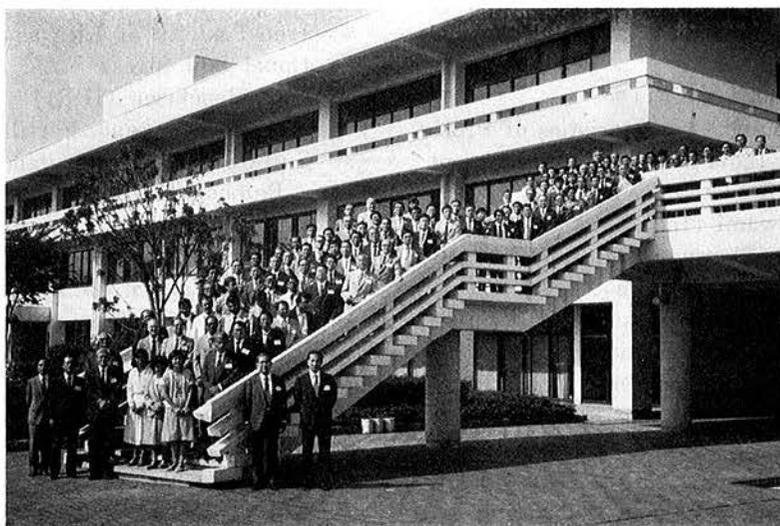


# International Symposium on Distribution, Characteristics and Utilization of Problem Soils

Sponsored by Tropical Agriculture Research Center, Ministry of Agriculture,  
Forestry and Fisheries  
October 19-22, 1981, Tsukuba, Ibaraki



The 15th TARC International Symposium, which was held at Tsukuba Office of the Secretariat of Agriculture, Forestry and Fisheries Research Council, had the theme "Distribution, characteristics and utilization of problem soils".

Vast areas of land such as plains, peninsulas, undulating hilly lands, basins and terraces in the world were left behind from agricultural activities, because the soils covering them have various constraints for growing crops. Thus, the soils were referred to as problem soils.

Two incentives are valid for agricultural development of problem soils in a country. One is increasing need of food and feedstuff caused by population increase in the country. Another is increasing demand of agricultural

products available for export which enables the people higher living standard. Since development of problem soils is more costly and less profitable in comparison with that of ordinary soils, various techniques applicable to reclaim problem soils should be evaluated in the light of economic consideration.

The objective of the symposium was to exchange the latest information on problem soils with the purpose of promoting international research cooperation, in particular in the tropics.

The program of the symposium and the name of the speakers are listed below:

#### **Inaugural address**

Ken-ichi Hayashi

Director of the Tropical Agriculture

Research Center

### Welcome address

Ryoichi Kawashima

Director-General, Secretariat of Agriculture, Forestry and Fisheries Research Council

### Country reports

Brazilian Problem Soils: Distribution, Characteristics and Utilization

José da Silva Madeira Neto (Brazil)

On the Classification and Utilization of Red Soils in Tropical and Sub-tropical China

Zhao Qi-Guo (China)

Distribution and Characteristics of Problem Soils in India and their Management for Crop Production

N. N. Goswami (India)

Distribution, Characteristics and Utilization of Problem Soils in Malaysia

Mohd. Zahari Abu Bakar (Malaysia)

The Nature, Distribution and Management of Some Problem Soils in the Philippines

Aurelio A. Briones (The Philippines)

Problems of Utilization and Management of Some Important Great Soil Groups in Sri Lanka

S. Somasiri (Sri Lanka)

Distribution, Characteristics and Utilization of Problem Soils in Thailand

S. Panichapong (Thailand)

Present Soil Conditions of Cultivated Land in Japan

Kazuo Abe (Japan)

### Introductory lectures

Capability Consideration for Tropical Soils

Kazutake Kyuma (Japan)

Problems, Potential and Management of Vertisols and Alfisols, The Two Important Soils of Semi-Arid Tropics—ICRISAT Experience

J. S. Kanwar (ICRISAT)

Suggestions for the Management of Problem Soils for Food Crops in the Humid

### Tropics

H. R. von Uexkull (Inter. Potash Inst. and Potash & Phosphorus Inst., Singapore)

Utilization of Organic Waste for Agriculture

P. R. Hesse (FAO)

Crop Response to Soils with Low pH, Low Base Status and Low Content in Phosphorus

Akira Tanaka (Japan)

### Technical reports

Iron-Toxicity of Rice as Multiple Nutritional Soil Stress

G. Benckiser (IRRI)

Improvement and Fertilization of Acid Sulfate Soils in Thailand

Paiboon Prabuddhan (Thailand)

Improvement and Fertilization of Acid Sulfate Soils in Malaysia

Mohd. Zahari Abu Bakar (Malaysia)

Nitrogen Fixation in Acid Sulfate Soils

Iwao Watanabe (IRRI)

Efficient Level of Phosphorus Fertility in Paddy Soils

Hitoichi Shiga (Japan)

Improvement and Fertilization of Peat Soils in Japan

Masanori Miyake (Japan)

Characteristics and Fertilization of Andepts in the Philippines

Aurelio A. Briones (The Philippines)

Characteristics of Andosols in Japan

Yoji Amano (Japan)

Problems and Improvement of Volcanic Ash Soils in Japan with Reference to the Weathering Sequence

Tatsuji Takahashi (Japan)

Microelement Deficiency of Upland Soils in Indonesia

M. Ismunadji (Indonesia)

Cropping Systems to Preserve Fertility of Red-Yellow Podzolic Soils in Indonesia

J. L. McIntosh (IRRI)

Improvement and Fertilization of the Savannas in Brazil

Morethson Resende (Brazil)

Phosphorus Nutrition Affecting Upland

- Rice Yield in Some Brazilian Latosols  
Yoshikazu Ohno (Japan)
- Present Methods of Fertilization for the Red Soils of China  
Ching-Kwei Li (China)
- Improvement and Fertilization of Upland Soils in Thailand  
Samrit Chaiwankupt (Thailand)
- Improvement of the Moisture Regime of Upland Soils in Thailand by Soil Management  
Toru Kubota (Japan)
- Soil and Water Management and Soil Physical Properties with Special Reference to Erosion Hazard by Water  
Shoichi Tokudome (Japan)
- Soil Management in the Sub-tropical Region  
Hideo Ichiki (Japan)

#### General discussion

- Chairperson: P. R. Hesse (FAO)  
J. S. Kanwar (ICRISAT)  
A. Tanaka (Japan)  
K. Kyuma (Japan)

#### Concluding remarks

- Yoshiharu Tokunaga  
Chairman of the Organizing Committee,  
Director, Department of Soils and Fertilizers,  
National Institute of Agricultural Sciences



#### General discussion

In the opening of the discussion, Kyuma (Japan) presented a brief review of the coun-

try reports. Followings are abstracted from the review.

Acid sulfate soils were listed among the problem soils in the reports from India, Malaysia, Philippines and Thailand. Technical know-hows for reclamation of acid sulfate soils are well-known. Still the problems remain because of a high investment needed to implement the improvement measures. Peat soils are extensive in Indonesia and Malaysia. Small areas are found almost everywhere, but relatively important areas occur in Sri Lanka and Vietnam. Major problems are land subsidence due to dehydration and oxidation as a result of drainage, poor anchorage for crops, poor mineral nutrient status. Problems of saline and sodic soils are reported from India, Malaysia, Philippines and Thailand. Without securing a source of good quality water no reclamation and utilization is possible. Besides those three major problem soils, sandy-textured soils occur as an important problem soil in Brazil, Malaysia and Thailand. They include sandy regosols or Quartzipsamments in the coastal region, those on old land surfaces and ground water podzols with deep bleached A2 horizon. Vertisols are considered to be a problem soil in the report from India, Sri Lanka and Thailand, because of their hardly manageable physical properties associated with a high content of montmorillonite. Andosols are regarded as a problem soil in Japan. Moderate to strong acidity and high phosphorus-sorption capacity are the major fertility problems. In the countries in the tropics Andosols are not necessarily problem soils because their occurrence is normally confined to high land areas which are suited to cultivation of high income cash crops such as vegetables and temperate fruit trees. The largest group of problem soils occurring in every country in the tropics is red and yellow colored soils with low activity clays. In the Soil Taxonomy terms the group is represented by Oxisols, Ultisols, some Alfisols and dystrophic Inceptisols and Entisols. Their inherent fertility is low, the nutrient holding capacity is low and base status is low. Thus, they are invariably acid and often Al-toxicity is worri-

some.

In the discussion of the country reports, Kanwar (ICRISAT) added some information on Vertisols and Alfisols, Benckiser (IRRI) suggested that iron toxic soils would be classified into the group of phosphorus deficient soils though they are also deficient in K, Mg and Ca, and Goswami (India) concluded that phosphorus is a key factor in crop production in most of the problem soils.

Hesse (FAO) divided soil problems into two topics: 1) the question of acidity in relation to aluminum and phosphorus and 2) the selection of cropping patterns as a means of reclaiming the problem soils.

In leading the discussion of the first topic, Tanaka (Japan) pointed out the necessity of a method for studying the interaction between pH and aluminum in soil. In the discussion followed, Goswami mentioned on crop tolerance to aluminum saturation, Li (China) questioned on the determination method of phosphorus sorption, Imai (Japan) proposed much wider soil/solution ratio in determining phosphorus sorption, Watanabe (IRRI) stressed the breeding of varieties tolerant to deficiencies, and Hew (Malaysia) requested the research efforts for perennial and horticultural crops. Hesse questioned on aluminum toxicity induced by conversion of aluminum phosphate to iron phosphate, and von Uexkull (Singapore) denied its possibility, however, added that it could be induced by heavy application of KCl. Li regarded iron phosphate as fixed and aluminum phosphate as available phosphate under dry soil conditions and hot climate. Kanwar stated importance of information exchange on the methods for the determination of available phosphate, Tanaka and Watanabe of characterization of the soils used in experiments, and Benckiser of dynamic aspects related to plant-soil relationships. McIntosh (IRRI) insisted as a scientist working in the developing countries that management techniques should be considered, for example, to maximize the effectiveness of

moderate rates of application such as 40 kg  $P_2O_5$ /ha on red yellow podzolic soils, although the optimal rate is much higher than that.

Hesse divided the second topic into two main parts, one dealing with nutrient supply by recycling and the other with water management, and reviewed the technical reports from the standpoint of recycling of organic matter. Somasiri (Sri Lanka) talked on the methods of incorporation or mulch of crop residues, Li on restoring soil organic matter in China, Kanwar on practical problems of recycling of organic matter in India, and von Uexkull explained that high crop yield with fertilizer remains a large amount of organic matter in soil as root. For Kanwar's question: fertilizer or cropping pattern, McIntosh proposed long-term experiments on management of organic residues, and Watanabe called cooperative research on this problem. Use of organic residues were further discussed by Goswami, Inoue (Japan), Li, Ismunadji (Indonesia), Zahari (Malaysia), and Kanwar from various aspects.

In the discussion of second part, water management, led by Kyuma, minimum tillage was taken up by Kubota (Japan) and Ohno (Japan), crop and soil management by Resende (Brazil), broad bed and furrow system by Kanwar, and safe disposal of excess rainfall by Somasiri.

As the final speaker, Kanwar commented his question "what about second generation problems", that they are the improvement of the efficiency of the inputs and of the environment for crop production because the present problem is soil fertility which would be declining as a consequence of intensive cropping.

### Excursion

Foreign participants attended the excursion, in which lowland soils and paddy field farming in areas surrounding Lake Kasumigaura, Ibaraki Prefecture, and volcanic ash soils and upland farming in Tochigi Prefecture were observed.