KUIYI ZHAO and JUHANI PÄIVÄNEN

PEATLANDS AND THEIR UTILIZATION IN NORTHEAST CHINA

KOILLIS-KIINAN SUOT JA NIIDEN HYVÄKSIKÄYTTÖ

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Peatlands complexes, site type classification and utilization of peatlands in northeast China are reviewed. The number of mire plant species common to both Finland and northeast China is about 120. Peatlands have been reclaimed for agriculture for a long time, but amelioration for forestry is only in the beginning. However, the potential of peatlands for forestry after drainage is considered high.

Keywords: China, peatland complexes, peatland site types, peatland utilization.

K. Zhao, Changchun Institute of Geography, Chinese Academy of Sciences, People's Republic of China.
J. Päivänen, Department of Peatland Forestry, University of Helsinki, Unioninkatu 40 B SF-00170 Helsinki, Finland.

INTRODUCTION

The wetland area in the People's Republic of China amounts to some 10 million hectares, 3.5 million of which is peatland and the rest gley moor (without peat). Furthermore there exists about 0.7 million hectares so called buried peatlands. The total peat resources is estimated 27 billion tons (Chai Xiu 1981). Most of the wetlands are situated in the northeast and the southwest, with only small areas in the Changjiang river basin and coastal region (Fig. 1). One third of the total mire area in China is situated in the northeastern part of the country

Northeast China is situated in the eastern part of Eurasia; latitude 28° 20'—53°28'N and longitude 120°30'—135°05'26"E (Liu Xingtu 1983). The area is surrounded by the neighbouring countries of the Democratic Republic of Korea, the Union of Soviet Socialist Republics and the People's Republic of Mongolia.

The territory is formed of a central plain, the Songliao plain, surrounded on three sides by mountains. The Changbai mountains are situated in the eastern part of this territory and run from northeast to southwest along the border towards the DRK. The Xiaoxingan mountains run from east to west and are situated along the northern border of the region. The Daxingan mountains run from northeast to southwest and are situated in the western part of the region. The Songliao plain is situated in the middle of the region and extends from the northeastern part of the region which is called Sanjiang plain, to the south, reaching the Bahai Sea.

The aim of this paper is to describe the peatlands and their utilization in the northeastern part of China and to make some comparisons to the Finnish situation. It is based mainly on an unpublished report prepared by Zhao Kuiyi during his study period (July 1984—July 1986) in the Department of Peatland Forestry, University of Helsinki and partly on information gained by Juhani Päivänen during his visit to northeast China in August 1985.

CONDITIONS FOR PEATLAND DEVELOPMENT

Climatic factors

Wetland formation in northeast China is favoured by climatic, topographic and geologic factors. The Changbai mountains act as a barrier to the most southeasterly monsoon winds from the Pacific Ocean and receive high rainfall. The amount of rainfall in the middle and western parts of the territory is distinctly smaller than in the eastern mountains. The continental climate — hot summers, cold

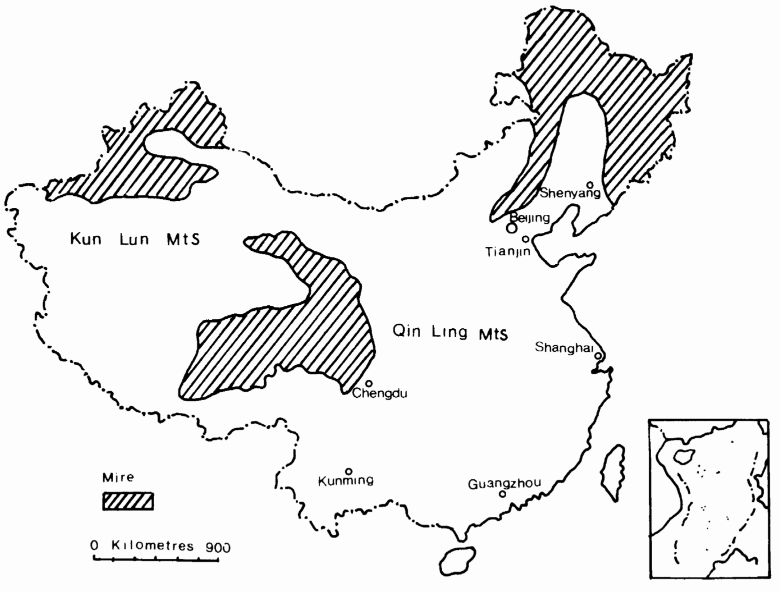

Figure 1. Mire distribution in China (Chai Xiu 1980).

Kuva 1. Soiden esiintymisalueet Kiinassa (Chai Xiu 1980).

winters and aridity index >1 — generally does not favour the development of mires. However, peatlands are found in the Changbai, Daxingan and Xiaoxingan mountains and on the Sanjiang plain, where there is the heaviest concentration of peatlands in China.

Climatic data for some representative locations in Finland and in northeastern China are presented in Table 1. In the northern part of the Daxingan mountains there are 6 to 8 months when the mean temperature is less than —20°C, the mean temperature is under —30°C in January. The snow cover is only about 5 cm deep and the layer of the frozen soil is about 2—3 m. Continuous and discontinuous permafrost is found on the northern side of the line from Zhanlanenr, Laolai, Dedu, Qingan, to Tieli. The freezing period is 5 to 6 months in Changbai mountains and on Sanjiang plain. It is even longer (about 8—9 months) in mires. Surface water infiltrates through the frozen soil layer only with great difficulty. This situation favours paludification and the development of peat.

In the Da, Xiaoxingan mountains and Changbai mountains the annual precipitation amounts to 400—650 mm and 650—1000 mm, respectively. About 65 per cent of the precipitation is produced by the summer storms. In these regions peatlands are located on lowland areas where water converges. The annual precipitation amounts to 500—600 mm on Sanjiang plain and most of the rain falls in the summer. Rainfall during the autumn becomes frozen on the surface or in the soil. When the ice melts in the beginning of the following summer, there is extensive flooding and excessive water in the soil which promotes the growth of marsh vegetation.

Topographic and geologic factors

The territory also has favourable topographical and geological conditions for peat and marsh development. Da, Xiaoxingan are low mountains and hills, rising to less than 1000 m above sea level, except for a few peaks that are over 1000 m. The relative heights are about 50—300 m with wide intermountain valleys. In the Changbai mountains, platforms on volcanic rock in different stages are found at an altitude of 800 m. Areas less than 800 m above sea level are valley basins with low hills, wide valleys and meandering river courses.

The Sanjiang plain is low-lying and has been formed by fluviation of the Suanhuajiang, Heilongjiang and Wusulijiang rivers, descending very gradually from the southwest to the northeast, about 1/5000—1/10000 (Liu Xingtu 1983). On this plain, the rivers have gentle gradients, and flat and shallow water bottoms, numerous meandering bends, ox-bow lakes, and kettle and linear depressions. The plain has slowly been sinking since Tertiary times and belongs to the neotectonic depression zone. A deposition of impermeable clay and silt about 3—17 m thick greatly restricts

Table 1. Comparison of climatic data between Finland and northeast China (Kolkki 1966 a, b; Lang Huiqing 1981).

Taulukko 1. Eräiden ilmastotunnusten vertailua Suomen ja Koillis-Kiinan välillä (Kolkki 1966 a, b; Lang Huiqinjg 1981).

	Mean temperature *Keskilämpötila* Jan *Tammi*	July *Heinä*	Year *Koko vuosi*	Absolute minimum temperature *Minimi-lämpötila*	Active accumulated temperature *Lämpösumma* $\geqslant 5$	$\geqslant 10$	Annual mean precipitation *Vuotuinen sademäärä*	Aridity index *Kuivuus-indeksi*	Cryogenic time *Kylmä-kausi*	Frozen soil *Routa*
Utsjoki	—11.2	11.8	—0.8	—47.5 (Ivalo)	500		400	0.25	11.10—30.4	continuous or discontinous *jatkuva tai epäjatkuva*
Oulu	— 9.5	16.6	2.29	—40.1	1050		500	0.50	1.11—15.4	seasonal *kausittainen*
Helsinki	—6.8	17.1	4.4	—32.9	1300		700	0.65	25.11—3.4	seasonal *kausittainen*
Daxingan mountains	—24.4—30.6	18.4—20.2	—2.1—5	—52.3		1 500—1 750	340—520	1.0—0.8	21.10—21.4	continuous discontinuous *jatkuva tai epäjatkuva*
Xiaoxingan mountains	—23.7—28.4	20.4—20.8	—0.3—1.3	—43.7		2 000—2 250	470—640	1.0—0.8	1.11—11.4	disconti-nuous *jatkuva tai epäjatkuva*
Changbai mountains	—14.4—16.6	20.4—22.0	2.5—4.9	—42.3		2 000—3 000	600—900	1.0—1.75	11.11—11.4	seasonal *kausittainen*
Sanjiang plain	—19.9—21.7	20.9—21.7	1.5—2.5	—42.0		2 250—2 500	560—660	1.0—0.7	11.11—11.4	seasonal *kausittainen*

surface drainage and underground discharge, particularly during the rainy summer and autumn. Therefore great areas of marshes have formed on the terraces and flood areas of rivers, e.g. Nonjiang, Binlahunhe, Naoliha, Qixinghe (Fig. 2).

Figure 2. *Phragmites communis* marsh on clay soil in Sanjiang plain (Photos: Zhao Kuiyi).

Kuva 2. *Sanjiangin tasangon (suistomaan)* Phragmites communis *-kasvustoa (Valokuvat: Zhao Kuiyi).*

MIRE COMPLEX TYPES AND PEATLAND SITE TYPES.

According to Kivinen and Pakarinen (1981), the mires in northeast China are predominantly limnogenic (gley) moors, i.e. similar to those in Sanjiang plain, which are under the influence of limnic or river waters. However, raised bogs, aapa fens and palsa mires are found in small areas from Changbai, Xiaoxingan and Daxingan mountains, respectively. The mires in the northeast China are situated in an area extending from the temperature zone to the boreal zone, with complex topography, influence of altitude, different water supply and rainfall, and thus the peatland site types are diverse (Fig. 3).

Raised bogs are associated with areas of high rainfall. Raised bogs are found at the platforms on volcanic rock of the main peak of the Changbai mountains (2691 m above sea level) (Chai Xiu, 1964). The centre of a raised bog is about 1 m higher than the marginal slope of the bog, and the peat layer is about 2 m deep. Peatland site types are oligotrophic and the

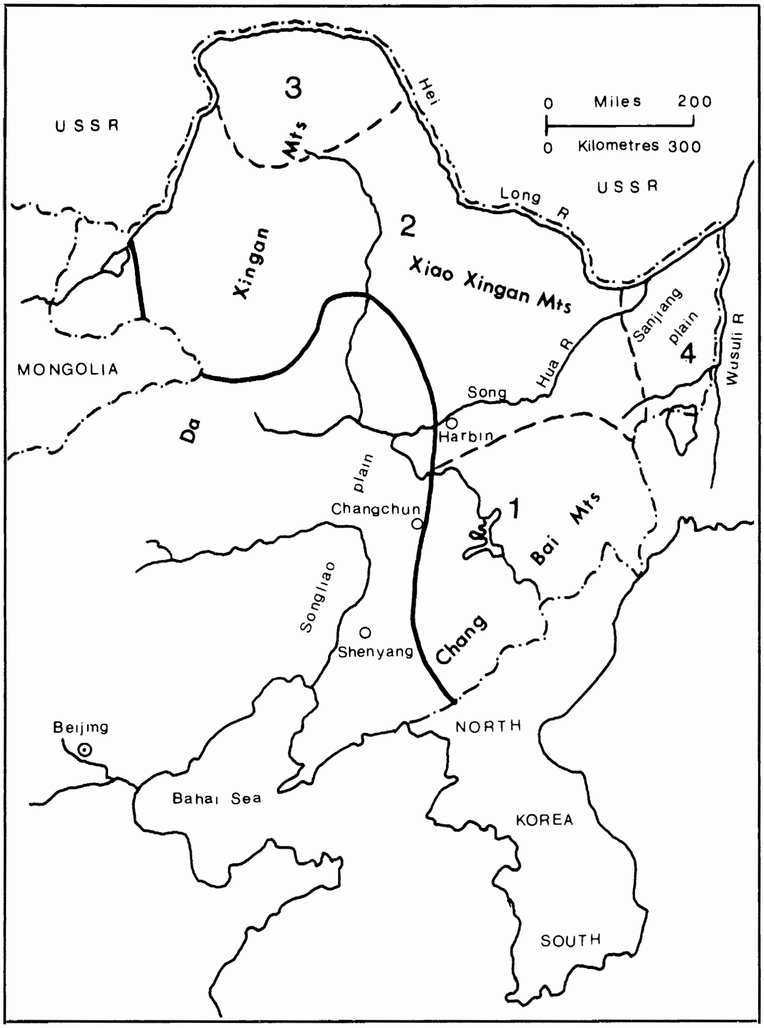

Figure 3. Distribution of mire complex types in northeast China: 1. Limnogenic and raised mires, 2. Limnogenic and aapa mires, 3. Limnogenic and palsa mires, 4. Limnogenic mires.

Kuva 3. Suoyhdistymätyyppien pääasialliset esiintymisalueet Koillis-Kiinassa:
1. Limnogeenisiä ja kohosoita, 2. Limnogeenisiä ja aapasoita, 3. Limnogeenisiä ja palsasoita, 4. Limnogeenisiä soita.

bog centre is nearly treeless. The scarce trees are small in size and stunted. There are very few vascular plants while the *Sphagnum* mosses dominate the ground layer.

Raised bogs are also found in the rainy area of the Xiaoxingan mountains (Fig. 4). The precipitation and the humidity in the northern part of the Daxingan mountains is too low, and the duration of the growing season is short for raised bogs to develop. The peat layer is therefore shallow, only about a half meter deep.

The rainfall is even higher in Sanjiang plain, but the climate varies. The dry period of the year is favourable for decomposition of peat, and therefore the wetlands are generally herbaceous gley moors without actual peat accumulation. Peatlands with grass-covered, distinctly dome-shaped hummocks are sometimes found. The development of these dome hummocks is dependent upon floods and groundwater flow. They resemble the Finnish aapa mires (Fig. 5).

Permafrost hummocks are found in the region of continuous permafrost in the northernmost part of the Daxingan mountains. Hummocks are about 1 m high and a few meters long as in Finnish palsa mires. The ground vegetation on the hummocks is dominated by *Sphagnum* mosses with a few species of dwarf shrubs.

A few years ago the senior author and his colleagues visited the peatlands in Changbai mountains and Xingan mountains several times. However, a report describing the mire site types was not published. The preliminary site type classification given in Table 2 is based on these field investigations. Data from the Sanjiang plain is according to Liu Xiaotu et al.

Figure 4. Typical raised bog low-shrub vegetation *(Vaccinium uliginosum, Ledum palustre* var. *angustum).*

Kuva 4. Kohosuolle tyypillistä varpukasvillisuutta Vaccinium uliginosum, Ledum palustre *var.* angustum).

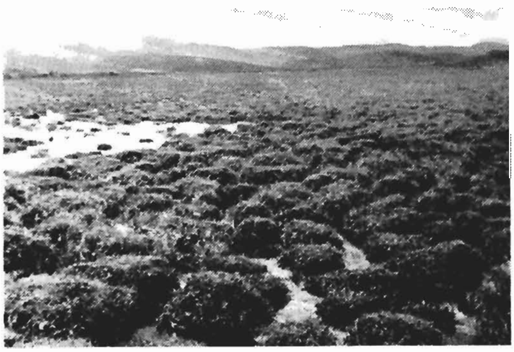

Figure 5. *Carex meyeriana, Deyeuxia angustifolia* fen (aapa mire) in Daxingan mountains (see Table 2, site type 25).

Kuva 5. Aapasuoyhdistymää muistuttavaa suoaluetta Daxingan vuoristossa. Suotyypin nimikkolajeja Carex meyeriana *ja* Deyeuxia angustifolia *(ks. Taulukko 2, suotyyppi 25).*

(1983). The site types are based mainly on the composition of the vegetation.

There are about 280 mire species in Finland (Eurola and Kaakinen 1978) and about 420 in northeast China (Zheng Xuangfeng 1982). The number of species common to both Finland and northeast China is about 120, i.e. 42 and 28 per cent of the total number of species in Finland and northeast China, respectively. However, the tree species, dominant species in the ground vegetation, as well as the composition and structure of plant communities are quite different from each other in the two regions. Most of the species in common are bryophytes, of which 57 % and 49 % are common to both Finland and northeast China. The corresponding figures for vascular plants are only 37 % and 23 %, respectively.

Table 2. A preliminary peatland site type classification for northeast China (Chai Xiu et al. 1964, Yi Fuke et al. 1982, Liu Xingtu et al. 1983).

Taulukko 2. Alustava Koillis-Kiinan suotyyppien luokittelu (Chai Xiu ym. 1964, Yi Fuke ym. 1982, Liu Xingtu ym. 1983).

I	Treed mires *Puustoiset suot*
1.	*Alnus sibirica* fen
2.	*Polytrichum sp, Osmunda Cinnamomea, Larix olgensis* var. *changbaiensis* swamp
3.	*Carex globularis, Betula fruticosa, Larix gmelinii* swamp
4.	*Sphagnum spp, Eriophorum vaginatum, Larix olgensis* var. *changbaiensis* swamp
5.	*Sphagnum spp, Carex appendiculata, Larix gmelinii* swamp
6.	*Sphagnum spp, Carex globularis, Larix gmelinii* swamp
7.	*Sphagnum spp, Vaccinium uliginosum, Larix gmelinii* swamp
8.	*Sphagnum spp, Pinus pumila, Larix gmelinii* swamp
9.	*Sphagnum spp, Ledum palustre* var. *angustum, Larix gmelinii* swamp
10.	*Sphagnum spp, Ledum palustre* var. *angustum, Larix olgensis* var *changbaiensis* bog
II	Shrubmires *Pensaiset suot*
11.	*Eriophorum vaginatum, Ribes repens, Betula fruticosa* fen
12.	*Carex meyeriana, Salix brachypoda, Betula fruticosa* fen
13.	*Carex schmidtii, Betula ovalifolia* fen
14.	*Carex schmidtii, Carex appendiculata, Salix brachypoda* fen
15.	*Carex lasiocarpa, Salix pentandra* fen
16.	*Eriophorum vaginatum, Betula fruticosa* fen
17.	*Sphagnum spp, Betula fruticosa* fen
III	Open mires *Avosuot*
18.	*Phragmites communis* marsh
19.	*Typha orientalis* marsh
20.	*Miscanthus sacchariflorus* marsh
21.	*Carex spp* herbrich fen
22.	*Deyeuxia angustifolia, Carex spp* fen
23.	*Carex spp, Spiraea salicifolia* fen
24.	*Deyeuxia angustifolia, Carex appendiculata* var. *sacculiformis* fen
25.	*Carex meyeriana, Deyeuxia angustifolia* fen
26.	*Carex schmidtii, Carex appendiculata* fen
27.	*Carex appendiculata* var. *sacculiformis, Carex appendiculata* fen
28.	*Carex lasiocarpa, Carex meyeriana* fen
29.	*Carex appendiculata* var. *sacculiformis, Carex meyeriana* fen
30.	*Carex meyeriana, Carex appendiculata* fen
31.	*Phragmites communis, Carex lasiocarpa* fen
32.	*Sphagnum spp, Carex rhynchophysa* fen
33.	*Eriophorum sp, Carex lasiocarpa* fen
34.	*Carex lasiocarpa* fen
35.	*Menyanthes trifoliata, Carex lasiocarpa* fen
36.	*Carex chordorrhiza, Carex lasiocarpa* fen
37.	*Menyanthes trifoliata, Carex chordorrhiza* fen
38.	*Deyeuxia langsdorffii, Carex chordorrhiza* fen
39.	*Glyceria spiculosa, Carex chordorrhiza* fen
40.	*Carex chordorrhiza* fen
41.	*Glyceria spiculosa* fen
42.	*Sphagnum spp, Carex lasiocarpa* bog
43.	*Sphagnum spp, Carex limosa* bog
44.	*Sphagnum spp* bog

PEATLAND UTILIZATION

Peat resources survey

The Changchun Institute of Geography, Chinese Academy of Sciences is responsible for the inventory of peat in the country. Accurate data on the surface vegetation, density of tree cover, topographic level, peat depth, peat type based on macroscopic remains, humification, and apparent fiber content is compiled. Sections and profiles showing stratigraphic sequences and topographic relationships are also constructed. The information is used to prepare maps and peat resources data bases.

Peatland forestry

In the Da, Xiaoxingan and Changbai mountain areas about 10 % of the forest area consists of peatland forest.

Natural peatland forests, mostly larch (*Larix gmelinii*) stands, are understocked and small-sized. In order to improve forest growth, Tuanghongling forestry station in the Xiaoxingan mountain area performed some forest drainage in 1964. In 16 years, the formally 2 to 3 metre high, 5 cm DBH trees achieved a height of 12 to 15 metres and a diameter of 15 cm. Forest drainage is gradually being performed also by other forestry stations (Fig. 6).

Afforestation of open mires is by one of two mechanical methods, "tilt afforestation" and "peat mound afforestation". In the former the open mire is mechanically drained with double ridge ploughing and planting is done on the tilts. The spacing between the planting tilts is about 3 m giving 1800 seedlings per hectare. At Yongcui forestry station, for instance, two-year-old larch seedling were planted on the tilts and 90 per cent of them were alive and 8 m high 11 years later. In the "peat mound afforestation" method a 30 cm high 1×1 m mound is made on which 5 larch seedlings are planted. Later they will be thinned to 1 or 2. This kind of afforestation has been shown to cause the groundwater level to drop, raise soil temperature and improve soil aeration. Altogether they are favourable for the growth of young trees. Dailing Forestry Research Institute carried out peat mound afforestation in 1957 and 20 years later the trees were 16 to 18 m high.

The use of peatlands for forestry in the Heilongjiang province especially has been previously described for Finnish readers by Kaunisto (1982).

Figure 6. Forest drainage (*Sphagnum* spp, *Ledum palustre* var. *angustum, Larix gmelinii* swamp) in Xiaoxingan mountains (see Table 2, site type 9).

Kuva 6. Aurattua metsäojaa Xiaoxingan vuoristossa. Suotyypin nimikkolajeja Sphagnum *spp.,* Ledum palustre *var.* angustum, Larix gmelinii *(ks. Taulukko 2, suotyyppi 9).*

Agricultural utilization

Mire reclamation is an important way to enlarge the area of farmland. In transforming and using mires for agriculture useful know-how has been obtained in combined mire reclamation and construction of irrigation systems. Draining is necessary before reclamation. Later, after subsidence, drainage network is converted into irrigation system giving gradually higher production. Soil improvement is also important. Mineral soil is admixed in order to ameliorate the physical properties of the peat. Furthermore, by drying and tilling the peat soil aeration can be improved which quickens the oxidation of toxic compounds and the decomposition of orcanic matter. Finally, phosphorus and potassium fertilizers are added.

In Huadian County in the Changbai mountain area, for example a successful routine in mire reclamation has been developed: first ditching to drain the peatlands is done, then tilling to cultivate the peat soil, planting green soya beans for the first year then soybeans for several years, later ridging or changing the areas into irrigated fields. Finally high productive fields, locally called "descendant fields", are obtained (Zhao Kuiyi 1980).

Besides use for cultivation there is a tradition of using peat as a bedding material in barns of northeast China.

Industrial utilization

In northeast China, research and experiments on the use of peat in industry is still being carried out. For example, the know-how to produce fibreboard and peat bricks from peat has been obtained. This activity is going to be extended to an operative scale.

Reed *(Phragmites communis)* is an important raw material for paper in some paper mills in China.

Peatland conservation

The northeastern mires are the largest and the most various wetlands in China. There are about 420 species (79 families, 194 genuses) of hydrophilous plants (Zheng Xuangfeng 1982), which is about 13 per cent of the total 3200 plant species (193 families, 959 genuses) in the northeast China (Liu Shennuo 1959, Gao Chien 1980). The mire area in the Sanjiang plain is the habitat and breeding ground for some 200 waterbirds species (Liu Xingtu 1983). Mire complexes can prevent the surroundings from drying and regulate the climate just as forests and lakes do. Therefore the Chinese Government decided to establish two mire conservation areas which cover several tens of thousands of hectares in 1982.

RECOMMENDATIONS FOR DEVELOPING THE CLASSIFICATION AND UTILIZATION OF PEATLANDS

Peat formation is based mainly on climate, parent material, topography, biotic factors and time. These are also the main attributes to form the different peatland complex types described e.g. in Europe. However, in China the concept "peatland complex type" is not generally used.

Different methods of peatland classification for different aims have been used in China. The classification systems may be grouped into three: genetic classifications, classification by single factors, and classification by comprehensive factors (Liu Xingtu 1983).

Mires can be divided into different stages of development by a genetic classification with corresponding changes in peat depth, water supply, trophic status, plant composition and topography. Mires develop from eutrophic to mesotrophic and, further, to oligotrophic ones, i.e. all the oligotrophic mires have developed from eutrophic mires. The development of wetlands not only depends on time, but is also determined by other formation factors: geographical situation, climate, topography, hydrology etc. The climate is unfavourable in some places in China for peat accumulation. In some places in northeast China the wetlands are herbaceous gley moors without peat accumulation. Thus it is difficult to distinquish the development stage and a genetic classification is not appropriate.

In single factor classifications, scientists have different views on the classification principles, e.g. the topography has been taken as a main basis in the classification of mires. These scientists consider landform as the basic determining factor of the water supply of mires. Thus seaside, lakeshore and flood land mires have been distinguished. This division does not show the complicated characteristics of mires.

In classifications with comprehensive factors, the classification system should include the water supply of mire, topographical condition, vegetation characteristics, peat properties and genesis of peatland etc. At present, this latest method of classification of peatlands is widely used in the country. The preliminary classification presented in Table 2 is an example of this classification approach.

The principle of peatland site type classification in Finland has been the linking of vegetation to the trophic status, i.e. plant communities reflect the trophic status of the site. According to the dominant tree species, the peatland site types have been divided into three main groups and the water and soil conditions of all the site types in each group have been analysed. As the trophic status and hydrologic conditions are known for every site type, they can be arranged in a hierarchy from oligotrophic to eutrophic. The site types have been named after dominant species which are easily recognized in the field. Thus classification of peatland site types in Finland is both scientific and practical.

In conclusion, the authors make the following recommendations: 1) The peatland site type classification in China should be further developed according to the principles of the Finnish classification. First, three peatland regions could be distinguished in the whole country with the Kunlunshan and Qianglin mountains as limits. These regions are: north China, south China and the Qingzang Plateau. It is intended to develop further the preliminary site type classification presented for northeast China and to determine the trophic status of the site types.

2) The afforestation of open peatlands and drainage of treed peatlands should be further studied. As there is a shortage of forest resources in China, particularly in northeast China, the forests have to be protected: annual cutting should not exceed the allowable cut. In this situation, afforestation of open peatlands would be extremely important. Successful afforestation of open peatlands and forest drainage of peatlands which have a forest-cover in the virgin state could yield high-productive forests. Industrial utilization of peat as a raw material should be favoured, e.g. production of peat fibreboard. This will enable considerable saving of timber.

3) Peatland conservation areas should also be established in the regions of the Da, Xiaoxingan and of the Changbai mountains.

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TIIVISTELMÄ:

KOILLIS-KIINAN SUOT JA NIIDEN HYVÄKSIKÄYTTÖ

Kiinan kansantasavallassa arvioidaan olevan noin 10 milj. ha märkiä maita, joista noin 3,5 milj. ha luetaan soihin. Tämän lisäksi turvetta esiintyy mineraalimaakerrosten hautaamissa soissa noin 0,7 milj. ha alalla. Suot sijaitsevat pääasiassa maan pohjois- ja koillisosissa sekä 3400 metrin korkeudelle Qing Zhangin ylätasangolla (kuva 1). Kolmannes koko suoalasta sijaitsee Koillis-Kiinassa.

Koillis-Kiinan pääosan muodostaa Songliaon tasanko, jota vuoristot (Da Xingan, Xiao Xingan ja Chang Bai) ympäröivät kolmelta suunnalta (kuva 3). Da ja Xiao Xingan vuoristossa vuotuinen sademäärä on vain 340—640 mm, mutta Chang Bai vuoristossa 600—900 mm. Mantereisen ilmaston vuoksi vuotuiset lämpötilan vaihtelut ja kasvukauden lämpösumma ovat Koillis-Kiinan kaikissa osissa suuremmat kuin Suomessa (taulukko 1).

Soiden alueellista jakaantumista ei ole tähän mennessä tutkittu suoyhdistymätyyppien esiintymisen kannalta. Tässä yhteydessä on kuitenkin hahmotettu Koillis-Kiinaan neljä aluetta, joista kolmella esiintyy limnogeenisten soiden (ks. Kivinen ja Pakarinen 1981) lisäksi myös joko kohosoiden, aapasoiden tai palsasoiden tyyppisiä suoyhdistymiä (kuva 3).

Kohosoita (kuva 4) esiintyy Chang Bai vuoriston runsassateisella alueella ja aapasoiden tyyppisiä soita Koillis-Kiinan pohjoisosan vuoristoissa (kuva 5). Pohjoisemmassa osassa esiintyy myös ikiroudassa olevia palsoja. Sanjiangin tasangon laajoilla suistomailla turpeen muodostuminen on hidasta; nämä limnogeenisiksi soiksi kutsutut alueet voisi luokitella myös märiksi maiksi tai suorastaan vesikasvillisuuden vallitsemiksi alueiksi (kuva 2).

Esitetty Koillis-Kiinan soiden alustava suotyyppiluettelo perustuu osin kirjallisuuteen ja osaksi toistaiseksi julkaisemattomiin aineistoihin (taulukko 2). Suotyyppien erotteluperusteena on käytetty kasviyhdyskuntia. Suotyyppien trofiatasojen selvittäminen on tarkoitus ottaa jatkotutkimusten kohteeksi.

Suokasveja on Suomessa noin 280 (Eurola ja Kaakinen 1978) ja Koillis-Kiinassa noin 420 (Zheng Xuangfeng 1982) lajia; yhteisiä lajeja on noin 120. Eniten yhteisiä lajeja on pohjakerroksessa, kenttäkerroksessa jo huomattavasti vähemmän ja yhteisiä puulajeja ei ole ensinkään.

Soiden metsätaloudellinen hyväksikäyttö on Koillis-Kiinassa käynnistynyt lähinnä avosoiden ojituksina ja metsityksinä 1950-luvulla. Näistä saatuja kokemuksia on aiemmin esitellyt Kaunisto (1982). Viime vuosina on koetoimintaa laajennettu myös niukkapuustoisille "sekatyypeille" (kuva 6). Koillis-Kiinassa vallitsevan puupulan vuoksi koetaan metsäojitus myös keinona vähentää tulevaisuudessa hakkuupaineita mineraalimaiden metsissä.

Soita on raivattu laajassa mitassa myös maatalouskäyttöön. Maanparannuksessa on käytetty mineraalimaan lisäystä ja keinolannoitteita. Turvekerroksen painumisen hidastuttua kuivatusojaverkostoa on menestyksellisesti käytetty keinokasteluverkostona kasvukauden aridisina ajanjaksoina.

Soiden taloudellisen hyödyntämisen lisääntyessä kasvavaa huomiota on kiinnitetty soiden suojeluun. Valtiovallan toimesta onkin v. 1982 perustettu mm. kaksi laajaa (useita kymmeniä tuhansia hehtaareja) soiden suojelualuetta Sanjiangin tasangolla. Soidensuojelualueita pitäisi myös perustaa Da, Xiao Xingan ja Chang Bai -vuoristoihin.

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