2/g
1	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	-	
2	5	- 20	2	12	17	11	7	2	48	1	11	11	41	0.0	1.41	46	44	38	33	32	29	25	24	-	
3	25	- 45	3	14	16	10	6	2	47	2	11	13	40	0.0	1.34	48	45	35	29	29	26	25	23	-	
4	50	- 60	6	15	16	9	5	2	46	3	12	15	39	2.0	-	-	-	-	-	-	-	-	-	33	
5	60	- 80	8	14	16	9	5	2	45	2	14	16	39	0.0	1.47	44	42	35	31	31	28	29	25	-	
6	90	- 120	7	14	15	8	4	2	43	4	19	23	34	1.5	1.46	44	41	35	31	30	28	28	26	31	
7	120	- 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 (hor. 5) : anomaly between pH 2.7 and 3.4 caused by sampling heterogeneity and different analytical procedure

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	-- KCl	CaCO <sub>3</sub> %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum cmol(+)/kg	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 5	4.9	4.0	-	1.53	-	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
2	5 - 20	5.2	4.1	-	0.58	-	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
3	20 - 45	5.2	4.2	-	0.28	-	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
4	45 - 60	5.2	4.2	-	0.16	-	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
5	60 - 80	5.2	4.2	-	0.37	-	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
6	80 - 120	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
7	120 - 150	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. no.	Top - Bot	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	TiO <sub>2</sub>	MnO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub> LOSS	IGN.	SiO <sub>2</sub> /Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub> /Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub> /R <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub> /Fe <sub>2</sub> O <sub>3</sub>
4	45 - 60	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
6	80 - 120	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. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	KAOL	MIX	QUAR	GIBB	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
1	0 - 5	8	3	1	4	4	0.1	0.1	0.0	1.4	0.3	0.0	0.0	0.3	0.1
2	5 - 20	8	3	1	4	4	0.0	0.1	0.0	1.8	0.4	0.0	0.0	0.2	0.1
3	25 - 45	8	3	1	4	4	0.0	0.1	0.0	1.9	0.3	0.0	0.0	0.1	0.1
4	50 - 60	8	3	1	4	4	0.0	0.1	0.0	2.0	0.3	0.0	0.0	0.0	0.0
5	60 - 80	8	3	1	4	4	0.0	0.1	0.0	2.3	0.2	0.0	0.0	0.0	0.0
6	90 - 120	8	3	1	4	4	0.0	0.1	0.0	2.1	0.3	0.1	0.0	0.0	0.0
7	120 - 150	8	3	1	4	4	0.0	0.1	0.0	2.1	0.3	0.0	0.0	0.0	0.0

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

LOCATION : Ding Hu Shan Biosphere Res., 85 km W of Guangzhou, Guangdong Province  
 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 multivariated 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
<b>GUANGZHOU</b>															
EP Thornthwaite	mm	14	20	22	44	84	152	164	178	171	148	103	59	34	1179
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
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
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
<b>DING HU</b>															
relative humidity	%	15	77	79	85	84	85	84	80	83	80	77	69	73	80
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

## 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 desintegrating 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 18	-	0	0	5	31	20	56	9	12	20	23	-	1.15	57	56	50	42	41	35	17	14
2	18 - 35	3	0	1	5	32	21	58	8	13	20	21	-	1.46	46	45	43	36	36	31	18	15
3	35 - 45	19	0	0	6	32	17	56	9	12	21	24	-	-	-	-	-	-	-	-	-	-
4	45 - 60	-	1	1	6	32	18	57	7	13	20	23	-	-	-	-	-	-	-	-	-	-
5	70 - 100	-	0	1	5	36	17	59	6	14	21	20	-	-	-	-	-	-	-	-	-	-
6	100 - 120	-	0	0	4	50	20	74	7	12	19	8	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 18	4.2	3.6	-	2.38	-	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
2	18 - 35	4.5	3.7	-	0.83	-	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
3	35 - 45	4.7	3.8	-	0.46	-	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
4	45 - 60	4.8	4.0	-	0.34	-	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
5	70 - 100	4.9	4.1	-	0.21	-	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
6	100 - 120	5.2	4.6	-	0.05	-	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. OXALATE(o), Na DITHION(d) & PYROPH(p))

Hor. no.	Top - Bot	MICA /ILL	CHLO	KAOL	HALL	GIBB	GOET	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Si(d)	Mn(d)	Fe(p)	Al(p)
1	0 - 18	4	5	4	2	4	4	0.4	0.2	0.0	2.4	0.6	0.1	0.0	1.4	0.5
2	18 - 35	4	5	4	2	4	4	0.2	0.1	0.0	2.6	0.6	0.0	0.0	1.5	0.4
3	35 - 45	4	5	4	2	4	4	0.1	0.1	0.0	2.9	0.6	0.0	0.0	1.6	0.3
4	45 - 60	4	5	4	2	4	4	0.1	0.1	0.0	2.8	0.6	0.0	0.0	1.4	0.4
5	70 - 100	4	4	4	3	4	4	0.0	0.1	0.0	2.7	0.6	0.0	0.0	1.0	0.3
6	100 - 120	5	3	4	3	3	4	0.0	0.0	0.0	1.1	0.2	0.0	0.0	0.3	0.1

FAO/UNESCO (1988) : Silti-Cumulic 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

LOCATION : Shaanxi, 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  
 Landuse/vegetation remarks : no natural vegetation left

#### ADDITIONAL REMARKS :

Land use: local information indicates that 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 type of manuring still continues, the application is 450-600 kg/ha (30-40 jin/mu). Recently also ammonium nitrate and ammonium carbonate (NH<sub>3</sub>HCO<sub>3</sub>) are used as fertilizers.

Soil and crop management/irrigation: plowing 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
EP Penman	mm	22	0	0	87	117	155	183	183	171	111	87	57	0	968
relative humidity	%	22	63	65	67	71	71	63	73	75	81	79	75	68	71
precipitation	mm	22	7	9	26	57	64	53	114	91	112	65	28	4	630
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
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. It has a very thick, dark brown anthropogenic topsoil (0-80 cm thick), containing many small particles: coarse sand, charcoal, small gravel and pottery fragments, shells. Soil structure is strongly developed and a moderate very large columnar structure is observed between 30 to 138 cm depth. Calciumcarbonate precipitations in the form of pseudomycelia occur throughout the profile with a highest density between 114 to 138 cm depth. From 30 to 200 cm common large pores or frequently filled vertical channels occur, caused by earthworm activity. The 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 21	-	0	0	0	0	0	1	31	42	72	27	-	1.39	47	46	43	37	34	31	21	19
2	21 - 30	-	0	0	0	0	0	1	29	43	72	27	-	1.46	46	45	40	34	31	29	20	19
3	30 - 70	-	0	0	0	0	0	1	29	42	71	28	-	1.53	45	44	39	34	32	30	21	19
4	70 - 81	-	0	0	0	0	0	1	25	40	65	34	-	-	-	-	-	-	-	-	-	-
5	81 - 114	-	0	0	0	0	0	1	25	40	65	34	-	-	-	-	-	-	-	-	-	-
6	114 - 138	-	0	0	0	0	1	1	30	43	73	26	-	-	-	-	-	-	-	-	-	-
7	138 - 200	-	0	0	0	0	1	2	33	42	75	23	-	-	-	-	-	-	-	-	-	-
8	200 - 250	-	0	0	0	0	1	1	35	43	78	21	-	-	-	-	-	-	-	-	-	-
9	250 - 300	-	0	0	0	0	1	2	31	44	75	24	-	1.20	55	54	47	40	34	28	16	15

Hor. no.	Top - Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	---- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 21	8.2	7.5	3.3	0.81	-	45.0	1.9	0.6	0.0	47.5	-	-	11.7	43	2.8	47.5	406	-	0.25
2	21 - 30	8.2	7.4	2.1	0.67	-	49.1	2.0	0.5	0.0	51.6	-	-	11.9	44	2.3	51.6	434	-	0.40
3	30 - 70	8.3	7.4	1.6	0.45	-	47.8	1.9	0.4	0.1	50.2	-	-	12.2	43	1.6	50.2	411	-	0.28
4	70 - 81	8.0	7.0	0.0	0.48	-	28.8	2.0	0.4	0.3	31.5	-	-	17.9	52	1.7	31.5	176	-	0.44
5	81 - 114	8.1	7.0	0.0	0.43	-	29.6	1.9	0.3	0.4	32.2	-	-	16.7	49	1.5	32.2	193	-	0.29
6	114 - 138	8.0	7.0	3.4	0.40	-	42.1	0.8	0.2	0.0	43.1	-	-	10.6	40	1.4	43.1	407	-	0.51
7	138 - 200	8.3	7.5	4.3	0.33	-	40.9	1.2	0.2	0.5	42.8	-	-	8.9	39	1.2	42.8	481	-	0.29
8	200 - 250	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
9	250 - 300	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. OXALATE(o) &amp; Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 21	0.1	0.1	0.0	1.0	0.1	0.0
2	21 - 30	0.1	0.1	0.0	1.0	0.1	0.0
3	30 - 70	0.1	0.1	0.0	1.0	0.1	0.0
4	70 - 81	0.1	0.1	0.0	1.3	0.1	0.1
5	81 - 114	0.2	0.2	0.0	1.2	0.1	0.1
6	114 - 138	0.1	0.1	0.0	0.9	0.8	0.0
7	138 - 200	0.1	0.1	0.0	0.8	0.1	0.0
8	200 - 250	0.1	0.1	0.0	0.8	0.1	0.0
9	250 - 300	0.1	0.1	0.0	0.8	0.1	0.0

FAO/UNESCO (1988) : Sodi-Haplic Gypsisol (Siltic) (1974 : Gypsic Xerosol, sodic phase)  
 USDA/SCS SOIL TAXONOMY (1992) : Cambic Gypsiorthid, coarse-silty, mixed, frigid (1975 : Cambic Gypsiorthid)  
 CSTC (1991) : Haplic grey desert soil

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

Remarks : presence of gypsic horizon is assumed based on high exchangeable Ca and extreme base oversaturation.

LOCATION : Gansu, 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 Slaking/crusting : partly slaked  
 Cracking : nil Alkali : nil  
 Salt : 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., 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
EP Perman	mm	26	0	0	76	111	140	153	161	143	102	71	0	0	957
relative humidity	%	26	56	56	56	54	57	59	67	68	73	71	66	60	62
precipitation	mm	26	2	3	11	25	47	46	83	91	62	30	6	1	407
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
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

## 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 CaCO<sub>3</sub>, 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
B	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
Bx	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
Bxk	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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 10	TOT SILT	<2 μm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	25	-	0	0	0	0	5	5	46	34	79	16	-	1.18	57	56	53	44	35	24	10	10
2	25	62	-	0	0	0	0	5	5	44	36	80	15	-	1.14	59	58	55	47	35	22	11	10
3	62	101	-	0	0	0	0	4	5	43	37	80	16	-	-	-	-	-	-	-	-	-	-
4	101	150	-	0	0	0	0	5	6	48	33	81	14	-	1.21	57	56	52	46	40	26	11	11
5	150	190	-	0	0	0	0	5	6	45	36	81	14	-	1.19	57	57	54	49	43	32	11	10

Hor. no.	Top	Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	----	EXCH sum	AC. H+Al	CEC soil	----	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0	25	8.3	7.8	3.5	0.96	-	43.1	2.5	0.4	0.4	46.4	-	-	6.9	45	3.4	46.4	672	-	0.30		
2	25	62	8.3	8.0	3.3	0.24	-	67.2	5.7	0.2	3.8	76.9	-	-	4.8	32	0.8	76.9	***	-	0.27		
3	62	101	8.9	8.6	3.1	0.20	-	38.5	6.1	0.2	9.3	54.1	-	-	4.7	30	0.7	54.1	***	-	0.25		
4	101	150	8.9	8.7	3.6	0.17	-	51.2	6.3	0.2	8.9	66.6	-	-	3.9	28	0.6	66.6	***	-	0.28		
5	150	190	9.1	8.8	3.1	0.18	-	39.9	6.0	0.2	9.3	55.4	-	-	4.2	31	0.6	55.4	***	-	0.21		

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

## EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o) &amp; Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 25	0.1	0.0	0.0	0.6	0.0	0.0
2	25 - 62	0.1	0.0	0.0	0.6	0.0	0.0
3	62 - 101	0.1	0.0	0.0	0.7	0.0	0.0
4	101 - 150	0.1	0.0	0.0	0.6	0.0	0.0
5	150 - 190	0.1	0.0	0.0	0.7	0.0	0.0

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) : Warplic altocrylic haplo-desert soil

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

LOCATION : Gansu, 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 : intermountain 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  
 Landuse/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 riverchannels 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
EP Penman	mm	26	0	0	76	111	140	153	161	143	102	71	0	0	957
relative humidity	%	26	56	56	56	54	57	59	67	68	73	71	66	60	62
precipitation	mm	26	2	3	11	25	47	46	83	91	62	30	6	1	407
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
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

## 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 10	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 28	-	1	1	1	1	3	6	37	37	74	20	-	1.34	47	45	41	36	33	30	18	16
2	28 - 54	-	0	1	1	1	3	6	33	41	74	21	-	1.25	50	49	40	33	30	26	17	15
3	54 - 100	-	0	1	1	2	3	7	34	37	71	22	-	1.22	51	50	42	34	31	28	17	15
4	100 - 110	67	23	22	10	4	3	61	15	14	29	10	-	-	-	-	-	-	-	-	-	-
5	110 - 135	1	1	1	2	6	7	17	35	31	66	17	-	-	-	-	-	-	-	-	-	-
6	135 - 160	62	19	29	24	9	2	83	5	1	6	11	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH sum	AC. H+Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	0 - 28	8.2	7.7	2.4	0.76	-	41.1	3.2	0.4	0.2	44.9	-	-	8.1	40	2.7	44.9	554	-	0.29
2	28 - 54	8.3	7.7	2.7	0.59	-	44.8	3.9	0.3	0.1	49.1	-	-	9.0	43	2.1	49.1	546	-	0.35
3	54 - 100	8.1	7.6	2.0	0.72	-	44.8	4.3	0.3	0.1	49.5	-	-	9.8	45	2.5	49.5	505	-	0.46
4	100 - 110	8.2	7.8	0.6	0.43	-	36.3	2.6	0.1	0.3	39.3	-	-	5.4	56	1.5	39.3	728	-	0.34
5	110 - 135	8.1	7.5	1.0	0.73	-	37.1	3.8	0.1	0.2	41.2	-	-	10.3	61	2.6	41.2	400	-	0.36
6	135 - 160	8.2	7.8	0.3	0.26	-	15.5	1.6	0.1	0.0	17.2	-	-	4.9	46	0.9	17.2	351	-	0.34

## WATER SOLUBLE SALTS

Hor. no.	Top - Bot	CA	MG	NA	K	SUM CATIONS	CO3	HCO3	CL	SO4	NO3	SUM ANIONS	PH	EC5	ECE	SAR	SP
		-----mmol(+)/l-----								-----mmol(-)/l-----				---mS/cm---			
3	54 - 100	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. OXALATE(o) and Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 28	0.1	0.1	0.0	0.8	0.1	0.0
2	28 - 54	0.1	0.1	0.0	0.9	0.1	0.0
3	54 - 100	0.1	0.1	0.1	0.9	0.1	0.0
4	100 - 110	0.1	0.0	0.0	0.7	0.0	0.0
5	110 - 135	0.2	0.1	0.1	0.9	0.1	0.1
6	135 - 160	0.1	0.0	0.0	0.7	0.0	0.0

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

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

LOCATION : between Changyi and Hubuti, Xinjiang  
 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, Suaeda. 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
EP Penman	mm	17	0	0	0	99	146	165	174	152	102	59	0	0	0
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
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
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

## 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 CaCO<sub>3</sub> or gypsum were observed in the C2 horizon.

## ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2
1	0	- 6	-	0	0	1	2	10	14	29	41	71	16	-	1.42	45	43	39	30	27	24	17	15
2	6	- 36	-	0	0	0	1	11	12	32	43	74	14	-	1.38	52	50	47	40	33	24	14	12
3	36	- 77	-	0	0	0	1	21	22	33	30	63	16	-	1.37	52	50	45	39	33	26	13	11
4	77	- 125	-	0	0	0	1	13	14	30	37	67	19	-	-	-	-	-	-	-	-	-	-
5	125	- 160	-	0	0	0	1	23	24	32	24	56	20	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top	Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	---- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
1	0	- 6	8.6	8.3	3.6	0.73	-	40.7	3.6	2.7	2.2	49.2	-	-	7.6	48	2.6	49.2	647	42	3.40
2	6	- 36	8.5	8.2	3.5	0.27	-	46.4	3.6	0.9	2.4	53.3	-	-	7.4	54	0.9	53.3	720	40	4.70
3	36	- 77	8.6	8.3	2.5	0.14	-	102	3.3	0.5	7.3	113	-	-	7.2	46	0.5	113	***	43	5.40
4	77	- 125	8.7	8.3	3.0	0.15	-	43.3	3.2	0.6	3.0	50.1	-	-	6.3	34	0.5	50.1	795	46	4.60
5	125	- 160	9.0	8.4	2.9	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 estimated from saturation extract data.

## WATER SOLUBLE SALTS

Hor. no.	Top - Bot	CA	MG	NA	K	SUM CATIONS	CO <sub>3</sub>	HCO <sub>3</sub>	CL	SO <sub>4</sub>	NO <sub>3</sub>	SUM ANIONS	PH	EC5	ECE	SAR	SP
		-----mmol(+)/l-----					-----mmol(-)/l-----							---mS/cm---			
1	0 - 6	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
2	6 - 36	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
3	36 - 77	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
4	77 - 125	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
5	125 - 160	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. OXALATE(o) and Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 6	0.1	0.1	0.1	0.5	0.0	0.0
2	6 - 36	0.1	0.1	0.1	0.5	0.0	0.0
3	36 - 77	0.1	0.1	0.1	0.5	0.0	0.0
4	77 - 125	0.1	0.1	0.1	0.6	0.0	0.0
5	125 - 160	0.1	0.1	0.1	0.5	0.0	0.0

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 : torric

LOCATION : 2 km W of Changyi, Xinjiang  
 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: winterwheat (September-July), corn (April-September), rape (April-June), sunflower, flax; plowing is done by tractor, weeding and harvesting manually. Irrigation: since 200 years, 5 basin floodings per growing season of 900-1200 m<sup>3</sup>/ha (60-80 m<sup>3</sup>/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: winterwheat 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
EP Penman	mm	17	0	0	0	99	146	165	174	152	102	59	0	0	897
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
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
wind speed (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

## 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
C	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
2C1	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
2C2	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. no.	Top	Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2		
1	0	12	-	1	1	1	3	6	14	43	57	37	-	1.25	51	46	39	35	33	31	26	21	
2	12	28	-	0	1	1	2	4	7	14	42	56	38	-	-	-	-	-	-	-	-	-	
3	28	50	-	0	0	1	2	5	8	23	35	58	33	-	1.48	45	44	39	37	35	34	28	23
4	50	96	-	0	1	1	7	8	17	14	38	53	31	-	1.50	46	46	43	40	38	36	26	20
5	96	150	-	0	0	0	1	1	2	7	38	45	53	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top	Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0	12	8.1	7.3	2.2	0.89	-	46.3	3.6	0.9	0.7	51.5	-	-	19.5	53	3.1	51.5	264	-	0.46
2	12	28	8.1	7.2	2.5	0.86	-	50.2	3.6	0.9	0.6	55.3	-	-	21.1	56	3.0	55.3	262	-	0.38
3	28	50	8.2	7.3	2.3	0.61	-	48.1	3.4	0.8	0.5	52.8	-	-	18.6	56	2.1	52.8	284	-	0.34
4	50	96	8.2	7.3	1.0	0.35	-	46.9	3.1	0.5	0.4	50.9	-	-	17.4	57	1.2	50.9	293	-	0.29
5	96	150	8.1	6.9	0.9	0.45	-	42.1	4.5	0.7	0.7	48.0	-	-	29.5	56	1.6	48.0	163	-	0.41

## WATER SOLUBLE SALTS

Hor. no.	Top - Bot	CA	MG	NA	K	SUM CATIONS	CO3	HCO3	CL	SO4	NO3	SUM ANIONS	PH	EC5	ECE	SAR	SP
		-----mmol(+)/l-----					-----mmol(-)/l-----							---mS/cm---			
1	0 - 12	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
5	96 - 150	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. OXALATE(o) and Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 12	0.1	0.1	0.1	0.8	0.1	0.0
2	12 - 28	0.1	0.1	0.1	0.8	0.1	0.0
3	28 - 50	0.1	0.1	0.1	0.7	0.1	0.0
4	50 - 96	0.1	0.1	0.1	0.7	0.0	0.0
5	96 - 150	0.2	0.1	0.1	1.1	0.1	0.0

FAO/UNESCO (1988) : Petri-Sodic Solonchak (Siltic), phreatic phase  
 (1974) : Orthic Solonchak, phreatic 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

LOCATION : Turpan, Xinjiang  
 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" crumbly 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
EP Penman	mm	29	0	0	93	147	205	231	239	211	144	81	0	0	1351
relative humidity	%	29	59	46	33	27	27	29	31	36	41	49	53	62	41
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
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

## PROFILE DESCRIPTION :

Deep, imperfectly drained, brown, saline sandy loam with a thick hard, dirty white cristallized 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 8	-	0	0	0	2	15	18	35	32	66	16	-	-	-	-	-	-	-	-	-	-
2	8 - 25	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	25 - 44	-	0	0	0	1	14	15	42	34	76	9	-	0.99	69	63	57	45	30	23	17	15
4	44 - 65	-	0	0	0	1	12	14	44	31	74	12	-	1.21	58	56	50	39	33	28	20	16
5	65 - 125	-	0	0	0	3	16	19	36	30	66	15	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	--- ECEC	BASE SAT %	ESP	EC 2.5 mS/cm
1	0 - 8	8.7	8.6	2.6	1.59	-	101	15.2	1.8	6.8	125	-	-	8.5	52	5.6	125	***	77	39.00
2	8 - 25	8.6	8.4	1.1	0.38	-	59.5	16.2	0.1	61.4	137	-	-	1.3	-	1.3	137	***	55	59.00
3	25 - 44	8.5	8.2	2.9	0.46	-	154	19.1	0.8	2.9	176	-	-	8.4	95	1.6	176	***	43	14.00
4	44 - 65	8.9	8.7	3.0	0.24	-	170	11.6	0.9	2.1	184	-	-	8.7	74	0.8	184	***	52	8.90
5	65 - 125	8.5	8.2	3.0	0.28	-	202	11.9	0.7	2.8	217	-	-	9.5	65	1.0	217	***	21	6.00

Remarks : ESP estimated from saturation extract data.

## WATER SOLUBLE SALTS

Hor. no.	Top - Bot	CA	MG	NA	K	SUM CATIONS	CO3	HCO3	CL	SO4	NO3	SUM ANIONS	PH	EC5	ECE	SAR	SP
		-----mmol(+)/l-----					-----mmol(-)/l-----							---mS/cm---			
1	0 - 8	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
2	8 - 25	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
3	25 - 44	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
4	44 - 65	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
5	65 - 125	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. OXALATE(o) &amp; Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 8	0.1	0.1	0.2	0.7	0.1	0.0
2	8 - 25	0.0	0.0	0.0	0.1	0.0	0.0
3	25 - 44	0.1	0.2	0.1	0.5	0.1	0.0
4	44 - 65	0.1	0.1	0.1	0.6	0.1	0.0
5	65 - 125	0.1	0.1	0.2	0.6	0.1	0.0

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 : torric

LOCATION : about 80 km N of Urumqi, Xinjiang  
 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
EP Penman	mm	17	0	0	0	99	146	165	174	152	102	59	0	0	897
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
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
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

## 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 sandgrains 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 μm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 50	-	0	0	1	63	32	96	1	1	1	3	-	1.60	41	40	38	11	6	6	3	2
2	50 - 100	-	0	0	1	57	38	96	1	1	1	3	-	1.62	41	40	38	11	6	6	3	3

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	----	EXCH sum	AC. H+Al	CEC soil	----	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 50	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	***	-	-	0.18	
2	50 - 100	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	-	-	0.27	

## EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o) &amp; Na DITHIONITE(d))

Hor. no.	Top - Bot	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Mn(d)
1	0 - 50	0.0	0.0	0.0	0.4	0.0	0.0
2	50 - 100	0.0	0.0	0.0	0.3	0.0	0.0

FAO/UNESCO (1988) : Yermi-Calcaric Regosol, skeletal 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 : torric

LOCATION : about 40 km S of Urumqi, Xinjiang  
 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 phylum.

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				
		Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
CHANGYI															
EP Penman	mm	17	0	0	0	99	146	165	174	152	102	59	0	0	897
relative humidity	%	17	81	81	75	53	47	49	50	51	53	59	77	82	63
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
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															
relative humidity	%	14	80	81	77	54	44	45	44	42	45	57	76	82	61
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
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

## 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.

FAO/UNESCO (1988) : Vetit-Haplic Acrisol (Pachic and Chromic) (1974 : Ferric Acrisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Kandiodult, 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

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 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 :

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 from 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 interfluvies (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 m<sup>2</sup>.  
 Penetrometer readings in the moist B horizon are about 4 kg/cm<sup>2</sup>.  
 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
pan evaporation	mm	22	101	109	153	189	217	194	212	179	145	145	109	101	1853
relative humidity	%	26	84	84	82	79	80	81	81	85	87	84	84	84	83
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
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
bright sunshine	%	27	39	38	42	48	55	52	58	50	46	47	42	40	47

## 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 - 175 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 5	-	5	18	22	24	5	74	1	6	7	19	13.9	-	-	-	-	-	-	-	-	-
2	5 - 20	-	5	14	19	23	7	69	1	5	6	25	17.0	1.42	40	38	32	28	27	24	19	17
3	20 - 40	-	6	14	17	20	4	61	1	7	8	32	17.6	-	-	-	-	-	-	-	-	-
4	40 - 100	-	8	12	14	15	5	54	1	8	9	37	2.9	1.40	39	38	34	31	30	28	24	21
5	100 - 150	-	10	13	13	14	3	53	2	8	10	37	4.4	1.35	40	39	36	33	32	30	25	21
6	150 - 180	-	21	12	9	10	4	55	1	9	10	35	3.4	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	----- K	----- Na	sum	EXCH. H+Al	AC. Al	CEC soil	----- clay	----- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 5	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
2	5 - 20	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
3	20 - 40	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
4	40 - 100	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
5	100 - 150	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
6	150 - 180	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 DITHIONITEAVAIL. P  
(Bray)  
mg/kg

Hor. no.	Top - Bot	MICA /ILL	KAOL	MIX	GIBB	GOET	Fe	Al	
1	0 - 5	2	8	-	3	3	1.4	0.2	3.3
2	5 - 20	2	8	3	3	3	1.6	0.2	1.0
3	20 - 40	2	8	3	3	3	2.1	0.2	0.0
4	40 - 100	2	8	3	3	3	2.7	0.2	0.0
5	100 - 150	2	8	3	3	3	2.8	0.2	0.0
6	150 - 180	-	8	-	3	3	2.8	0.2	0.0

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

LOCATION : Hai Nan, 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 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 Paulo 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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
HAIKOU		of record													
pan evaporation	mm	27	102	96	138	182	211	197	216	178	155	160	130	110	1874
relative humidity	%	30	85	87	87	85	84	84	83	86	86	83	82	83	85
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
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
bright sunshine	%	28	38	35	40	50	60	56	63	55	54	56	51	44	51
NADA															
pot. evaporation	mm	22	101	109	153	189	217	194	212	179	145	145	109	101	1853
relative humidity	%	26	84	84	82	79	80	81	81	85	87	84	84	84	83
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
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
bright sunshine	%	27	39	38	42	48	55	52	58	50	46	47	42	40	47

## 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
Bw1	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
Bw2	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. no.	Top	-	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	-	20	-	1	1	2	5	2	11	1	12	12	77	1.9	1.10	58	56	51	43	41	37	30	27	
2	20	-	50	-	1	1	2	4	2	9	2	7	9	82	4.7	-	-	-	-	-	-	-	-	-	-
3	50	-	80	-	0	1	2	3	1	7	6	6	12	81	5.5	1.01	55	54	49	42	41	38	30	28	
4	80	-	120	-	0	1	2	3	2	8	0	11	11	81	2.0	-	-	-	-	-	-	-	-	-	-
5	120	-	200	-	1	1	2	3	2	7	1	14	15	78	2.4	1.10	55	54	52	49	48	45	34	31	
6	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. no.	Top	Bot	pH-H2O	-- KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
										K	Na	sum				clay	OrgC	ECEC			
1	0	20	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
2	20	50	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
3	50	80	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	80	120	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
5	120	200	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
6	200	300	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 DITHIONITEAVAIL. P  
(Bray)  
mg/kg

Hor. no.	Top - Bot	CHLO	KAOL	GIBB	GOET
1	0 - 20	2	6	3	3
2	20 - 50	2	6	3	3
3	50 - 80	2	6	3	3
4	80 - 120	2	6	3	3
5	120 - 200	2	6	3	3
6	200 - 300	2	6	3	3

Fe	Al
7.8	0.7
8.1	0.7
8.3	0.8
7.2	0.6
7.6	0.7
7.9	0.7

mg/kg
0.0
0.0
0.0
0.0
0.0
0.0

FAO/UNESCO (1988) : Vetit-Haplic Acrisol (Pachic and Xanthic) (1974 : Ferric Acrisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Kandudult, 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

LOCATION : Hainan, 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 Date (mm/yy) : 10/92

GENERAL LANDFORM : mountain Topography : steeply dissected  
 PHYSIOGRAPHIC UNIT : Toen-ling mountains  
 SLOPE Gradient : 40% Form : straight  
 POSITION OF SITE Kind : 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
pan evaporation	mm	20	95	101	163	200	218	195	218	185	150	127	90	84	1824
relative humidity	%	21	87	87	83	82	82	84	82	86	89	88	89	88	86
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
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
bright sunshine	%	21	33	33	44	47	49	43	50	44	39	33	29	31	40

## PROFILE DESCRIPTION :

Very deep, well drained, yellowish brown sandy clay derived from granite with a prominent thin dark topsoil.

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. no.	Top - Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	TOT SILT	<2 µm	DISP	BULK DENS	pH	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 11	-	8	17	14	12	4	55	2 16	18 27	13.8	-	-	-	-	-	-	-	-	-
2	11 - 22	-	9	16	12	9	6	52	7 14	21 27	15.5	1.23	50	48	45	42	41	38	28	21
3	22 - 46	-	10	14	10	9	4	46	5 14	20 35	19.9	1.40	44	44	41	39	38	37	32	25
4	46 - 80	-	9	13	9	7	4	42	2 13	16 42	7.4	-	-	-	-	-	-	-	-	-
5	80 - 140	-	10	11	8	8	3	40	6 13	19 41	5.5	1.27	47	46	44	42	42	40	37	27
6	140 - 200	-	7	12	9	8	5	41	4 14	18 41	3.0	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT. N %	EXCH. Ca	CAT. Mg	----	----	----	EXCH. H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 11	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
2	11 - 22	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
3	22 - 46	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
4	46 - 80	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
5	80 - 140	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
6	140 - 200	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)

CLAY MINERALOGY (1 very weak, ..., 8 very strong)								EXTRACTABLE Fe & Al by Na DITHIONITE		AVAIL. P (Bray)
Hor. no.	Top - Bot	MICA /ILL	CHLO	KAOL	MIX	GIBB	GOET	Fe	Al	mg/kg
1	0 - 11	3	3	8	3	3	3	1.0	0.2	0.0
2	11 - 22	3	3	8	3	3	3	1.1	0.2	0.0
3	22 - 46	3	3	8	3	3	3	1.6	0.3	0.0
4	46 - 80	3	3	8	3	3	3	1.9	0.4	0.0
5	80 - 140	2	3	8	3	3	3	2.0	0.4	0.7
6	140 - 200	1	2	8	2	3	3	2.1	0.4	0.0

FAO/UNESCO (1988) : Vetii-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

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, 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 and Liang Date (mm/yy) : 10/92

GENERAL LANDFORM : plain Topography : undulating  
 PHYSIOGRAPHIC UNIT : low, broad, interfluvial (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
pan evaporation	mm	25	149	132	154	166	190	170	182	159	145	161	158	153	1919
relative humidity	%	25	78	81	83	84	83	85	84	86	86	81	77	77	82
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
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
bright sunshine	%	25	57	49	49	55	61	57	63	56	54	57	57	58	56

## 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.

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. no.	Top	-	Bot	>2 mm	2000 1000	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	-	6	-	27	12	7	7	2	56	1	10	11	33	19.0	-	-	-	-	-	-	-	-
2	6	-	30	-	24	11	6	7	3	52	1	10	12	37	7.4	-	-	-	-	-	-	-	-
3	30	-	45	-	28	10	6	7	2	52	2	9	11	37	6.6	-	-	-	-	-	-	-	-
4	45	-	110	-	23	8	4	4	3	42	4	9	13	45	2.3	-	-	-	-	-	-	-	-
5	110	-	140	-	22	9	5	7	3	46	7	16	23	32	2.9	-	-	-	-	-	-	-	-
6	140	-	180	-	21	10	6	8	5	48	6	16	22	30	5.5	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT-N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
							---	----	----	----	Na sum	cmol(+)/kg	----	----	----	OrgC	ECEC			
1	0 - 6	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
2	6 - 30	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
3	30 - 45	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
4	45 - 110	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
5	110 - 140	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
6	140 - 180	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 DITHIONITEAVAIL. P  
(Bray)  
mg/kg

Hor. no.	Top - Bot	CHLO	KAOL	MIX	GIBB	GOET	Fe	Al	
1	0 - 6	2	8	2	2	4	1.8	0.3	1.9
2	6 - 30	2	8	2	2	4	1.8	0.3	2.9
3	30 - 45	2	8	2	2	4	2.0	0.4	1.1
4	45 - 110	2	8	2	2	4	2.6	0.4	0.3
5	110 - 140	2	8	2	2	4	2.0	0.2	0.8
6	140 - 180	-	8	1	2	4	2.0	0.3	0.9

FAO/UNESCO (1988) : Alumi-Orthic Acrisol (Pachic and Chromic) (1974 : Haplic Acrisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Udic Kandiuustult, 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

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, 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 anymore done, however, the litter is still frequently collected by farmers for kitchen fuel. This will still 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:													
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
relative humidity	%	27	77	79	80	80	80	80	71	72	74	72	74	76	76
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
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
bright sunshine	%	27	35	30	28	33	33	40	65	65	58	53	49	42	45

## 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 and the deep subsoil an angular blocky structure, being strongly mottled. 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 (1.0YR 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 - 250 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. no.	Top - Bot	>2 mm	2000 1000	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 μm	DISP	BULK DENS	pH	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 7	-	0	1	2	7	9	19	13	30	43	38	1.7	-	-	-	-	-	-	-	-	-
2	7 - 22	-	0	1	2	7	7	17	12	31	43	39	1.4	1.35	46	41	37	35	33	31	25	23
3	22 - 45	-	0	1	2	5	6	14	13	26	40	47	0.0	-	-	-	-	-	-	-	-	-
4	45 - 95	-	0	1	2	5	5	12	11	26	36	52	2.0	1.20	45	44	42	40	38	37	29	26
5	95 - 150	-	0	0	1	4	6	11	11	25	36	53	1.4	1.27	45	44	42	40	39	38	32	29
6	150 - 220	-	0	0	1	3	6	10	12	25	36	54	5.0	1.46	45	44	43	41	40	39	37	34
7	220 - 270	-	0	0	0	2	5	7	13	26	39	54	-	1.36	49	49	48	46	45	45	41	41
8	300 - 350	-	0	0	0	1	6	8	15	24	39	53	-	-	-	-	-	-	-	-	-	-
9	370 - 450	-	0	0	0	1	9	10	13	30	43	47	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	-----K	-----Na	sum	EXCH H+Al	AC. Al	CEC soil	-----clay	-----OrgC	-----ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 7	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
2	7 - 22	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
3	22 - 45	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
4	45 - 95	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
5	95 - 150	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
6	150 - 220	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
7	220 - 270	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
8	300 - 350	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
9	370 - 450	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)

Hor. no.	Top - Bot	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	GOET	EXTRACTABLE Fe by Na DITHIONITE	Fe & Al	Fe	Al	AVAIL. P (Bray) mg/kg
1	0 - 7	2	2	2	5	3	4	1	2.1	0.3			0.0
2	7 - 22	2	2	2	5	3	3	1	2.1	0.3			0.0
3	22 - 45	2	2	2	5	3	3	2	2.7	0.3			0.0
4	45 - 95	2	2	2	5	3	2	1	3.2	0.4			0.0
5	95 - 150	3	2	2	6	3	2	2	3.4	0.3			0.0
6	150 - 220	3	2	2	6	3	1	2	4.3	0.4			0.0
7	220 - 270	3	2	2	6	3	-	2	6.7	0.5			0.1
8	300 - 350	4	3	3	6	3	-	2	5.6	0.4			0.0
9	370 - 450	4	3	3	4	3	-	1	4.0	0.3			0.0

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

LOCATION : Jiangxi, 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  
 Landuse/vegetation remarks : Near site arable farming; crops: tea, buck-wheat, tunip, 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.  
 The soil is comparable to similar soils in e.g. Zimbabwe, Mocambique.

CLIMATE : Köppen: Ca  
 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
relative humidity %	27	77	79	80	80	80	80	71	72	74	72	74	76	76
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
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
bright sunshine %	27	35	30	28	33	33	40	65	65	58	53	49	42	45

## 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.

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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 8	-	0	1	3	23	27	54	1	16	17	29	0.9	-	-	-	-	-	-	-	-	-
2	8 - 22	-	0	1	3	14	29	47	7	15	23	31	1.5	1.45	42	40	36	33	31	29	24	23
3	22 - 46	-	0	1	3	21	19	43	6	14	20	37	1.5	-	-	-	-	-	-	-	-	-
4	46 - 95	-	0	1	2	14	25	41	7	13	20	39	1.5	1.38	43	43	39	36	35	33	29	27
5	95 - 140	-	0	1	3	19	20	42	7	13	19	39	1.9	1.45	42	42	40	38	37	36	30	27
6	140 - 180	-	0	0	2	14	28	45	5	13	18	37	22.3	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	-----	-----	-----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 8	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
2	8 - 22	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
3	22 - 46	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
4	46 - 95	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
5	95 - 140	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
6	140 - 180	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 by Na DITHIONITE		AVAIL. P (Bray)	
Hor. no.	Top - Bot	MICA /ILL	CHLO	KAOL	MIX	QUAR	GOET	Fe	Al	mg/kg	
1	0 - 8	1	4	5	3	2	3	1.4	0.4	0.3	
2	8 - 22	1	4	5	3	2	3	1.8	0.4	0.0	
3	22 - 46	1	4	6	4	1	3	2.1	0.5	0.0	
4	46 - 95	1	4	6	4	-	3	2.6	0.4	0.0	
5	95 - 140	1	4	5	3	-	3	2.6	0.4	0.0	
6	140 - 180	1	4	5	3	-	3	2.5	0.4	0.0	

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

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

GENERAL LANDFORM : plain Topography : undulating  
 PHYSIOGRAPHIC UNIT : low broad interfluvium  
 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: Ca  
 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
relative humidity %	27	77	79	80	80	80	80	71	72	74	72	74	76	76
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
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
bright sunshine %	27	35	30	28	33	33	40	65	65	58	53	49	42	45



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

LOCATION : Jiangxi, 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 / Z. Ganlin Date (mm/yy) : 11/92

GENERAL LANDFORM : plain Topography : undulating  
 PHYSIOGRAPHIC UNIT : low, broad, smooth interfluvium  
 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  
 Landuse/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 interfluvium 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: Ca  
 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
relative humidity %	27	77	79	80	80	80	80	71	72	74	72	74	76	76
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
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
bright sunshine %	27	35	30	28	33	33	40	65	65	58	53	49	42	45

## PROFILE DESCRIPTION :

Deep, moderately well drained, yellowish brown loam; the weathered sandstone is found at a depth of 2 meter.

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 - 210 cm	Sand with sandstone fragments

## ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT SAND	50 20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2					
1	0 - 18	-	0	3	9	24	28	65	8	15	23	13	-	1.45	39	38	35	28	24	21	17	13
2	18 - 30	-	0	3	7	21	14	44	7	20	27	29	-	-	-	-	-	-	-	-	-	-
3	30 - 70	-	0	2	5	13	9	28	7	26	33	39	-	1.41	45	44	42	40	39	38	29	28
4	70 - 110	-	0	2	7	15	14	38	7	23	30	32	-	1.43	44	43	42	40	38	37	29	26
5	110 - 140	-	0	3	9	34	16	63	8	13	21	17	-	-	-	-	-	-	-	-	-	-
6	140 - 170	-	0	3	10	25	25	63	5	9	14	23	-	-	-	-	-	-	-	-	-	-
7	170 - 200	-	0	2	12	34	14	63	5	8	14	24	-	-	-	-	-	-	-	-	-	-
8	200 - 240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT-N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 18	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
2	18 - 30	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
3	30 - 70	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
4	70 - 110	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
5	110 - 140	4.7	4.0	-	0.00	0.01	1.8	0.3	0.1	0.0	2.2	1.6	1.4	3.0	18	0.0	3.8	73	47	0.02
6	140 - 170	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
7	170 - 200	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
8	200 - 240	4.8	3.9	-	0.00	0.00	6.1	1.0	0.1	0.1	7.3	3.9	3.4	-	-	0.0	11.2	-	-	0.03

## CLAY MINERALOGY (1 very weak, ..., 8 very strong)

EXTRACTABLE Fe & Al  
by Na DITHIONITEAVAIL. P  
(Bray)  
mg/kg

Hor. no.	Top - Bot	MICA /ILL	CHLO	SMEC	KAOL	MIX	QUAR	GOET	Fe	Al	
1	0 - 18	1	2	2	4	3	3	1	0.6	0.1	20.8
2	18 - 30	2	2	2	4	3	3	2	1.6	0.4	0.3
3	30 - 70	2	2	2	4	3	3	2	1.6	0.5	0.2
4	70 - 110	2	2	2	4	3	3	2	1.5	0.4	0.3
5	110 - 140	2	2	2	4	3	3	3	0.8	0.2	3.8
6	140 - 170	2	2	2	4	4	2	5	1.9	0.3	6.2
7	170 - 200	2	2	4	3	4	2	5	1.8	0.3	0.2
8	200 - 240	1	-	4	3	4	1	-	0.1	0.1	0.5

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

LOCATION : 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/ Van Engelen, V./ Zhang Date (mm/yy) : 11/92

GENERAL LANDFORM : plain Topography : undulating  
 PHYSIOGRAPHIC UNIT : summit of broad interfluvium  
 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 the terracing.

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

CLIMATE :		Köppen: Ca													
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
pan evaporation	mm	12	43	43	67	103	165	183	290	239	146	111	82	66	1539
relative humidity	%	12	83	85	85	83	80	81	72	77	81	80	79	76	80
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	6.6	6.5	8.4	10.3	13.6	15.0	19.1	18.2	13.7	11.1	8.9	8.6	11.7
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
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

## 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 - 146 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
	146 - 200 cm	Red (2.5YR 4/8, moist) clay

## ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 11	-	1	1	2	4	4	12	20	42	62	26	10.3	1.23	46	43	39	34	34	29	22	19
2	11 - 50	-	0	0	0	1	2	3	10	34	44	53	1.0	1.30	47	45	41	38	38	36	35	32
3	50 - 90	-	0	0	0	1	2	3	10	34	44	53	2.3	-	-	-	-	-	-	-	-	-
4	90 - 145	-	0	1	1	1	3	5	11	33	44	51	1.5	1.49	42	42	41	40	39	38	36	32
5	190 - 200	-	0	1	1	1	5	8	13	32	46	47	-	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 11	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			
2	11 - 50	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			
3	50 - 90	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			
4	90 - 145	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			
5	190 - 200	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 AMM. Na DITHIONITE) / AVAIL. P (Bray) mg/kg

Hor. no.	Top - Bot	MICA /ILL	VERM	KAOL	MIX	QUAR	GOET	Fe	Al	
1	0 - 11	4	3	4	3	2	1	2.0	0.2	2.4
2	11 - 50	4	3	5	3	1	2	3.2	0.4	1.0
3	50 - 90	4	3	5	3	1	2	3.3	0.4	1.2
4	90 - 145	4	3	5	3	1	1	3.3	0.4	0.5
5	190 - 200	4	3	6	3	1	2	3.5	0.3	0.2

FAO/UNESCO (1988) : Humi-Dystric Cambisol (Alumic) (1974 : Dystric Cambisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrichrept, coarse-loamy, mixed, mesic (1975 : Umbric Dystrichrept)  
 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

LOCATION : Yanshan, Wuyi Mountains Natural Reserve  
 Latitude : 27°50' 0'' N Longitude : 117°19' 0'' E Altitude : 1800 m a.s.l.  
 AUTHOR(S) : Luo/ Van Engelen, V./ Zhang 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  
 Cracking : Average size : 20 cm  
 Salt : nil Slaking/crusting : nil  
 SLOPE PROCESSES Soil erosion : nil Alkali : nil  
 Slope stability : locally unstable Aggradation : nil

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 tchekiensis 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: Ca														
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	
pan evaporation mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642	
relative humidity %	12	81	83	83	82	79	81	74	76	79	78	78	76	79	
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	
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	

## 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. no.	Top - Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 10	-	5	8	6	5	3	27	5	29	35	39	-	-	-	-	-	-	-	-	-
2	10 - 25	-	5	8	6	5	2	27	6	32	38	36	-	-	-	-	-	-	-	-	-
3	25 - 80	-	9	15	11	9	5	49	6	22	28	23	-	-	-	-	-	-	-	-	-
4	80 - 100	-	8	16	15	17	6	61	9	17	26	13	-	-	-	-	-	-	-	-	-

Hor. no.	Top - Bot	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT-N %	EXCH Ca	CAT. Mg	-----K	Na	sum	EXCH H+Al	AC. Al	CEC soil	-----clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0 - 10	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
2	10 - 25	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
3	25 - 80	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
4	80 - 100	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 &amp; Al (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	Top - Bot	MICA /ILL	CHLO	KAOL	QUAR	GIBB	Fe	Al	P mg/kg
1	0 - 10	2	4	4	3	4	1.6	0.4	2.3
2	10 - 25	2	4	4	3	4	1.6	0.6	0.9
3	25 - 80	3	4	4	3	4	0.7	0.3	4.0
4	80 - 100	4	-	4	1	2	0.3	0.1	2.0

FAO/UNESCO (1988) : Alumi-Dystric Cambisol (Xanthic), lithic phase (1974 : Dystric Cambisol, lithic phase)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrichrept, fine, mixed, thermic (1975 : Umbric Dystrichrept)  
 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

LOCATION : 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/ Van Engelen, V./ Zhang 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 wheathered 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: Ca													
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
pan evaporation	mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642
relative humidity	%	12	81	83	83	82	79	81	74	76	79	78	78	76	79
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
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

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	undecomposed 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
R	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

PHYSICAL DATA																								
Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 μm	DISP	BULK DENS	pF- 0.0	---	---	---	---	---	---	---	---
1	0	8	-	8	10	9	10	7	43	8	19	28	30	-	-	-	-	-	-	-	-	-	-	
2	15	40	-	6	8	9	11	5	39	8	18	26	36	-	0.92	58	52	43	34	33	28	22	18	
3	50	80	-	19	21	15	14	7	75	14	3	17	8	-	-	-	-	-	-	-	-	-	-	
Hor. no.	Top	Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	AT SAT %	EC 2.5 mS/cm		
1	0	8	4.7	4.0	-	5.18	0.39	1.6	0.7	0.6	0.0	0.0	2.9	2.9	2.8	15.9	53	18.1	5.8	18	18	0.07		
2	15	40	4.5	4.1	-	1.75	0.15	0.0	0.0	0.1	0.1	0.1	0.2	3.7	3.7	9.7	27	6.1	3.9	2	38	0.02		
3	50	80	5.0	4.1	-	0.01	0.00	0.0	0.0	0.2	0.0	0.2	0.2	1.6	1.4	4.4	53	0.0	1.8	5	32	0.02		

Hor. no.	Top - Bot	MICA /ILL	VERM	CHLO	KAOL	MIX	QUAR	Fe	Al	P mg/kg
1	0 - 8	2	2	2	6	4	2	1.3	0.4	1.3
2	15 - 40	2	1	1	5	3	1	1.6	0.5	0.2
3	50 - 80	2	1	1	4	3	-	0.9	0.1	4.8

FAO/UNESCO (1988) : Alumi-Haplic Alisol (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

LOCATION : 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/ Van Engelen, V./ Zhang 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  
 Landuse 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: Ca													
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
pan evaporation	mm	12	74	80	138	192	215	219	178	186	143	96	72	49	1642
relative humidity	%	12	81	83	83	82	79	81	74	76	79	78	78	76	79
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
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

## 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 moderate 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
Bt	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
2Bt1	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
2Bt2	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. no.	Top	Bot	>2 mm	2000 1000	1000 500	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2	
1	0	5	-	4	4	10	11	4	33	9	14	22	45	22.4	0.85	52	43	37	32	31	28	23	20
2	15	40	-	5	4	8	7	3	27	5	15	19	54	2.1	1.22	48	46	42	38	38	36	35	27
3	50	60	-	6	6	9	10	4	34	10	16	25	41	2.6	-	-	-	-	-	-	-	-	-
4	70	85	-	5	4	8	7	4	27	8	8	16	57	0.0	-	-	-	-	-	-	-	-	-
5	90	110	-	6	8	16	12	3	45	5	12	16	38	0.5	1.23	48	45	41	37	37	35	32	28

Hor. no.	Top	Bot	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	0	5	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
2	15	40	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
3	50	60	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
4	70	85	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
5	90	110	4.6	3.9	-	0.06	0.01	0.4	0.0	0.0	0.0	0.4	3.0	2.7	-	-	0.2	3.4	-	-	0.01

## CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe &amp; Al (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	Top - Bot	CHLO	KAOL	GOET	Fe	Al	P mg/kg
1	0 - 5	6	8	3	2.1	0.5	0.2
2	15 - 40	5	8	3	2.8	0.7	0.0
3	50 - 60	5	8	3	2.4	0.5	0.0
4	70 - 85	5	8	3	2.7	0.5	0.0
5	90 - 110	5	8	3	2.0	0.4	0.0

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

LOCATION : 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/ Van Engelen, V./ Zhang Date (mm/yy) : 11/92

GENERAL LANDFORM : mountain Topography : mountainous  
 PHYSIOGRAPHIC UNIT : higher part lower mountains  
 SLOPE Gradient : 30% Aspect : NNE Form : complex  
 POSITION OF SITE Kind : 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 boundary : 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 R horizon. It is assumed that the moderately weathered stones occurring in the 2Bt 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
pan evaporation	mm	26	79	67	80	98	116	124	174	163	151	139	112	88	1388
relative humidity	%	27	73	78	81	82	84	85	81	82	80	75	72	72	79
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
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
bright sunshine	%	26	37	26	21	22	26	31	51	49	48	49	49	44	38

## 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
Bt	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 impeded tubular pores; slightly porous; common very fine roots throughout; few channels; clear wavy boundary to
2Bt	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 impeded tubular pores; slightly porous; few very fine roots throughout; frequent medium strongly weathered shale fragments; no biological activity; clear irregular boundary to
R	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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 μm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	15	-	0	1	1	5	12	19	19	20	40	42	-	0.73	54	42	36	32	31	27	19	17
2	20	40	-	0	1	1	8	9	18	12	30	41	40	-	-	-	-	-	-	-	-	-	-
3	50	70	-	1	1	2	6	11	21	12	30	41	38	-	1.30	46	43	39	36	36	33	33	25
4	70	90	-	1	2	3	13	10	29	16	36	52	19	-	-	-	-	-	-	-	-	-	-
5	100	120	-	1	4	7	18	17	48	11	29	40	13	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	--- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	--- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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 DITHIONITE) / AVAIL. P (Bray)

Hor. no.	MICA /ILL	VERM	CHLOR	KAOL	MIX	GOET	Fe	Al	P mg/kg
1	4	1	2	4	3	2	1.6	0.3	0.6
2	4	2	3	4	3	3	1.9	0.3	0.0
3	4	3	3	4	3	3	2.0	0.3	0.0
4	4	2	3	4	2	3	1.7	0.2	0.0
5	4	2	2	4	2	4	1.6	0.2	0.0

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Dystrachrept, fine, mixed, thermic (1975 : Typic Dystrachrept)  
 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

LOCATION : 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/ Van Engelen, V./ Zhang Date (mm/yy) : 11/92

GENERAL LANDFORM : intermontane basin Topography : undulating  
 PHYSIOGRAPHIC UNIT : broad smooth interfluvium  
 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
pan evaporation	mm	20	103	86	100	111	148	157	204	188	184	177	148	118	1722
relative humidity	%	24	71	77	82	83	84	85	81	83	79	74	70	70	78
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
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
bright sunshine	%	24	36	25	20	19	28	31	52	50	52	53	55	48	39

## 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.

Ah	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
2Ah	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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2
1	0	10	-	1	2	8	16	6	33	8	15	23	44	9.4	-	-	-	-	-	-	-	-	-
2	10	15	-	1	2	8	16	9	35	8	13	21	44	4.4	1.39	45	42	36	31	29	28	26	25
3	20	40	-	0	2	7	18	7	34	7	14	21	45	5.9	1.33	47	44	40	35	32	30	26	24
4	40	60	-	0	1	7	16	10	34	7	14	22	44	4.6	-	-	-	-	-	-	-	-	-
5	70	90	-	1	1	7	16	6	31	9	15	24	45	6.2	1.17	48	47	40	33	31	30	26	25
6	110	140	-	0	1	6	15	9	32	8	13	21	47	7.6	1.24	47	47	41	35	33	31	28	26
7	175	200	-	0	1	7	18	7	34	4	17	21	45	7.4	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
no.						Ca	Mg	K	Na	sum	cmol(+)/kg								
1	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
2	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
3	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	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
5	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
6	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
7	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 (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	MICA /ILL	CHLOR	KAOL	MIX	GIBB	GOET	Fe	Al	P mg/kg
1	2	4	4	4	2	2	2.7	0.7	0.2
2	2	4	4	4	2	2	2.7	0.7	0.4
3	2	4	4	4	2	2	2.4	0.6	0.1
4	2	4	4	4	2	2	2.4	0.6	0.2
5	2	4	4	4	2	2	2.5	0.6	0.2
6	2	4	4	4	2	2	2.6	0.6	0.0
7	2	4	4	4	2	2	2.1	0.5	0.0

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

LOCATION : 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/ Van Engelen, V./ Zhang 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 there 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
pan evaporation	mm	26	79	67	80	98	116	124	174	163	151	139	112	88	1388
relative humidity	%	27	73	78	81	82	84	85	81	82	80	75	72	72	79
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
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
bright sunshine	%	26	37	26	21	22	26	31	51	49	48	49	49	44	38

## 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. no.	Top - Bot mm	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 2 TOT <2 µm	DISP	BULK DENS	pF- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 5	-	2 2 3 5 6	17 9 28 37 46	16.5	-	- - - - - - - -
2	10 - 20	-	4 2 2 5 4	17 11 20 31 52	29.8	1.35	46 44 40 37 36 34 33 28
3	25 - 50	-	2 2 3 4 13	8 22 31 57	35.8	1.31	43 41 37 34 33 32 31 27
4	55 - 75	-	5 3 2 4 3	18 7 20 27 56	37.2	-	- - - - - - - -
5	90 - 110	-	5 3 2 3 4	17 7 18 25 57	32.8	1.53	41 40 40 38 37 36 31 29
6	130 - 165	-	9 12 7 4 1	33 9 19 28 39	34.7	-	- - - - - - - -

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	--- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	--- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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	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
6	7.6	6.8	2.3	0.71	0.12	45.0	0.0	0.1	0.0	45.1	0.0	0.0	20.4	52	2.5	45.1	221	0	0.20

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe & Al (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	MICA /ILL	VERM	CHLO	KAOL	GOET	TALC	Fe	Al	P mg/kg
1	-	1	6	4	2	1	2.5	0.4	0.7
2	-	1	6	4	2	1	2.7	0.5	0.1
3	-	1	6	4	2	1	3.1	0.5	0.0
4	-	1	6	4	2	1	2.9	0.4	0.1
5	-	1	6	4	2	1	3.0	0.5	0.0
6	4	4	3	6	2	1	3.6	0.5	0.0

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

LOCATION : 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/ Van Engelen, V./ Zhang 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
pan evaporation	mm	20	103	86	100	111	148	157	204	188	184	177	148	118	1722
relative humidity	%	24	71	77	82	83	84	85	81	83	79	74	70	70	78
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
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
bright sunshine	%	24	36	25	20	19	28	31	52	50	52	53	55	48	39

## 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.

Ah	0 - 8 cm	Dark yellowish brown (10YR 4/6, moist) to yellowish brown (10YR 5/4, dry) slightly gravelly sandy clay loam; leaves, undecomposed; 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
R	130 - 250 cm	Yellow (10YR 7/8, moist) highly weathered biotite granite

## ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT	50	20	TOT	<2 µm	DISP	BULK DENS	pH	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 8	-	12	17	9	6	2	46	1	17	18	36	-	-	-	-	-	-	-	-	-	-	-
2	8 - 20	-	15	13	7	5	2	42	2	16	18	40	-	-	-	-	-	-	-	-	-	-	-
3	20 - 36	-	9	11	8	5	2	35	1	17	17	48	-	-	-	-	-	-	-	-	-	-	-
4	36 - 55	-	13	15	8	5	2	43	2	15	17	40	-	-	-	-	-	-	-	-	-	-	-
5	55 - 75	-	18	10	5	4	1	38	3	13	15	47	-	1.29	46	43	39	36	35	34	34	29	-
6	90 - 120	-	14	8	5	4	3	33	3	15	18	49	-	-	-	-	-	-	-	-	-	-	-
7	140 - 160	-	12	13	10	11	4	51	7	18	25	25	-	-	-	-	-	-	-	-	-	-	-
8	200 - 220	-	14	20	14	11	7	66	7	17	24	10	-	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH-H <sub>2</sub> O	--KCl	CaCO <sub>3</sub> %	ORG-C %	MAT-N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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
6	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
7	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
8	4.8	4.0	-	0.04	0.01	0.2	0.0	0.1	0.0	0.3	7.4	5.7	-	-	0.1	7.7	-	-	0.01

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe &amp; Al (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	MICA /ILL	CHLO	SMEC	KAOL	GIBB	GOET	Fe	Al	P mg/kg
1	2	3	-	8	1	1	1.4	0.2	3.0
2	2	3	-	8	1	1	1.5	0.2	0.0
3	3	3	-	8	1	1	1.4	0.3	0.0
4	3	3	-	8	1	1	1.5	0.3	0.0
5	3	3	-	8	1	1	1.5	0.3	0.0
6	3	3	-	8	1	1	1.6	0.3	0.0
7	3	3	3	6	1	1	1.7	0.3	0.0
8	3	-	4	4	1	1	0.7	0.1	0.0

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; fluvisol and gleyic properties, sulfidic materials  
 USDA/SCS (1992) : ochric epipedon; aquic conditions, sulfidic materials  
 Soil moisture regime : aquic

LOCATION : 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/ Van Engelen, V./ Zhang 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 Kind : 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  
 Landuse/vegetation remarks : irrigation/drainage channels, 2 crops/yr

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 5YR5/8.  
 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
EP Thorntwaite	mm	14	20	22	44	84	152	164	178	171	148	103	59	34	1179
relative humidity	%		74	80	82	84	83	83	80	81	77	71	76	71	78
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
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 :

Deep, poorly drained, dark brown to grayish 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; 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	Grayish 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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	10	-	1	1	1	3	3	10	24	29	54	37	-	0.89	64	62	55	51	49	46	37	30
2	10	25	-	1	1	2	21	25	51	17	12	29	20	-	-	-	-	-	-	-	-	-	-
3	25	45	-	0	1	1	2	5	8	12	44	56	37	-	-	-	-	-	-	-	-	-	-
4	45	68	-	0	0	0	6	17	23	20	33	52	25	-	1.16	55	55	54	52	52	49	38	32
5	68	110	-	0	0	0	15	52	68	12	10	22	11	-	-	-	-	-	-	-	-	-	-
6	150	200	-	3	2	2	3	4	13	8	23	30	56	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	--- sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	--- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	5.6	5.2	-	2.65	0.25	17.6	1.4	0.1	0.5	19.6	0.0	0.0	17.9	49	9.3	19.6	109	0	0.52
2	6.5	6.1	0.7	1.71	0.17	17.0	1.4	0.1	0.5	19.0	0.0	0.0	17.9	88	6.0	19.0	106	0	0.42
3	6.3	5.7	-	1.21	0.13	14.5	1.8	0.1	0.2	16.6	0.0	0.0	16.6	45	4.2	16.6	100	0	0.32
4	3.1	3.0	-	2.20	0.13	10.1	2.4	0.1	0.1	12.7	8.9	6.5	12.6	50	7.7	21.6	101	52	2.40
5	4.8	4.5	-	1.41	0.08	11.1	3.8	0.1	0.2	15.2	0.3	0.0	8.9	80	4.9	15.5	171	0	1.80
6	6.8	6.8	0.9	2.13	0.10	19.7	2.7	0.1	0.2	22.7	0.0	0.0	14.2	25	7.5	22.7	160	0	1.40

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe &amp; Al (by Na DITHIONITE) / AVAIL. P (Bray)

Hor. no.	MICA /ILL	VERM	CHLO	KAOL	QUAR	FELD	Fe	Al	P mg/kg
1	4	4	4	6	1	1	2.1	0.2	7.4
2	4	4	4	4	1	1	2.2	0.2	4.2
3	5	4	4	6	1	1	2.4	0.2	1.2
4	5	4	4	5	1	1	1.6	0.1	0.1
5	4	3	3	4	1	-	1.7	0.1	0.7
6	-	2	6	4	-	2	1.6	0.1	0.0

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

LOCATION : Chaoyang, Liaoning province  
 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  
 Landuse/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
pan evaporation	mm	29	42	65	145	279	389	300	233	194	178	151	86	46	2109
relative humidity	%	29	44	40	38	38	41	60	73	74	64	55	50	46	52
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	448.0	519.2	523.4	594.5	540.1	506.6	502.4	523.4	498.2	435.4	418.7	5941.1
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
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
bright sunshine	%	29	71	73	68	63	63	57	52	57	69	71	70	71	65

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).

## 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 lined 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 lined tubular pores and few medium vertical continuous tubular pores; common very fine roots; few worm channels; locally slightly calcareous (10% HCl)

## ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	15	-	0	1	1	2	12	16	35	20	55	30	-	1.29	49	48	44	35	33	22	18	15
2	20	40	-	0	0	0	1	10	11	32	23	56	33	-	-	-	-	-	-	-	-	-	-
3	40	60	-	0	0	0	1	12	14	31	21	53	34	-	1.30	47	45	39	32	31	25	23	18
4	70	100	-	0	0	0	1	14	15	32	19	52	34	-	1.38	44	41	36	31	30	25	23	19
5	110	140	-	0	0	0	1	17	18	30	19	49	33	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	QUAR
1	3	3	4	3	2
2	3	3	5	3	2
3	3	3	5	3	2
4	3	3	5	3	2
5	3	3	4	3	2

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

LOCATION : Daoshuzi, 3 km W of Xinchengzi, Shenyang Province  
 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: XINCHEGZI	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
XINCHEGZI															
pan evaporation	mm	24	30	50	100	190	310	240	160	150	145	110	50	30	1606
relative humidity	%	24	62	58	56	58	58	70	82	80	72	68	66	62	66
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
bright sunshine	h/d		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
SHENGYANG															
pan evaporation	mm	29	21	36	87	182	255	211	179	155	133	99	50	25	1432
relative humidity	%	30	64	58	54	53	55	68	78	79	72	68	65	64	60
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	217.8	291.2	455.7	549.6	641.7	600.1	555.1	521.5	469.9	363.4	235.1	190.0	5091.1
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
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
bright sunshine	%	30	58	62	63	61	60	54	48	53	65	63	58	55	58

## 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. no.	Top	-	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2
1	5	-	20	-	0	0	0	0	7	8	29	33	62	30	-	1.29	47	44	39	35	34	31	29	21
2	25	-	35	-	0	0	0	0	4	4	24	31	55	41	-	-	-	-	-	-	-	-	-	-
3	40	-	65	-	0	0	0	0	9	10	32	26	58	33	-	1.35	45	45	42	39	39	36	29	19
4	80	-	100	-	0	0	0	0	7	8	28	26	54	39	-	1.28	47	46	43	40	40	36	31	22
5	125	-	140	-	0	0	0	0	11	11	30	25	55	34	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE OrgC	AL SAT	EC 2.5 SAT	2.5 mS/cm
						---	----	----	----	--	cmol(+)/kg	--	----	----	----	----	%	%		
1	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	
2	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	
3	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	
4	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	
5	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)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR
1	3	2	5	3	3	2
2	4	2	5	3	2	2
3	3	2	4	3	3	2
4	3	2	5	3	3	2
5	3	3	5	3	3	2

Remarks (hor. 1 - 5): MIX : vermiculite-chlorite

FAO/UNESCO (1988) : Silti-Chromic Luvisol (1974 : Chromic Luvisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Udic Haplustalf, fine-silty, mixed, mesic (1975 : Udic Haplustalf)  
 LOCAL CLASSIFICATION : Argillic brown soil

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

LOCATION : Ynda, Dongling district, Liaoning Province  
 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 derived from :  
 Depth lithological boundary : 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
<b>DONGLING</b>															
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		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
<b>SHENGYANG</b>															
pan evaporation	mm	29	21	36	87	182	255	211	179	155	133	99	50	25	1432
relative humidity	%	30	64	58	54	53	55	68	78	79	72	68	65	64	60
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	217.8	291.2	455.7	549.6	641.7	600.1	555.1	521.5	469.9	363.4	235.1	190.0	5091.1
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
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
bright sunshine	%	30	58	62	63	61	60	54	48	53	65	63	58	55	58

## 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. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 2 SILT	<2 µm	DISP	BULK DENS	pH- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 15	-	3 4 4 3 6	19 33 26 59 22	-	-	-	-
2	20 - 30	-	1 1 1 1 5	7 20 37 57 36	-	1.45	42 41 39 36 36 33 29 19	-
3	35 - 60	-	1 1 0 0 5	7 28 32 59 34	-	1.48	40 37 35 33 32 30 30 21	-
4	75 - 100	-	1 1 1 1 4	8 25 32 57 36	-	-	-	-
5	105 - 120	-	27 15 7 5 2	55 6 9 15 30	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH AC. H+Al Al	CEC soil	----	----	---	BASE SAT %	Al SAT %	EC 2.5 mS/cm	
						----	----	----	----	---	cmol(+)/kg	--	----	----	----	----	----		
1	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
2	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
3	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
4	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
5	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)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR
1	3	3	3	3	2	-
2	4	4	4	3	2	2
3	4	4	4	4	2	1
4	4	4	4	4	2	2
5	4	1	4	5	2	1

FAO/UNESCO (1988) : Hypoglossi-Albic Luvisol (Siltic)  
 USDA/SCS SOIL TAXONOMY (1992) : Eutric Glossoboralf, fine, mixed  
 CSTC (1991) : Haplic dark brown soil  
 (1974 : Albic Luvisol)  
 (1975 : Typic Glossoboralf)

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 : Changbaishan Forest, Antu County, Jilin Province  
 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  
 Landuse/vegetation remarks : mixed broad-leaf/coniferous forest (Korea pine / broadleaved 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 walnut, 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".  
 USDA/SCS (1992) classification: the soil is very close to Oxyaquic Paleboralfs.

CLIMATE : Köppen: Dwb  
 Station: CHANGBAI 42 24 N/128 06 E 750 m a.s.l. 2 km W of site Relevance: very good  
 ANTU (SONGJIANG) 42 32 N/128 15 E 591 m a.s.l. 19 km NE of site Relevance: good

		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
ANTU (SONGJIANG)															
pan evaporation	mm	23	19	31	70	144	228	174	162	135	113	89	42	22	1227
relative humidity	%	23	72	69	66	61	62	78	84	86	81	71	72	73	73
precipitation	mm	23	7	9	14	40	67	105	146	143	73	35	22	9	670
no. of raindays		23	10	8	10	11	13	17	19	17	13	10	10	9	146
T mean	°C	23	-18.5	-14.9	-5.3	4.3	11.6	15.9	19.8	18.5	11.4	3.7	-5.6	-14.6	2.2
T max	°C	23	-9.2	-5.5	2.1	12.3	20.2	23.4	26.3	25.2	20.0	12.9	2.5	-6.2	10.3
T min	°C	23	-26.5	-23.5	-12.6	-3.4	2.8	8.8	14.1	13.1	4.5	-4.1	-12.7	-22.0	-5.1
windspeed(at 2m)	m/s	23	1.8	2.0	2.6	2.8	2.5	1.7	1.4	1.2	1.4	1.9	2.2	2.0	2.0
bright sunshine	h/d	23	5.5	6.6	6.8	7.2	7.8	7.2	6.7	6.3	6.7	6.6	5.5	5.0	6.5
bright sunshine	%	23	58	62	59	54	54	47	45	46	54	60	57	55	54

Remarks: extensive climatic data are also available in ISIS for Fusongdonggang (42 06'N, 127 34'E; about 55 km SW of site; altitude 774 m a.s.l.; relevance: moderate).

## 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 tubular pores 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. no.	Top - Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2		
1	0 - 12	-	0	1	2	1	1	6	14	48	62	32	9.2	-	-	-	-	-	-	-		
2	18 - 30	-	0	3	4	2	1	10	12	56	68	22	12.5	1.43	41	39	37	36	36	35	30	17
3	45 - 80	-	0	0	1	1	1	2	8	36	44	54	29.0	1.42	44	44	43	42	41	41	40	34
4	95 - 120	-	0	0	0	1	0	1	6	40	46	53	25.6	-	-	-	-	-	-	-	-	
5	120 - 150	-	0	0	0	1	0	1	9	43	52	47	23.0	-	-	-	-	-	-	-	-	

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	--- sum	EXCH H+Al	AC. Al	CEC soil	----- clay	OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	QUAR
1	3	3	4	3	2
2	2	4	3	3	2
3	3	3	5	3	2
4	4	3	8	3	2
5	3	3	6	3	2

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 : 7 km S of Zhaodong, Heilongjiang Province  
 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															
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
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	183.5	260.4	419.8	495.5	570.6	587.5	569.7	514.5	418.6	311.1	199.4	148.8	4679.5
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
bright sunshine	%	30	64	67	66	58	57	56	53	56	61	60	62	58	60

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 CN039).

## 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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH	---	---	---	---	---	---	---	---
				0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2													
1	1	14	-	0	0	0	1	24	26	27	16	43	32	9.3	1.05	54	52	48	39	36	32	27	20	
2	17	30	-	0	0	0	1	21	23	25	16	41	36	27.4	1.30	49	49	49	49	49	48	37	32	
3	40	60	-	0	0	0	0	16	17	30	14	44	40	37.9	1.32	53	53	53	53	53	50	39	31	
4	65	85	-	0	0	0	0	13	14	27	19	47	40	39.7	-	-	-	-	-	-	-	-	-	
5	100	140	-	0	0	0	0	9	9	28	23	51	40	27.3	-	-	-	-	-	-	-	-	-	

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE SAT %	ESP	EC 2.5 mS/cm
1	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
2	9.6	7.8	2.8	2.04	0.24	44.0	4.9	0.2	16.2	65.3	0.1	0.0	29.3	80	7.1	65.4	223	55	0.94
3	10.0	8.2	6.1	0.78	0.09	37.0	7.7	0.3	21.0	66.0	0.0	0.0	24.3	61	2.7	66.0	272	86	1.10
4	9.9	8.3	8.5	0.44	0.05	35.3	9.9	0.1	16.8	62.1	0.0	0.0	21.9	55	1.5	62.1	284	77	1.00
5	9.6	8.0	7.8	0.35	0.04	39.9	11.2	0.1	9.1	60.3	0.0	0.0	19.2	48	1.2	60.3	314	47	0.66

## CLAY MINERALOGY (1 very weak, ..., 8 very strong)

Hor. no.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	FELD
1	3	3	6	3	2	1
2	3	3	6	3	2	1
3	3	3	6	3	2	1
4	3	3	4	4	3	2
5	3	3	6	4	2	2

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 : km 14 S of Zhaozhou, Heilongjiang Province  
 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  
 Landuse/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. Plowing 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 practiced; 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 (CN038) 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													
ZHAODONG			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
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															
pan evaporation	mm	28	10	22	81	196	307	272	229	196	154	104	38	12	1620
relative humidity	%	28	71	66	54	47	49	63	74	74	68	61	65	70	64
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	336.6	212.7	156.2	5037.6
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
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
bright sunshine	%	27	69	72	73	63	61	56	61	66	66	66	62	64	65

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 CN038).

## 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. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT	50 20	TOT	<2 µm	DISP	BULK DENS	pF	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 15	-	0	0	0	1	17	18	31	16	46	36	-	-	-	-	-	-
2	15 - 22	-	0	0	0	1	17	18	29	17	46	37	-	1.23	48	45	41	38
3	22 - 35	-	0	0	0	1	17	18	29	17	46	37	-	-	-	-	-	-
4	40 - 70	-	0	0	0	0	13	13	32	17	49	38	-	1.14	50	49	43	37
5	100 - 135	-	0	0	0	0	10	11	32	22	54	36	-	1.31	47	46	41	36
6	200 - 220	-	0	0	0	0	15	15	35	21	56	29	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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
6	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)

Hor. no.	MICA /ILL	CHLO	SMEC	KAOL	QUAR
1	3	2	4	3	2
2	3	1	6	3	2
3	3	3	8	3	2
4	3	2	6	3	2
5	3	3	7	3	2
6	3	3	7	3	2

FAO/UNESCO (1988) : Silti-Haplic Greyzem (Chromic)  
 USDA/SCS SOIL TAXONOMY (1992) : Boralfic Argiboroll, fine, mixed (1974 : Orthic Greyzem)  
 CSTC (1991) : Luvic chernozem (1975 : Boralfic Argiboroll)

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 : Gaosheng, Yagou, Acheng County, Heilongjiang Province  
 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  
 Landuse/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 (CN040), 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															
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
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	183.5	260.4	419.8	495.5	570.6	587.5	569.7	514.5	418.6	311.1	199.4	148.8	4679.5
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	7.8	8.5	8.7	8.1	7.9	7.6	6.6	5.8	5.1	7.2
bright sunshine	%	30	64	67	66	58	57	56	53	56	61	60	62	58	60

## 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 impeded 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 impeded tubular pores; no roots; non calcareous (10% HCl)
Cg	180 - 220 cm	silty clay

Remarks : Ah horizon not sampled.

## ANALYTICAL DATA :

Hor. no.	Top	-	Bot	>2 mm	2000 1000	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0	-	20	-	0	1	1	1	5	8	37	29	67	26	9.2	1.34	46	43	42	40	37	34	27	18
2	30	-	50	-	0	0	0	0	3	4	35	43	78	19	9.9	1.57	38	35	34	32	31	29	23	15
3	60	-	90	-	0	0	0	0	1	2	29	33	62	37	10.5	1.58	39	37	37	36	35	34	33	27
4	110	-	140	-	0	0	0	0	1	1	22	40	62	37	3.7	-	-	-	-	-	-	-	-	-
5	200	-	220	-	0	0	0	0	1	1	27	37	64	35	11.3	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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	-	0.11
2	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	-	0.04
3	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	0.03
4	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	0.02
5	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	-	0.03

## CLAY MINERALOGY (1 very weak, ..., 8 very strong)

Hor. no.	MICA /ILL	CHLO	SMEC	KAOL	QUAR
1	3	3	4	3	2
2	3	4	3	3	2
3	3	4	5	3	2
4	3	3	6	3	2
5	3	3	6	3	2

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 : Bangpu, km 38 road Harbin - Suihua, Heilongjiang Province  
 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  
 SOLE 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, higher yields were obtained. Only small quantities of manure were applied. The level of mechanization is rather low, plowing 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) netto 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													
HULAN			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
precipitation	mm	26	3	3	10	24	40	70	150	107	61	23	5	5	500
T mean	°C	26	2.0	4.0	22.0	54.0	95.0	140.0	175.0	166.0	109.0	65.0	26.0	6.0	864.0
HARBIN															
pan evaporation	mm	30	11	23	78	190	295	246	205	170	139	99	40	14	1509
relative humidity	%	30	74	70	58	51	51	66	77	78	71	65	67	73	67
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	183.5	260.4	419.8	495.5	570.6	587.5	569.7	514.5	418.6	311.1	199.4	148.8	4679.5
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	7.8	8.5	8.7	8.1	7.9	7.6	6.6	5.8	5.1	7.2
bright sunshine	%	30	64	67	66	58	57	56	53	56	61	60	62	58	60

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).

## 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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2
1	0	25	-	0	0	0	0	7	8	28	26	54	38	-	1.30	46	42	41	38	36	34	31	25
2	35	65	-	0	0	0	0	6	7	32	21	53	41	-	1.23	50	44	42	38	35	33	30	23
3	75	105	-	0	0	0	0	4	4	30	29	60	36	-	1.41	45	42	41	38	36	35	32	23
4	120	150	-	0	0	0	0	2	2	30	38	68	30	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE OrgC	AL ECEC	EC 2.5 SAT	2.5 SAT
			%	%	%	----	----	----	----	--	cmol(+)/kg	--	----	----	----	----	%	%	mS/cm	
1	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	
2	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	
3	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	
4	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)

Hor. no.	MICA /ILL	CHLO	SMEC	KAOL	QUAR	FELD
1	3	2	8	3	2	1
2	3	2	8	3	1	-
3	3	2	7	3	1	1
4	3	3	8	3	1	1

FAO/UNESCO (1988) : Epiandi-Eutric Leptosol, skeletal phase (1974 : Eutric Regosol, petric phase)  
 USDA/SCS SOIL TAXONOMY (1992) : Typic Ustorthent, ashy-skeletal, mixed, frigid (1975 : Typic Ustorthent)  
 CSTC (1991) : Cinderic andisol

DIAGNOSTIC CRITERIA FAO (1988) : ochric A horizon; andic properties  
 USDA/SCS (1992) : ochric epipedon; andic soil properties  
 Soil moisture regime : ustic

LOCATION : Heilungshan volcano, Wudalianchi, Heilongjian Province  
 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  
 Landuse/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 Kangxi. 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 lavaflow 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 plowing since plowing 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	
BEIJAN															
pan evaporation	mm	30	5	12	48	126	226	197	169	143	109	72	19	5	1121
precipitation	mm	30	3	3	6	22	40	84	144	118	79	24	7	4	534
T mean	°C	30	-24.1	-19.6	-8.1	3.4	11.8	18.0	20.7	18.6	11.8	2.3	-10.8	-21.4	

Remarks: additional climatic data 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).

## 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. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT 50 20	TOT <2	DISP	BULK DENS	pF	---	---	---	---	---	---	---	---	---
			1000 500 250 100 50	SAND 20 2	SILT 6 2			0.0 1.0	1.5	2.0	2.3	2.7	3.4	4.2			
1	0 - 20	-	34 25 14 10 3	85 6 4	9 6	-	-	-	-	-	-	-	-	-	-	-	-
2	20 - 50	-	30 28 14 9 6	87 6 3	9 4	-	-	-	-	-	-	-	-	-	-	-	-
3	60 - 110	-	39 28 12 9 4	92 4 2	6 2	-	-	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	7.5	6.8	1.1	0.04	0.00	0.8	0.8	0.1	0.3	2.0	-	-	4.6	219	0.1	2.0	43	-	0.10

## CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si (by AMM. OXALATE) / P-RETENTION / PH NaF

Hor. no.	MICA /ILL	KAOL	MIX	QUAR	Fe	Al	Si	P-ret. %	pH NaF
1	3	2	3	1	0.3	0.2	0.2		7.5
2	-	-	-	-	0.2	1.2	0.8		8.1
3	-	-	-	-	0.1	0.3	0.3		7.5

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

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

LOCATION : 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 Xiaoping 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 boundary : 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  
 Landuse/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. For similar reasons the Pale-classification in Soil Taxonomy 1975 is disregarded.

CLIMATE :		Köppen: Caw													
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															
pan evaporation	mm	20	196	195	255	251	216	148	161	166	141	139	159	190	2217
relative humidity	%	20	72	67	59	59	69	79	83	84	83	82	80	76	75
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
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		13.8	16.2	18.5	19.6	18.7	15.3	13.3	14.8	16.2	14.0	13.8	13.5	15.6
bright sunshine	%	23	55	56	66	63	50	33	36	38	38	36	47	55	47

## 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. no.	Top	Bot	>2 mm	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK DENS	pF-	---	---	---	---	---	---	---
									SAND			SILT	µm			0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	13	-	1	2	4	9	6	21	7	12	19	60	33.8	1.18	50	48	42	35	33	31	28	26
2	13	35	-	1	2	4	10	8	24	7	11	18	58	37.3	1.33	47	46	41	37	34	32	30	29
3	35	85	-	1	1	1	2	2	7	6	15	20	73	2.1	1.13	56	55	50	45	43	41	38	36
4	85	-	-	1	1	1	2	1	6	4	5	9	86	1.1	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	5.8	5.9	-	0.25	0.04	6.8	0.3	0.2	0.0	7.3	-	-	7.8	11	0.9	7.3	94	-	0.11
4	4.8	4.1	-	0.23	0.03	1.9	1.0	0.3	0.1	3.3	2.4	1.7	8.3	10	0.8	5.7	39	20	0.04

## CLAY MINERALOGY (1 very weak, ..., 8 very strong) / AVAILABLE P (Bray &amp; Olsen)

Hor. no.	MICA /ILL	CHLO	KAOL	MIX	FELD	GIBB	GOET	AVAIL. Bray	P mg/kg Olsen
1	3	4	4	2	1	4	2	11.7	12.9
2	3	4	4	2	1	4	2	3.6	11.8
3	2	3	4	3	2	5	1	0.7	4.4
4	3	3	4	3	2	4	1	0.8	3.5

FAO/UNESCO (1988) : Alumi-Ferralic Cambisol (Chromic) (1974 : Ferralic Cambisol)  
 USDA/SCS SOIL TAXONOMY (1992) : Fluventic Umbric Dystrachrept, fine, kaolinitic, hyperthermic  
 (1975) : Fluventic Umbric Dystrachrept  
 CSTC (1991) : Haplic latosol

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

LOCATION : Menglun, roadcut 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 boundary : 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  
 Landuse/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: Am													
Station: MENGLA		21 29 N/101 34 E				632 m a.s.l.				59 km SE of site				Relevance: poor	
		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
pan evaporation	mm	24	103	129	170	188	192	145	133	133	139	129	106	92	1660
relative humidity	%	24	87	81	79	79	82	87	89	90	88	88	88	89	86
precipitation	mm	24	29	22	40	95	172	234	308	309	150	100	48	32	1540
no. of raindays		24	6	5	6	13	19	24	25	25	17	13	9	8	172
tot.glob.rad.	MJ/m2		10.6	13.0	15.1	16.8	17.7	14.5	13.4	13.7	14.7	12.8	11.0	9.8	0.0
T mean	°C	24	15.2	16.6	19.6	22.6	24.3	24.7	24.5	24.2	23.6	21.8	18.8	15.8	21.0
T max	°C	24	24.5	26.9	30.3	32.1	31.7	30.4	29.7	29.6	30.0	28.6	26.4	24.1	28.7
T min	°C	24	11.0	11.2	13.5	17.2	20.2	21.9	22.0	21.8	20.8	18.7	15.4	12.3	17.2
windspeed(at 2m)	m/s	24	0.6	0.7	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.6
bright sunshine	h/d	24	5.2	6.0	6.3	6.3	6.2	4.3	3.8	4.0	5.1	5.0	4.9	4.6	5.1
bright sunshine	%	24	47	52	52	50	48	33	29	32	42	43	44	43	43

## 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. no.	Top - Bot	>2 2000 mm 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	--- 1.0	--- 1.5	--- 2.0	--- 2.3	--- 2.7	--- 3.4	--- 4.2
1	0 - 40	- 0	1	3	14	18	36	16	14	31	34	10.2	1.12	50	45	39	34	31	28	23	22
2	40 - 70	- 1	1	3	14	15	33	14	15	29	37	17.7	1.21	44	37	33	31	30	29	26	25
3	70 - 98	- 0	1	3	12	19	35	13	15	28	37	16.7	-	-	-	-	-	-	-	-	-
4	98 - 175	- 0	0	2	14	16	33	12	16	27	40	13.7	1.36	45	44	39	35	34	32	29	28
5	175 - 260	- 0	1	2	11	18	32	13	15	28	40	5.4	-	-	-	-	-	-	-	-	-
6	260 - 355	- 0	1	2	13	16	33	17	13	30	37	2.5	-	-	-	-	-	-	-	-	-
7	355 - 420	- 0	2	8	23	12	45	8	35	43	12	0.0	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	-----	-----	---	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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
6	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
7	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 &amp; Olsen)

Hor. no.	MICA /ILL	CHLO	SMC	KAOL	MIX	QUAR	FELD	GOET	AVAIL. Bray	P mg/kg Olsen
1	2	2	-	7	6	1	1	2	2.1	6.8
2	2	2	-	7	6	1	1	2	0.7	0.6
3	2	2	-	7	7	1	1	2	0.7	0.6
4	2	2	-	7	7	1	1	2	0.7	0.6
5	2	2	-	7	7	1	-	2	0.7	2.4
6	2	2	-	6	6	-	-	2	0.0	2.4
7	4	-	2	5	-	2	2	2	0.7	0.6

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

LOCATION : 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 boundary : 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  
 Landuse/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: Caw													
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
pan evaporation	mm	36	219	260	355	340	262	288	175	174	176	193	108	113	2664
relative humidity	%	36	65	61	58	59	63	70	72	77	75	74	73	71	68
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		12.2	14.8	17.7	19.0	15.8	15.9	16.6	15.8	12.6	12.0	11.5	15.2	15.2
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
windspeed(at 2m)	m/s	36	3.8	4.2	4.7	2.9	2.6	2.3	1.9	1.2	1.4	1.8	2.3	1.3	2.6
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
bright sunshine	%	26	61	64	66	60	52	37	38	44	48	45	53	59	52

## 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 17	-	4	6	6	9	7	32	7	9	17	51	27.2	1.10	45	41	37	33	30	28	22	17
2	17 - 40	-	3	4	5	7	7	26	8	7	15	59	33.9	1.35	45	45	39	36	34	32	31	26
3	40 - 55	-	6	6	6	7	6	31	8	9	17	53	32.0	1.39	43	42	37	33	31	30	27	23
4	55 - 80	-	12	11	8	9	7	47	6	10	15	38	25.1	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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 &amp; Olsen)

Hor. no.	MICA /ILL	SMC	KAOL	MIX	AVAIL. P mg/kg Bray	Olsen
1	4	3	6	3	1.8	2.5
2	4	3	6	3	0.0	0.6
3	4	3	6	3	0.0	1.9
4	4	3	6	3	0.7	4.9

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

LOCATION : 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 boundary : 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  
 Landuse/vegetation remarks : Leucaena planted in 1991

CLIMATE : Köppen: Caw  
 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
pan evaporation mm	20	263	326	478	544	530	353	299	235	28	205	195	202	3848
relative humidity %	20	45	36	32	35	45	62	66	72	69	68	63	56	54
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		13.9	15.9	19.5	21.3	20.2	17.0	16.7	17.1	14.6	13.4	13.3	12.7	16.3
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
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
bright sunshine %	24	78	76	74	70	59	43	43	48	50	52	67	74	60

## 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 aggradated.

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. no.	Top	Bot	>2 mm	2000 1000	1000 500	250 250	100 100	50 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	10	-	1	2	5	30	20	58	8	9	18	25	18.0	1.62	38	38	38	34	31	29	19	17
2	10	28	-	2	2	4	19	14	40	9	18	27	33	23.0	-	-	-	-	-	-	-	-	-
3	28	46	-	2	2	2	4	4	13	4	28	32	55	36.5	1.47	46	45	41	39	37	35	32	30
4	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. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE ESP	EC 2.5	
											cmol(+)/kg		clay	OrgC	ECEC	SAT %		mS/cm	
1	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
2	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
3	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
4	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 &amp; Olsen)

Hor. no.	MICA /ILL	SMC	KAOL	MIX	QUAR	GOET	AVAIL. Bray	P mg/kg Olsen
1	4	6	4	2	2	2	6.1	4.1
2	4	6	4	2	2	2	2.2	5.7
3	4	6	4	2	2	2	15.4	3.4
4	4	6	4	2	2	1	0.7	1.6

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

LOCATION : Lubacan village, Gaofeng municipality, Pingba County  
 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  
 Form : platy, flat Stoniness : very few stones  
 Cracking : nil Average size : 15 cm  
 Salt : nil Slaking/crusting : 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  
 Landuse/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 (CHA48) are also classified as Yellow Soils within the Chinese classification system. The different geomorphological units form part of the broad Pingba basin.

CLIMATE :		Köppen: Caw													
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															
relative humidity	%	21	83	83	80	79	81	82	83	84	83	84	83	84	82
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
bright sunshine	%	21	16	18	26	34	28	25	43	45	36	24	23	17	30
ANSUN															
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		5.7	7.1	10.2	13.3	13.3	12.7	15.6	15.1	12.4	8.5	6.9	5.5	10.5
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

## 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. no.	Top	-	Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	2 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	---	---	---	---	---	---	---	---
1	0	-	15	-	1	1	1	1	6	6	30	36	58	-	1.26	56	54	52	48	46	43	42	37
2	15	-	50	-	0	0	0	1	2	2	29	31	67	-	1.09	62	61	60	58	58	57	49	44
3	50	-	110	-	0	0	1	2	4	3	34	37	60	-	1.08	64	64	63	63	62	62	50	46
4	110	-	140	-	0	1	2	2	6	3	39	42	53	-	-	-	-	-	-	-	-	-	-
5	140	-	-	-	0	1	2	3	6	5	41	47	47	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	---	EXCH H+Al	AC. Al	CEC soil	----	----	---	BASE EC	Al SAT	EC 2.5 mS/cm
1	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
2	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
3	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
4	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
5	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 &amp; Olsen)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	MIX	GOET	AVAIL. P mg/kg Bray	P mg/kg Olsen
1	3	3	2	5	5	3	8.4	8.8
2	3	3	2	5	5	3	0.0	1.6
3	4	2	2	5	5	4	0.0	0.4
4	4	2	2	5	4	4	0.0	1.8
5	4	2	2	5	4	4	0.0	1.9

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

LOCATION : 200 m NE of Gaofeng railway station, Pingba County  
 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  
 Landuse/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 CHA47, 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: Caw														
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															
relative humidity %	21	83	83	80	79	81	82	83	84	83	84	83	84	82	
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	
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		5.7	7.1	10.2	13.3	13.3	12.7	15.6	15.1	12.4	8.5	6.9	5.5	10.5	
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	

## 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. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	---	---	---	---	---	---	---	---	---
1	0	10	-	0	0	0	0	0	1	6	19	25	75	-	1.17	55	54	53	49	47	45	38	36		
2	10	38	-	0	0	0	0	0	1	4	17	22	78	-	1.15	59	58	57	56	55	55	41	39		
3	38	110	-	0	0	0	1	0	2	13	11	24	74	-	1.11	61	60	59	59	58	58	41	39		
4	110	250	-	0	0	0	1	1	2	4	10	15	84	-	-	-	-	-	-	-	-	-	-		

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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 &amp; Olsen)

Hor. no.	MICA /ILL	CHLO	KAOL	GIBB	GOET	AVAIL. Bray	P mg/kg Olsen
1	2	5	4	4	3	0.7	1.6
2	2	5	4	4	3	0.0	0.6
3	2	4	4	4	3	0.0	1.7
4	3	4	4	4	3	0.0	1.7

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

LOCATION : Gaofeng municipality, about 2 km from village, Pingba County  
 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, 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  
 Landuse/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 (CN047) and quaternary clay (CN048). 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: Caw  
 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															
relative humidity	%	21	83	83	80	79	81	82	83	84	83	84	83	84	82
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
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		5.7	7.1	10.2	13.3	13.3	12.7	15.6	15.1	12.4	8.5	6.9	5.5	10.5
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

## 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. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 35	-	2	2	2	2	2	10	7	37	44	46	-	1.15	57	56	53	49	45	42	38	33
2	35 - 115	-	1	1	1	2	2	7	2	21	23	70	-	1.19	55	54	52	50	49	48	39	35
3	115 - 140	-	1	1	1	2	2	7	3	20	24	70	-	1.26	57	56	55	54	53	52	44	42

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum	EXCH H+Al	AC. Al	CEC soil	----- clay	OrgC	ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	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
2	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
3	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 &amp; Olsen)

Hor. no.	MICA /ILL	CHLO	KAOL	MIX	QUAR	GOET	AVAIL. P mg/kg Bray	Olsen
1	2	4	4	3	2	1	0.8	2.0
2	2	4	4	3	2	1	0.0	0.6
3	3	4	4	4	-	2	0.0	0.6

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

LOCATION : 20 m from weather station of SAAS fieldstation, Songtao, Ziyang County  
 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 boundary : 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  
 Landuse/vegetation remarks : intercropping of five crops

CLIMATE :		Köppen: Caw													
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
EP Penman	mm	29	32	45	72	99	125	125	132	139	99	67	53	36	719
relative humidity	%	29	81	80	74	73	73	78	82	81	84	84	83	83	80
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		6.2	7.2	9.9	12.0	13.4	14.0	16.6	16.1	10.5	7.3	6.1	5.4	10.4
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
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
bright sunshine	%	24	18	20	30	34	31	32	42	48	27	19	19	17	29

## 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 expd-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 expd-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. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 2 SILT	<2 µm	DISP	BULK DENS	pF- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 25	-	2 2 2 4 11	21 19 34	53 26	18.8	1.48	39 37 33 31 30 28 24 20
2	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. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	---- K	---- Na	sum	EXCH. H+Al	AC. Al	CEC soil	---- clay	---- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	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
2	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 &amp; Olsen)

Hor. no.	MICA /ILL	VERM	SMEC	KAOL	MIX	QUAR	FELD	GOET	AVAIL. P mg/kg Bray	Olsen
1	4	2	5	3	3	2	1	2	0.7	8.0
2	4	2	5	3	3	2	1	1	0.0	1.9

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

LOCATION : Valley bottom near SAAS fieldstation, Songtao, Ziyang County  
 Latitude : 30° 6' 0'' N Longitude : 104°45' 0'' E Altitude : 392 m a.s.l.  
 AUTHOR(S) : Vogel, A.W., Wang Mingzhu, Huang Xiaoping 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  
 Landuse/vegetation remarks : paddy intercropped with soybeans

CLIMATE : Köppen: Caw  
 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
EP Penman mm	29	32	45	72	99	125	125	132	139	99	67	53	36	719
relative humidity %	29	81	80	74	73	73	78	82	81	84	84	83	83	80
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		6.2	7.2	9.9	12.0	13.4	14.0	16.6	16.1	10.5	7.3	6.1	5.4	10.4
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
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
bright sunshine %	24	18	20	30	34	31	32	42	48	27	19	19	17	29

## PROFILE DESCRIPTION :

Deep, very poorly drained, reddish brown silty clay to silt loam developed in alluvial and colluvial deposits derived from sandstone/shale. The profile was at the moment of description completely saturated but shows no mottling or clear hydromorphic properties. Due to the lack of sufficient water the rice cannot be irrigated continuously and soybeans are sown as an emergency crop. 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. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50	TOT SAND	50 20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 20	-	2	2	2	2	5	12	10	33	43	45	19.1	-	-	-	-	-
2	20 - 55	-	1	2	2	3	12	19	17	30	47	35	14.4	1.44	50	50	49	48
3	55 - 105	-	2	2	2	2	9	16	26	39	65	19	13.5	-	-	-	-	-
4	105 -	-	2	2	2	3	16	23	24	27	51	25	12.5	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	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
2	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
3	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
4	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 &amp; Olsen)

Hor. no.	VERM	SMEC	KAOL	MIX	QUAR	FELD	AVAIL. P mg/kg
1	3	5	3	3	2	2	9.4
2	3	5	3	3	2	1	7.0
3	3	5	3	3	2	1	0.0
4	3	5	3	3	2	1	1.8

## ANALYTICAL DATA (field-moist samples) :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50	TOT SAND	50 20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 20	-	2	2	2	2	5	12	13	30	43	45	23.9	-	-	-	-	-
2	20 - 55	-	2	2	2	2	6	13	14	30	45	43	20.9	-	-	-	-	-
3	55 - 105	-	2	2	2	3	17	25	24	27	50	25	14.8	-	-	-	-	-
4	105 -	-	2	2	2	4	15	24	22	26	48	28	18.8	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm	AVAIL. P mg/kg
1	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
2	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
3	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
4	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



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## APPENDIX 2 FIELD METHODS

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, if available, the local classification.

All data are stored in ISIS version 4.0 (ISRIC, 1994), ISRIC's soil pedon data management system for micro computers. The information given on the soil data sheets in this publication have been generated from the ISIS files.

## APPENDIX 3 ANALYTICAL METHODS

### 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<sub>2</sub>O

(1:2.5): 20 g of soil is shaken with 50 ml of deionised water for 2 hours, electrode in upper part of suspension.

### pH-KCl

Likewise but shaken with 1 M KCl.

### EC

(1:2.5): Conductivity of pH-H<sub>2</sub>O suspension.

### Particle-size distribution

Soil is treated with 15% hydrogen peroxide overnight in the cold, then on waterbath at about 80°C. 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 dried and weighed. Clay and silt determined by pipetting from sedimentation cylinder.

### Water-dispersable clay

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 1M ammonium acetate pH7 using automatic extractor.

(If EC>0.5mS pre-leaching with ethanol 80%). Cations are determined in the leachate by AAS.

CEC: saturation with sodium acetate 1M pH7; washed with ethanol 80% and then leached with ammonium acetate 1M pH7. Na determined by FES.

### Exchangeable acidity and aluminium

The sample is extracted with 1 M KCl solution and the exchange 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<sub>2</sub>SO<sub>4</sub> with Se as catalyst. Then ammonia is distilled, trapped in boric acid and titrated with standard acid.

### P-Bray 1

Phosphate is extracted with a mixture of 0.025 M HCl + 0.03 M NH<sub>4</sub>F and determined colorimetrically.

**P-Olsen**

Phosphate is extracted with 0.5 M NaHCO<sub>3</sub> solution pH 8.5 and determined colorimetrically.

**P-retention**

Blakemore et al. Shaken with (KH<sub>2</sub>PO<sub>4</sub> + NaAc) solution, 1000 mg/L P pH 4.6 for 16 hours.

Determination of residual P colorimetrically after centrifuging.

**pH-NaF**

To 1g of soil 50 ml of NaF 1M is added and stirred for 1 minute.

Reading pH by continuous stirring exactly 2 minutes after adding NaF solution.

**Extractable iron, aluminium, manganese and silicon**

All determinations by AAS.

1. "Free" (Fe, Al, Mn): Holmgren Shaken with sodium citrate (17%) + sodium dithionite (1.7%) solution for 16 hours.
2. "Active" (Fe, Al, Si): Shaken with acid ammonium acetate 0.2 M pH 3 for 4 hours in the dark.
3. "Organically bound" (Fe, Al): Shaken with sodium pyrophosphate 0.1 M for 16 hours.

**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 and analyzed using a Philips 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, K are measured by AAS. Cl with the Chlorocounter and SO<sub>4</sub> 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 is dried, ignited and fused with lithium tetraborate.

The formed bead is analyzed by X-ray fluorescence spectroscopy.

**Moisture retention**

Moisture determinations on undisturbed core samples in silt box (pF1.0; 1.5; 2.0) and kaolinite box (pF2.3; 2.7) respectively and on disturbed samples in high pressure pan (pF3.4; 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 CN001 to CN033. Slides of later 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
CN009	7690	erosion/conservation	loess terrace of Wei river basin
CN009	7691	other	one of numerous sites for loess digging
CN009	7692	profile	site
CN009	7693	profile	profile
CN009	7694	profile	profile
CN009	7695	profile details	profile close-up top
CN009	7696	profile details	profile close-up structure
CN009	7697	profile details	profile close-up fungus like CaCO <sub>3</sub>
CN009	7698	profile details	profile close-up CaCO <sub>3</sub> horizon
CN009	7699	profile details	prof. cl.up filled in earthworm channels
CN009	7700	other	digging loess
CN009	7702	other	village nearby CN009
CN009	7703	land use	land use: irrigation channel
CN010	7713	profile	profile
CN010	7714	profile	profile
CN010	7715	profile details	profile close-up topsoil
CN010	7716	profile details	profile close-up subsoil white speckles
CN010	7717	vegetation	vegetation
CN010	7718	vegetation	vegetation
CN010	7719	landscape	landscape site CN010
CN010	7720	land use	terraced landscape irrigated
CN010	7721	land use	land use
CN010	7722	other	ploughing
CN010	7723	other	ploughing
CN011	7731	profile	profile
CN011	7732	profile	profile (fujichrome)
CN011	7733	profile	profile (ektachrome)
CN011	7734	profile details	profile close-up gravel layer
CN011	7735	land use	land use / landscape
CN011	7736	land use	land use / landscape
CN011	7737	land use	irrigation channel (secondary)
CN011	7738	land use	irrig. struct.(split secondary & terti.)
CN011	7739	land use	irrigation structure (drop + split)
CN011	7741	maps	relief map intermontane plain of Yu-Zhon
CN011	7740	land use	irrigation structure, side look

CN012	7748	profile	profile (fujichrome)
CN012	7749	profile	profile (ektachrome)
CN012	7750	profile details	profile, close-up topsoil
CN012	7751	profile details	profile, close-up subsoil
CN012	7752	profile details	profile, close-up soil surface (+ clods)
CN012	7753	profile details	cl.up struct.slaked topsoil
CN012	7754	profile details	profile, close-up
CN012	7755	landscape	landscape + vegetation (fujichrome)
CN012	7756	landscape	landscape + vegetation (ektachrome)
CN012	7757	vegetation	landscape + vegetation general overview
CN012	7758	vegetation	landsc.+ veg.: close-up flowing Anabase
CN012	7759	vegetation	landscape + vegetation: herb
CN013	7769	profile	profile
CN013	7770	profile	profile
CN013	7771	profile details	profile topsoil
CN013	7772	profile details	profile subsoil (mottling or coating)
CN013	7773	land use	land use
CN013	7774	land use	irrigation canal (secondary)
CN013	7775	land use	irrigation canal (secondary)
CN013	7776	land use	irrigation canal + split structure
CN013	7777	land use	irr.can.+ inlet to field(basin flooding)
CN013	7778	land use	irrigation canal
CN014	7785	profile	profile
CN014	7786	profile	profile
CN014	7787	profile details	profile close up topsoil salt crust zone
CN014	7788	profile details	profile close-up subsoil
CN014	7789	landscape	landscape + vegetation
CN014	7790	landscape	landscape + vegetation
CN014	7791	vegetation	vegetation: Alhagi spp.
CN015	7801	profile	profile
CN015	7802	profile	profile
CN015	7803	profile details	profile, close-up shallow subsoil
CN015	7804	landscape	landscape
CN015	7805	landscape	landscape
CN015	7806	landscape	landscape nearby site
CN015	7807	vegetation	vegetation
CN015	7808	other	monolith sampling(moistering of the sand
CN016	7809	profile	site
CN016	7810	profile	profile
CN016	7811	profile	profile
CN016	7812	landscape	landscape + vegetation
CN016	7813	landscape	landscape + vegetation
CN016	7814	other	monolith sampling

CN016	7815	other	monolith sampling
CN025	13891	landscape	rice terraces abandoned
CN025	13892	landscape	rice fields
CN025	13893	profile	truncated B-horizon
CN025	13894	profile details	Bt2 horizon, clay cutans
CN025	13895	profile details	transition Ap-Bt1
CN025	13896	profile details	Bt1 horizon
CN026	13897	landscape	Tsuga tchekiangensis
CN026	13898	landscape	summit Wuyi Mts
CN026	13899	people	Huanggang Shan
CN026	13900	profile	profile + rotten granite
CN026	13901	profile	in situ weathering of granite
CN026	13902	profile details	A and Bw horizons
CN026	13903	profile details	transition BC and R horizons
CN026	13904	landscape	Tsuga tchekiangensis with bamboo undergrowth
CN027	13905	landscape	valley bottom
CN027	13906	landscape	V-shaped valley in fault line
CN027	13907	landscape	V-shaped valley
CN027	13908	landscape	valley bottom
CN027	13909	profile	irregular soil depth
CN027	13910	profile details	Ah + Bw horizons
CN027	13911	profile details	transition soil - weathered granite
CN027	13912	profile details	transition Bw-R horizons
CN028	13913	landscape	lower mountains
CN028	13914	landscape	lower mountains
CN028	13915	profile	stoneline
CN028	13916	profile details	two parent materials
CN029	13917	landscape	upper part lower mountains on Devonian shale
CN029	13918	landscape	upper part lower mountains on Devonian shale
CN029	13919	people	taking of monoliths
CN029	13920	profile	irregular soil depth
CN029	13921	profile details	pockets of weathered shale
CN030	13922	landscape	afforestation Pinus massoniana
CN030	13923	landscape	graves
CN030	13924	erosion /conservation	stabilized gullies
CN030	13925	profile	deep yellowish red soil
CN030	13926	profile	deep yellowish red soil
CN030	13927	profile details	detail A-horizon
CN030	13928	profile details	detail 2Bt2 horizon
CN030	13929	people	ISS staff + provincial staff + casuals
CN031	13934	landscape	tower karst

CN031	13935	landscape	tower karst
CN031	13936	landscape	tower karst
CN031	13937	landscape	tower karst
CN031	13938	landscape	tower karst
CN031	13939	people	taking of monolith
CN031	13940	people	taking of monolith
CN031	13941	profile	irregular soil depth
CN031	13942	profile	
CN031	13943	profile details	clay cutans in Bt2
CN031	13944	profile details	clay cutans in Bt1
CN032	13945	landscape	rounded hills
CN032	13946	landscape	rounded hills
CN032	13947	profile	deep weathering
CN032	13948	profile	deep weathering of granite
CN032	13949	profile	
CN032	13950	profile details	Bt2 horizon
CN033	13951	landscape	rice paddy
CN033	13952	people	
CN033	13953	land use	horticulture
CN033	13954	profile	old paddy soil
CN033	13955	profile details	ground water transition zone
CN033	13956	profile details	Ag1 horizon
CN033	13957	profile details	oxidized ped face from Cg1 horizon

## Other country reports (in press)

Country Report 1	Cuba
Country Report 3	Turkey (in prep.)
Country Report 4	Côte d'Ivoire
Country Report 5	Thailand
Country Report 6	Colombia
Country Report 7	Indonesia
Country Report 8	Ecuador (in prep.)
Country Report 9	Brazil
Country Report 10	Peru (in prep.)
Country Report 11	Nicaragua
Country Report 12	Costa Rica
Country Report 13	Zambia

