

# BULLETIN

OF THE INTERNATIONAL SOCIETY  
OF SOIL SCIENCE

•

# BULLETIN

DE L'ASSOCIATION INTERNATIONALE  
DE LA SCIENCE DU SOL

•

# MITTEILUNGEN

DER INTERNATIONALEN BODENKUNDLICHEN  
GESELLSCHAFT

•

**INTERNATIONAL SOCIETY OF SOIL SCIENCE**  
**ASSOCIATION INTERNATIONALE DE LA SCIENCE DU SOL**  
**INTERNATIONALE BODENKUNDLICHE GESELLSCHAFT**

Office/Bureau: c/o Royal Tropical Institute, 63 Mauritskade, Amsterdam, Netherlands.

---

**COUNCIL/CONSEIL/BEIRAT:**

**Executive Committee/Comité Exécutif/Verwaltungsausschuss:**

- President : V. A. Kovda, Sub-Faculty of Pedology, Moscow State University, Moscow V-23
- Vice-President : I. P. Guerasimov, Geography Institute of the Academy of Sciences of the USSR  
Staromometni 29, Moscow.
- Past-President : E. G. Hallsworth, C.S.I.R.O. Division of Soils, Private Bag No. 1, Glen Osmond  
South Australia.
- Secretary-General: F. A. van Baren, c/o Royal Tropical Institute, 63 Mauritskade, Amsterdam  
Netherlands.

**Honorary Members/Membres Honoraires/Ehrenmitglieder:**

- Prof. F. Hardy, C.B.E., M.A., Dip. Agric. (Cantab), Bel Air, Circular Road, St. Augustine, Trinidad
- Prof. Dr Dr W. L. Kubiena, Universität Hamburg, 2057 Reinbek Schloss, FRD.
- Prof. Dr Sante Mattson, Båstad, Sweden.
- Prof. Dr E. C. J. Mohr, Huize „Het Oosten“, Rubenslaan 1, Bilthoven, Netherlands.
- Prof. J. A. Prescott, 82 Cross Road, Myrthle Bank, South Australia.
- Dr L. A. Richards, 4455 Fifth Street, Riverside, Cal., U.S.A.
- Prof. Dr A. A. Rode, Dokuchaev Soil Institute, Pygevski per. 7, Moscow 17, USSR.

**Commissions/Commissions/Kommissionen:**

- I — SOIL PHYSICS.  
Chairman: W. R. Gardner, Department of Soil and Water Science, University of Wisconsin  
Madison, Wisc. 53706, U.S.A.
- II — SOIL CHEMISTRY.  
Chairman: H. Laudelout, Institut Agronomique, Héverlé, Belgium.
- III — SOIL BIOLOGY.  
Chairman: G. Fahreaus, Microbiologiska Institutionen, Uppsala 7, Sweden.
- IV — SOIL FERTILITY AND PLANT NUTRITION.  
Chairman: O. T. Rotini, Facoltà di Chimica Agraria dell' Università degli Studi, Via  
S. Michele degli Scalzi 2, Pisa, Italy.
- V — SOIL GENESIS, CLASSIFICATION AND CARTOGRAPHY.  
Chairman: R. Dudal, World Soil Resources Office, F.A.O., Via delle Terme Caracalla  
Roma, Italy.
- VI — SOIL TECHNOLOGY.  
Chairman: T. J. Marshall, C.S.I.R.O., Division of Soils, Private Mail Bag 1, Glen Osmond  
S.A., Australia.
- VII — SOIL MINERALOGY.  
Chairman: K. Norrish, C.S.I.R.O., Division of Soils, Private Mail Bag 1, Glen Osmond  
S.A. Australia.

BULLETIN  
OF THE INTERNATIONAL SOCIETY OF SOIL SCIENCE

BULLETIN  
DE L'ASSOCIATION INTERNATIONALE DE LA SCIENCE DU SOL  
MITTEILUNGEN  
DER INTERNATIONALEN BODENKUNDLICHEN GESELLSCHAFT

No. 34

1969

NEWS OF THE SOCIETY  
NOUVELLES DE L'ASSOCIATION  
NEUES AUS DER GESELLSCHAFT

**The Membershiplist 1968**

Apart from numerous changes of address and addresses of new members which have been published in an annexe to Bulletin No. 33, two misprints which have been cause of much confusion to the members involved are now corrected.

**France, page 39:** G. R. SIEFFERMANN, 7 rue de Lorraine, 67 Strasbourg-Meinau.

**U.S.A., page 134:** Prof. J. THORP, Department of Geology, Earlham College, Richmond, Indiana 47374.

**Bulletin No. 33**

In the item on Future Congresses, second part, (pages 16, 27 and 36) the name of Dr. P. H. Nye (U.K.) should be added to those of the members of the Working Committee on Future Congresses.

**Future Activities**

The view that the 10th International Congress of Soil Science might be held in Western Europe in 1971 has been too optimistic. The Executive Board has decided that the programme as accepted at the Adelaide meeting on August 15th, 1968, be executed.

The Soil Science Society of the Federal Republic of Germany will be the host for the joint session of Commissions V and VI on "Gleys and Pseudogleys". The meeting is scheduled for September 1971, presumably in Stuttgart-Hohenheim.

The meeting on "Soil Fertility Evaluation and Fertilizer Use under Tropical and Sub-Tropical Conditions" will take place in India in 1971. Details will be published in the next number of the Bulletin.

In the meantime a suggestion has been received for a session of Commission I in the U.S.A. whereas the possibilities are being studied to hold joint or single commission meetings on other subjects during the intervening period 1969—1974.

**NEWS OF THE NATIONAL SOCIETIES**  
**NOUVELLES DES SOCIETES NATIONALES**  
**NEUES DER GESELLSCHAFTEN DER EINZELNEN LÄNDERN**

**Soil Science Society of America**

Dr. Charles I. Rich, Professor of Agronomy at the Virginia Polytechnic Institute, Blacksburg, Virginia 24061, U.S.A., has been appointed representative of the Soil Science Society of America to the I.S.S.S.

A cordial invitation is extended to all ISSS members to attend the 1969 annual meetings of the Soil Science Society of America. Scientists from throughout the world will convene November 9—14, in Detroit, Michigan, for the exchange of latest research results. Meeting attendance is expected to exceed 3,000 in 1969.

The theme of the meetings will be Agronomy and Health. Aspects of this subject to be explored are Agronomy and Human Nutrition, Agronomy and Animal Nutrition, Soils and Pollution, and Plants and Pollution. Several symposia will be held. Two of these concern remote sensing and water pollution as it relates to the use and movement of fertilizers.

The Soil Science Society of America meets annually with the Crop Science Society of America and the American Society of Agronomy. For further information, please write: Soil Science Society of America, 677 South Segoe Road, Madison, Wisconsin 53711, USA.

**Australian Society of Soil Science**

The newly elected President of the Australian Society of Soil Science, Mr. G. D. Hubble, Cunningham Laboratory, St. Lucia, Queensland 4067, Australia, replaces the past Australian President Dr. T. J. Marshall as official representative on the Board of the I.S.S.S.

**Soil Science Society of Poland**

**Polish Journal of Soil Science**

To the series of soil science journals in one of the West-European languages a new periodical in the English language, The Polish Journal of Soil Science, is added. This is, in this case, specifically to be welcomed as it allows the soil scientists all over the world to be informed on the achievements, scope of work and problems dealt with by our Polish colleagues as organized in the Committee of Soil Science and Agricultural Chemistry of the Polish Academy of Sciences. The chief editor is Prof. Dr. B. Dobranski, Department of Soil Science, College of Agriculture, Króla Leszczyńskiego 9, Lublin, Poland.

**Soil Science Society of the German Democratic Republic**

The third scientific and general meeting was held on 8 and 9 April, 1969 in Kühlungsborn near Rostock. The theme "Fundamentals of a highly effective agricultural and landimprovement system" covered the fields of Commissions I and VI.

**Soil Science Society of Ghana**

The Fifth Annual Conference of the Soil Science Society of Ghana took place at the Soil Research Institute, Kwadaso-Kumasi, from the 3rd to the 7th of December, 1968. The conference was highlighted with a very lively symposium on "Problems of settled farming in Ghana".

The following members were elected to serve on the Executive Committee for two years with effect from January 1, 1969.

President: Dr. D. K. Acquaye, Senior Lecturer, Fac. of Agriculture, University of Ghana, Legon, Accra.

- Vice-President:** Dr. C. S. Ofori, Senior Research Officer, Soil Research Institute, C.S.I.R., Kwadaso-Kumasi.
- Secretary:** Mr. E. F. G. Mante, Research Fellow, Fac. of Agriculture, University of Ghana, Legon, Accra.
- Treasurer:** Dr. E. Baffoe-Bonnie, Lecturer, Fac. of Agriculture, University of Science and Technology, Kumasi.
- Publicity Secretary:** Mr. E. O. Asare, Lecturer, Fac. of Agriculture, University of Science and Technology, Kumasi.
- Ordinary members:** Mr. K. A. Quagrinae, Mr. A. T. Halm, Dr. S. V. Adu and Dr. Yaw Ahenkwah.

### **Soil Science Society of Mexico**

In its meeting of January 10th, 1969, the Mexican Society of Soil Science discussed the programme of the 4th National Congress to be convened in Monterrey, N.L. in August 1969. For further information apply to: Sociedad Mexicana de la Ciencia del Suelo, Escuela Nacional de Agricultura, Chapingo, Méx., Mexico.

### **Soil Science Society of Pakistan**

At the last general meeting the following officers were elected to serve on the Council of the Soil Science Society of Pakistan:

- President:** Dr. M. O. Ghani, Vice-Chancellor, Dacca University.
- Vice-Presidents:** Dr. A. Q. M. B. Karim, Director General, Soil Project of Pakistan, Lahore.  
Dr. M. A. Islam, Director of Agriculture, Government of East Pakistan.  
Dr. A. Karim, Head Dept. of Agr. Chemistry and Dean of Faculty of Agric., E. P. Agric. University, Mymensingh.
- Secretary:** Dr. M. S. Chowdhury, Senior Lecturer in Soil Science, Dacca University.
- Asstt Secretary:** Dr. K. A. Hasan, Pakistan Tea Research Institute, Sreemangal, Sylhet.
- Treasurer:** Dr. Chowdhury Inamul Huq, Dr. Bashir Ahmed Chowdhury,
- Council Members:** Dr. H. D. Khan, Dr. A. Islam, Dr. Manirul Huq, Dr. A. K. M. Fazlul Huq, Dr. M. Sulaiman, Dr. M. A. Malek, Dr. Mesbahul Karim and Dr. S. A. Khan Majlish.

### **Soil Science Society of Venezuela**

At the general meeting on October 19, 1968 of the newly reorganized Venezuelan Society of Soil Science, the following Board was elected:

- President:** Dr. Juan A. Comerma, Centro de Investigaciones Agron., Sección de Suelos, Maracay.
- Vice-President:** Prof. Antonio Estrada B., Depto de Edafología, Facultad de Agronomía, Maracay.
- Secretary-General:** Prof. Dr. Ildefonso Pla, Inst. de Edafología, Facultad de Agronomía, Maracay.
- Treasurer:** Prof. Nelson Rodríguez, Inst. de Edafología, Facultad de Agronomía, Maracay.
- Member:** Ing. Agr. Luis Arias, Coplanarh, Ministerio de Obras Públicas, Maracay.

Prof. Dr. Ildefonso Pla will be the representative on the Council of the I.S.S.S.

**NEWS OF THE COMMISSIONS  
NOUVELLES DES COMMISSIONS  
NEUES AUS DEN KOMMISSIONEN**

**Commission V**

**The First Draft Soil Map of the World**

Presentation at the 9th International Congress of Soil Science

Adelaide, August 1968

by

D. Luis Bramao \*

Seven years work, with the continued advice and guidance of the Advisory Panel of the Soil Map of the World, the direct participation of some 150 soil scientists and the incidental co-operation of at least as many more from approximately seventy nations of the world, enable FAO/UNESCO to present the first draft Soil Map of the World on the occasion of the 9th Congress of the International Society of Soil Science.

Meeting at Madison, Wisconsin, U.S.A. our Society's 7th Congress faced the problem which, in one way or another, had engaged the minds of far-thinking soil scientists for the past quarter of a century, how to equate the world's basic resources with the needs of its ever increasing population.

The most basic of these resources is the soil. How should the food growing potentials of any given country or even region be assessed? What priorities should be given in agricultural development? What could be grown, where, and under what conditions will particular crops yield best? How much land would be required for them? How could agricultural skills, acquired in one part of the world, be successfully applied to another? All these questions, and many others arising from them, are involved in a consideration of the soils of the world in all their richness and diversity and, indeed, in their poverty too, for not all soils are equally capable of growing food and many mistakes have been made in attempting to make them do so.

However, in 1960, as well as today, there were substantial areas of territory in the world where soil conditions are largely unknown, and after the preparation of the first draft Soil Map of the World vast areas will still have to be penetrated or assessed before the broad preliminary inventory is complete.

With such thoughts in mind, the Congress emphasized in a resolution the need for the publication of soil maps covering the great regions which were presented at the Madison Congress, at an adequate scale with appropriate texts, for international distribution. This would, in effect, be a compilation of world-wide soil inventories capable of being used by universities and research institutions, international agencies like FAO and UNESCO, bilateral aid organizations, agricultural and forestry departments, agronomists, land use planners and all those concerned in trying to bring about the productive and orderly development necessary for man to be adequately fed.

Dr. Richard Bradfield, then President of the Congress, addressed a letter to the Director-General of FAO calling his attention, and that of the Director-General of UNESCO, to the Congress resolution. Consultations were held at FAO Headquarters on the 5th and 6th October 1960 with Dr. Bradfield, Prof. V. Kovda, Dr. M. Batisse, Dr. F. W. Parker, Dr. R. Schickele and myself.

As a result the project was initiated in 1961 with the establishment of the project centre in Rome. An Advisory Panel was convened immediately after its first meeting was held in Rome, in June 1961, for the establishment of the guidelines for the implementation of the Project.

Although the work was centred in Rome, the Project has been in every sense a fully international enterprise and the result of real team work. Each of the great

---

\* Co-ordinator, Soil Map of the World - FAO/UNESCO Project

regions of the world contributed at least one member to the Project's Advisory Panel which has, at various times, benefited from the counsel of some 32 soil scientists of international repute. \*

On behalf of the Project I would like to thank Professor Bradfield, the members of the Advisory Panel of the Soil Map of the World, Professor van Baren, and those governments and soil scientists who have been more directly cooperating with the Project.

I would like to leave a word of thanks to the Soil Map of the World team in Rome who worked overtime Saturdays and Sundays so that the first draft of the World Soil Map could be presented, and to mention the support received by officers of UNESCO, in particular Professor Kovda and Dr. Batisse.

I shall attempt to give below a brief review of the main purposes and progress of the project. Three aspects were fundamental:—

Firstly, to build up a collection of basic material including soil maps and other maps and documents of environmental conditions.

This was done with material contributed by governments, UN Development Programme field activities carried out by FAO and UNESCO and from bilateral aid organizations. This collection is immensely valuable, not only for the Project but for studies of specific project areas in formulating development areas in preliminary feasibility studies and to acquaint experts with background information.

Secondly, to carry out field research work for the exploration of areas for which little or no soil knowledge was available. Field study tours, sometimes involving special expeditions, were organized and carried out in more than 40 countries, together with many correlation meetings which were needed to bring about the formation of the growing mass of data into an accepted framework. I would like to mention an example:

**The Soil Resources Expedition in Western and Central Brazil in June/July of 1965.** With the participation of twenty-seven colleagues of nine nationalities. They examined soils all the way from the Peruvian border to the capital of Brazil travelling by land over a distance of more than 3,000 km of thinly populated land, over a large part of the Amazons and some of the vast savannas of Central South America. This expedition is explained in World Soil Resources Report No. 22.

Thirdly, to carry out as much international field soil correlation research as allowed. The Project following the Advisory Panel's recommendations gave priority to these field studies and correlation problems around the table and during field research work. This helped very effectively to clarify situations arising from the use of different systems and nomenclature. Such discussions are an essential first step towards opening the gate wide for the transfer of agricultural knowledge and

---

\* Soil scientists who have participated in Advisory Panel meetings or who have been hosts to regional soil correlation activities are:—

Mr. F. H. Altaie (Iraq); Prof. G. Aubert (France); Dr. L. Bartelli (USA); Mr. M. Brambila (Mexico); Mr. M. Camargo (Brazil); Dr. D. Cappannini (Argentina); Dr. F. Carlisle (USA); Prof. N. Cernescu (Romania); Prof. Costa Lemos (Brazil); Dr. J. d'Hoore (Belgium); Dr. J. Douglass (USA); Dr. W. Ehrlich (Canada); Dr. P. Etchevehere (Argentina); Mr. G. Flores Mata (Mexico); Dr. F. Fournier (France); Acad. I. Guerasimov (USSR); Mr. J. Gitau (Kenya); Dr. S. Govinda Rajan (India); Dr. C. Kellogg (USA); Prof. V. Kovda (USSR); Dr. A. Leahey (Canada); Dr. E. Lobova (USSR); Mr. S. Muturi (Kenya); Mr. H. Obeng (Ghana); Prof. M. Ohmasa (Japan); Dr. M. Oyama (Japan); Mr. R. Pacheco (Ecuador); Mr. Pereira-Barreto (Senegal); Mr. K. Quagraine (Ghana); Mr. S. Raychaudhuri (India); Dr. B. Rosanov (USSR); Dr. G. Smith (USA); Dr. C. Stephens (Australia); Dr. R. Tamhane (India); Prof. R. Tavernier (Belgium); Dr. N. Taylor (New Zealand); Acad. I. V. Tiurin (USSR); Prof. F. van Baren (Netherlands).

**UNESCO Officers:** Prof. V. Kovda; Dr. M. Batisse; Prof. O. Fränze; Mr. S. Evteev.

**FAO Officers:** D. Luis Bramao; Dr. R. Dudal; Prof. J. Bennema; Mr. J. Riquier; Mr. K. J. Beek; Mr. M. Gardiner; Dr. J. Papadakis; Mr. A. C. S. Wright; Mr. J. H. V. van Baren; Mr. A. Smyth; Dr. R. B. Miller.

experience which is one of the Map's chief purposes. (Soil Resources reports Nos. 29, 32 and 33.)

One of the most important meetings was held in Moscow in 1966, a historic event because of the agreement achieved, for the first time, on the principles for the preparation of definitions of soil units and for a uniform legend of global acceptability.

International soil correlation was carried out to the maximum possible extent allowed by the resources of the Project. Although great progress has been achieved, the experience shows how fruitful international soil correlation can be and how much need still exists for such activities on a world wide basis. Report No. 33 — Definitions of Soil Units for the Soil Map of the World — was prepared expressly for discussion at the Congress. From the USDA it borrowed criteria used for the definition of the diagnostic horizons, for the identification of many of the units and for some of the nomenclature adopted, and from Soviet soil science the criteria for such soils as "Gleysols", "Halosols", "Chernozems", etc., and names such as Chernozems, Castanozems, Podzols, Solonchaks, Solonetz, etc. The French contributed definitions for soils which are typical of the alternatively dry and wet sub-tropics.

Most of the information for the humid tropical areas comes from FAO soil survey specialists working in cooperation with governments during the past fifteen years. Other influences, such as Canadian and Portuguese, could also be identified.

### **First Draft Soil Map of the World**

The first draft Soil Map of the World shows soils grouped into seventy-nine major soil units arranged into a large number of associations. Some of the continents have as many as 374 associations in addition to different classes and phases. The total number of mapping units will be considerably high in the final draft, perhaps above the thousand mark. Each mapping unit carries a symbol which indicates a dominant soil, its texture and slope, and the associated soils which occur as inclusions are not shown on the map but will be described in the covering text when the map is published. By consulting the map and text it will be possible to estimate the total areas of associated soils in any mapping unit, and so, take the first step towards appraising the potentialities of such units for agricultural use.

It should be stressed that the legend of the first draft soil map of the world has been designed for small scale maps ranging from 1 : 1,000,000 to 1 : 5,000,000 or smaller and should be judged in such a context.

### **The Scale and the Topographic Base Map**

The selection of the scale depended on many factors. At the 1960 Congress the soil maps of South America, Africa and Australia were displayed at a scale of 1 : 5,000,000; the map of Asia at a scale of 1 : 6,000,000 and a partial map of Europe at a scale of 1 : 2,500,000. The only small scale base map available with a worldwide coverage was the 1 : 5,000,000 projection of the American Geographic Society. Still today, there is no other small scale base map with world coverage. However, during the preparation of the different continental soil maps, larger scales were used. The procedure followed for the preparation of the different soil maps differed as is understandable.

**North America.** This map was prepared within the framework of the project by the U.S. Soil Conservation Service in cooperation with the Research Branch of the Canadian Department of Agriculture and with the Direction de Agrologia, Secretaria de Recursos Hidraulicos of Mexico. Official international soil correlation was carried out during three soil correlation meetings and study tours held respectively in Mexico in 1965; in Canada 1966 and in the USA in 1967. Additional field soil correlation was carried out in Mexico by Mexican, U.S. and FAO staff at the end of 1967 and during 1968. The present draft soil map of North America comprises 398 associations besides the phases and classes.

**Central America.** This map was prepared on the basis of existing national soil maps of the individual countries and by correlation work carried out by FAO Headquarters staff and by FAO staff in the Latin American region. Study tours and soil correlation has been carried out in the region during different occasions and as recently as 1967. This present draft contains about 80 soil associations.



**South America.** The map displayed during the Congress is the latest version of a sequence of our drafts; previous drafts having been presented in Wisconsin (1960), Rio de Janeiro (1962) and Bucharest (1964). The preparation of these drafts had the cooperation of many South American government institutions and soil scientists. Two soil correlation meetings took place in Rio de Janeiro (1962 and 1964) and a third was held in Buenos Aires in 1966. Several study tours were undertaken in the whole continent. They were mostly of an exploratory nature and included visits to areas which, so far, had never been studied by soil scientists. The draft explanatory text, which is now reproduced as World Soil Resources report No. 34, includes chapters on climate, natural vegetation, geomorphology, lithology and present land use and suitability for agricultural development of the continent's major soils. The draft consists of 374 soil associations. When the different phases and classes are taken into consideration 480 mapping units can be distinguished.

**Africa.** A study of the background information, including new soil maps prepared since 1963 (date of publication of the CCTA map) was undertaken. The most recent information originated from UNDP/FAO Special Fund projects and bilateral assistance activities and study tours which were carried out in West and East Africa. Provisional correlations were made between the FAO/UNESCO legend, the CCTA legend and the legends of the original documents. The map has some 210 soil associations.

A number of problems were encountered in the preparation of this draft:—

- (a) The dominant soil in a given association was often unknown;
- (b) Phases were added when the original documents permitted;
- (c) Correlation difficulties arose chiefly because of the lack of specific data related to the nature of the B horizons. It was often difficult to decide whether a soil was a Humic Cambisol, a Dystric Cambisol, an Acrisol, or a Ferralsol. Since the cation exchange of African soils is often higher than 16 me, which excludes "Ferralsols" in the present definition, whenever the argilluvic horizon cannot be identified soils cannot be classified as "Acrisols". It remains to group them with "Cambisols" which is rather inadequate for material of such deep weathering. The strict application of that 16 me limit will exclude many Ferralsols from the Soil Map of Africa.
- (d) The CCTA map distinguished "Red Ferralitic soils" and "Yellow Ferralitic soils". The FAO/UNESCO legend includes both in "Helvic Ferralsols" and separates them from "Rhodic Ferralsols". Interpretations were therefore necessary.

The criteria for the definitions of the legend and the existing background information of the CCTA and the FAO/UNESCO maps are quite different. Precise correlation, therefore, was often not possible and some boundaries will need revision. The present draft soil map of Africa therefore should be considered only as a first draft and additional field work is still needed to clarify many problems.

**Europe.** It includes many new national soil maps recently supplied to us. The map needs further revision and field soil correlation but in its present form includes the most recent information available. At present it contains 246 associations and 335 mapping units.

**Asia.** The soil map of Asia was entirely prepared by USSR soil scientists. However, international soil correlation, including meetings and study tours, was carried out in the USSR (Moscow and Tashkent, 1962); Japan (1965); and India (1965 and 1967). Discussions on the map's legend, including soil definitions and correlation, were held in Moscow during May 1968.

**Australia.** The draft soil map of Australia was prepared in Australia from the Atlas of Australian Soils, 1 : 2,000,000. At this stage only the dominant soils are shown. It is intended to redraft the map at the 1 : 5,000,000 scale using associations showing the dominant and associated soils, texture and slope classes by reducing and simplifying the present 1 : 2,000,000 soil map. It is envisaged that the final 1 : 5,000,000 map will be ready by the end of 1969.

### Uses of the Map

The history of the development of agriculture in many countries is closely related to the introduction of land use techniques including new crops and new crop varieties following the process of trial and error. In present development programmes,

however, the time element is different. It is imperative to transfer agricultural knowledge and experience faster and more effectively, not only in terms of specific new crops and breeds of livestock, but also with regard to all other basic aspects of rational land use and management that must go with it. In order to achieve this, the ecological environment must be carefully analysed on the basis of such physical factors as soil resources, crop-climate, water resources, vegetation and topography, to identify the so-called homo-environments. The information collected for the Soil Map of the World has been used for such analyses and for the subsequent preparation of preliminary land resources inventories combining crop-climate with soils and topography for more than 45 of the developing countries in South America, Africa, South Asia and the Near East. These inventories will require successive stages of refinement but they have already yielded very promising results in disclosing critical relationships between environment and agricultural production. They showed, for the first time, ratios between land already under cultivation and potential areas available for cropping, pastures and forests. Through this systematic approach, agricultural production potential can be assessed. These studies involve the interpretation and manipulation of a considerable amount of relatively complex data, which, with use of computer analysis, could be fully utilized to bring to light the potential land resources for food production by area, continent or on a world-wide scale.

When deciding how agricultural development can be most effectively undertaken, land resources studies will help in identifying promising production areas and negative or problem areas. They will make possible the prediction of areas where specific crops can best be produced. Thus, waste of effort, capital and, above all, human resources that inevitably occur when man cultivates unsuitable soils, can be avoided or at least reduced. The ability to make such judgements is imperative to everyone concerned with development and certainly to the broad scale planning agencies such as FAO and UNESCO. Thus, contributing to regional planning, the World Soil Map gives the opportunity of freeing the strategy of agricultural development from the straitjacket of national frontiers. By simplifying the exchange of modern techniques of production, it brings countries closer. It enables the targets in the battle against hunger to be delineated more accurately. However, all these must depend in the long run on man's readiness to use his soils according to their capabilities and treat them according to their needs. There are, happily, signs that this is now beginning to happen.

The value of the Soil Map of the World as an instrument for education and research cannot be minimized. The Map and its preparation is an important contribution to the advancement of soil science and it is possible to foresee numerous different uses to which it can be put when it is published. Many important correlations will be found with other sciences concerned with human welfare. For instance, to the geography of endemic diseases, the distribution of trace element disorders that may affect plants, animals and, always, man. I would also like to mention the question of fallout in soils, as in the case of strontium 90, and its consequences.

It is anticipated that the publication of the soil map, region by region, will start in 1969, with the soil map of South America, which is in final draft, and the other continents following.

The first soil map of the world will by no means be complete. Many areas will have to be penetrated and assessed before this first broad inventory is ready. The process must be a continuous one if soil quality is destined to play a role in the production of food. Just as we catalogue our potential oil and fuel reserves so we have taken the first step towards assessing the most fundamental of all our resources — our soils.

### **The mapping units of the Soil Map of the World (FAO/UNESCO Project)**

At the conclusion of the discussion on the Legend of the Soil Map of the World in Adelaide (See Bull. 33, page 19) it was decided that the World Soil Resources Office at Rome would prepare a new draft in which the amendments suggested during the 9th International Congress were to be given due consideration. The adapted list is now presented by Dr. Dudal, Chief Correlator of the Project.

## About the Legend for the Fao/UNESCO Soil Map of the World

On the occasion of the Ninth International Congress of Soil Science, held in Australia from 6 to 16 August 1968, an afternoon session was devoted to the discussion of the soil units proposed to be used for the Soil Map of the World. The session was held on Wednesday 14 August, chaired by Prof. V. Kovda, Chairman of Commission V, and moderated by Dr. Dudal, Project Soil Correlator. It was attended by about 300 soil scientists from a wide range of countries.

In preparing a soils legend which can be applied on a global basis, one is faced with the fact that, at present, there is no generally accepted system of soil classification. The different systems presently being used show profound divergencies as a result of differences in approach or in relation to the different environments for which they have been created. An attempt was made to correlate the major soil units which have been recognized in different parts of the world and to combine them into one outline. A first draft of definitions of soil units for the Soil Map of the World was discussed at the Eighth International Congress of Soil Science held in Bucharest in 1964. A general agreement on the principles to be adopted for the preparation of an international legend was reached at the Advisory Panel meeting held in Moscow in August 1966. As a result a new outline was prepared and was presented to the Congress in the form of World Soil Resources Report No. 33 (FAO, Rome, 1968) entitled "Definitions of Soil Units for the Soil Map of the World". This document served as a basis for the discussions held on the Soil Map of the World during the Soils Congress in Australia.

The proposed list of units is a mono-categorical classification of soils units including the major soils covering the earth surface, separated on the basis of present knowledge on their genesis, morphology and distribution and on their significance as resources for production. In order to secure a reliable identification and correlation the proposed soil units have been defined in terms of measurable and observable properties. The soil names which have been adopted correspond, whenever possible, to "traditional" usage, as in the case of Chernozems, Kastanozems, Podzols, Planosols, Solonetz, Solonchaks, Rendzinas, Rhegosols and Lithosols. Names which in recent years have acquired a more general acceptance, such as Vertisols, Andosols and Ferralsols, have been introduced. A number of names, however, though firmly established in current soils literature, such as Podzolic soils, Brown Forest soils, Mediterranean soils, Lateritic soils and Alluvial soils, could not be used without perpetuating the confusion which different use of these terms in different countries had created. It was imperative, therefore, to coin new names in a limited number of cases. The selection of these names has been guided by the requirements of an international terminology which should not change markedly with translation.

A brief review is given here below of the major subdivisions and names which were discussed during the Congress. An agreement in principle was reached subject to revision of certain definitions in accordance with the suggestions of the meeting and of additional study on the adequacy of some of the names. The brief descriptions which follow are **not** definitions but aim merely at familiarizing the reader with the proposed nomenclature. For the definitions, reference is made to the above-mentioned report. A new edition is now in preparation.

**Fluvisols** (from L. fluvius, river; connotative of floodplains and alluvial deposits). Weakly developed soils from alluvial deposits in active floodplains.

**Rhegosols** (from Gr. rhegos, blanket; connotative of mantle of loose material). Weakly developed soils from unconsolidated materials other than recent alluvial deposits.

**Arenosols** (from L. arena, sand). Strongly weathered sandy soils of tropical and subtropical areas.

**Gleysols** (from Russian local name "gley" meaning mucky soil mass; connotative of reduced or mottled layers resulting from an excess of water). Soils in which the hydromorphic processes are dominant.

**Rendzinas** (from Polish Rzedzic, noise; connotative of plough noise in shallow soils). Soils developing surface horizons rich in organic matter over highly calcareous materials.

**Rankers** (from Austrian ank, steep slope; connotative of shallow soils). Soils which develop a surface horizon enriched in organic matter over siliceous materials.

**Andosols** (from Japanese An, dark, and Do, soil; connotative of a dark surface horizon). Weakly developed soils from volcanic ash.

**Vertisols** (from L. *verto*, turn; connotative of a turn over of surface soil, self-mulching soils). Cracking clay soils.

**Yermosols** (from Sp. *Yermo*, desert, derived from L. *eremus*, solitary, desolate). Soils of desert environments.

**Xerosols** (from Gr. *xeros*, dry). Soils of semi-arid environments.

**Solonchaks** (from Rus. *sol*, salt). Soils showing strong salinity.

**Solonetz** (from Rus. *sol*, salt). Soils developed under the influence of high sodium saturation.

**Planosols** (from L. *planus*, flat, level; connotative of soils generally developed in level or depressed topography with poor drainage). Soils showing strong textural differentiation and surface waterlogging.

**Kastanozems** (from L. *castaneo*, chestnut, and from Russian *zemlja*, earth, land). Soils of subarid steppes showing an accumulation of organic matter in the surface horizons, often calcareous throughout.

**Chernozems** (from Russian *chern*, black, and *zemlja*, earth, land). Soils of grassland steppes showing strong accumulation of organic matter in the surface horizons and an accumulation of calcium carbonate at shallow depth.

**Phaeozems** (from Gr. *phaios*, dusky, and Russian *zemlja*, earth, land). Soils of forest-steppes showing a strong accumulation of organic matter in the surface but a deep leaching of calcium carbonate.

**Cambisols** (from late L. *cambiare*, change; connotative of soils in which changes in colour, structure and consistence have taken place as a result of weathering). Soils formed by a weak alteration of the parent material.

**Luvisols** (from L. *luvi*, perfect tense from *luo*, to wash, lessiver; L. *argilla*, white clay; L. *il*, in; connotative of illuvial accumulation of clay, arg-il-luvic). Soils having an argilluvic B horizon of medium to high base status.

**Acrisols** (from L. *acris*, very acid). Soils having an argilluvic B horizon of low base status.

**Podzols** (from Russian local name derived from *pod*, under, and from *zola*, ash). Soils having B horizons of iron or humus accumulation or both.

**Podzoluvisols** (combined from Podzol and Luvisol). Soils having an argilluvic B horizon but also showing features of Podzols.

**Nitols** (from L. *nitidus*, shiny, bright, lustrous; connotative for the shiny ped faces). Soils having very deeply developed argilluvic B horizons and showing features of strong weathering.

**Ferralsols** (from L. *ferrum* and aluminium; connotative of a high content of sesquioxides). Strongly weathered soils consisting mainly of kaolinite, quartz and hydrated oxides.

**Histosols** (from Gr. *histos*, tissue). Organic soils.

**Lithosols** (from Gr. *lithos*, stone). Shallow soils over hard rock.

These 25 major divisions are further subdivided into groups, totalling 89 units. The mapping units on the Soil Map of the World are composed of one or more of these soil groups occurring in association, with an indication of the texture of the dominant great soil group and the relief of the landscape in which they occur. Phases have been foreseen to indicate stoniness, indurated layers or hard rocks at shallow depth, salinity or alkalinity. It is stressed here that the above outline is not meant as another soil classification system but is mainly designed to serve as a common denominator. In the framework of the project, a correlation has been established between the units proposed above and those of several national classification systems. It is hoped that this outline will permit an intensified exchange of experience and will promote the creation of an internationally accepted soil classification.

**Any additional comments on the proposed definitions of soil units will be welcomed and can be sent to: Dr. R. Dudal  
c/o FAO  
00153 Rome, Italy**

**MISCELLANEOUS NEWS**  
**INFORMATIONS DIVERSES**  
**VERMISCHTE MITTEILUNGEN**

**Second Latin American Soil Biology Congress**

Scientists of 24 countries of the Americas and Europe assembled at Santa Maria Federal University, Brasil, from July 22—30, 1968, to participate in the UNESCO sponsored 2nd Latin-American Soil Biology Congress, organized by Prof. Dr. A. Primavesi, Director of the Instituto de Solos e Culturas. The subject matter dealt with was discussed in 3 Commissions: I - Soil Microbiology, II — Soil Zoology and III - Soil Biodynamics and Productivity. Each of these Commissions prepared and adopted a number of specific conclusions and recommendations, whereas at the closing session the Congress formulated a programme of future activity in a series of general conclusions. Among these is the suggestion that 5 Training Centers be established in Latin America, viz. for Soil Microbiology in Buenos Aires and in Mexico City, for Soil Zoology in Santiago de Chile and for Soil Biodynamics and Soil Productivity in Santa Maria and in Buenos Aires. The Congress also decided to ask for support and sponsorship from UNESCO for a quarterly Latin American Soil Biology Proceedings.

The 3rd Congress will be convened in 1970 in Mexico City.

**Soil Microbiology Symposium**

In 1968 it was decided that the Soil Microbiology Symposium, organized over the past numbers of years by Dr. Ponchon of the Pasteur Institute at Paris, will from now on be a bi-annual event and be convened alternately in France and in another country. The next meeting is scheduled for the 8th and 9th of May, 1970 in Ghent, Belgium, and will be under leadership of Professor J. Voets of the Faculty of Agronomy, Ghent University. The theme is: Action of pesticides and herbicides on the microflora and microfauna of the soil; telluric degradation of their molecules. Three invited speakers will discuss specific aspects of the subject. They are Professor Audus (U.K.), Dr. van der Drift (Netherlands) and Dr. Esser (Switzerland).

Interested members should inform:

Monsieur le Pr. J. POCHON  
Chef de Service, Microbiologie du Sol  
Institut Pasteur  
25, rue du Docteur Roux, 75-PARIS XVe, France,

of their intention to participate.

**The West-European working group on  
soil structure determination**

The stock of the manual "West-European Methods for Soil Structure Determination" is about exhausted. Only a few copies are still available at the price of Belgian Francs 600 or 12 U.S.\$ postage and insurance included. They can be ordered directly from: Prof. Dr. M. De Boodt

State Faculty of Agricultural Sciences  
Coupure Links 235  
GHENT, Belgium.

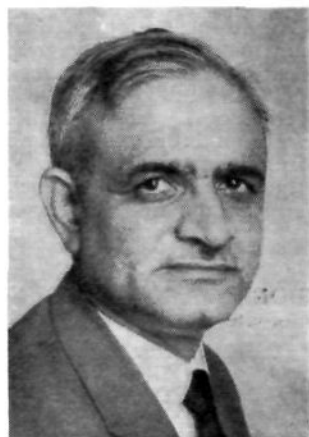
A supplement to the volume will be published in the summer of 1969 at a price of B. Francs 50 or U.S.\$ 1. Interested members in Western Europe are requested to contact the National Secretaries of the Working Group:

- Austria** : Prof. Dr. H. Franz, Hochschule f. Bodenkultur, Gregor Mendel-Strasse 33, Wien XVIII.
- Belgium** : Prof. Dr. L. De Leenheer, Soil Science Dept., State Agric. University, Coupure Links 235, Ghent.
- Denmark** : Prof. Dr. H. C. Aslyng, Royal Veterinary and Agric. College, Hydrotechnical Lab., Bülowsvej 23, 1870 Copenhagen V.

- Finland** : Mr. G. Larpes, Dept. of Agric. Chemistry and Physics, Agricultural Research Center, Tikkurila.
- France** : Dr. G. Monnier, Centre de Recherche INRA, Route de St. Cyr, Versailles.
- Germany (Fed. Rep.):** Prof. Dr. H. Frese, Bundes Allee 50, 3301 Braunschweig-Völkenrode.
- Ireland** : Mr. W. Burke, An Foras Taluntais (The Agricultural Institute), Kinsealy, Malahide, Co. Dublin.
- Netherlands** : Dr. P. K. Peerlkamp, Institute for Soil Fertility, Oosterweg 92, Haren (Gr.).
- Norway** : Mr. A. Njøs, Norges Landbrukshøgskole, Institut for Jordkultur, Vollebakk.
- Sweden** : Prof. Dr. R. Heinonen, Institute of Soil Management and Fertility, College of Agriculture, Uppsala 7.
- Switzerland** : Dr. E. Frei, Eidg. Landwirtsch. Versuchsanstalt, 8050 Zürich.
- United Kingdom** : Mr. A. J. Low, Jealott's Hill Research Station, Bracknell, Berks.

**Members outside West-Europe should address themselves directly to Professor De Boodt.**

#### **Distinguished award to Dr. J. S. Kanwar**



The Indian Council of Agricultural Research, New Delhi, awarded the Rafi Ahmed Kidwai Memorial Prize for the biennium 1964—1965 to Dr. J. S. Kanwar for his notable contributions in the field of Agricultural Chemistry.

Dr. J. S. Kanwar, formerly Director, Research, in the Punjab Agricultural University, Ludhiana, and now Deputy Director General, Indian Council of Agricultural Research, New Delhi, is well known for his work on soil fertility, micronutrients and sulphur, quality of irrigation water and soil salinity problems. His outstanding researches have led to the diagnosis of sulphur deficiency in the tea and groundnut growing areas of Punjab which limited their yield potential. His work indicated methods of correcting these deficiencies in a most scientific and economical manner. His identification of widespread deficiency of zinc and iron in citrus and other crops and the toxicity of boron in saline-alkali soils is of great practical value. Dr. Kanwar has also made significant

contributions in rating the quality of irrigation water and reclamation of saline and alkali soils. He advocated the biological approach along with chemical methods for the reclamation of these deteriorated soils, emphasizing the use of proper fertilisers and crop rotations and the introduction of sugarbeet in such soils.

Dr. J. S. Kanwar is the author of over 150 scientific and review papers. He is an internationally known soil scientist and was elected Vice-Chairman for Commission VI of the International Soil Science Society for the years 1964 tot 1968. He is also a member of the UNESCO Advisory Committee on Natural Resources.

#### **Esperanto and Soil Science**

Any member favouring the promotion of Esperanto as an international means of removing language barriers between scientists all over the world is invited to inform the Chairman of the Moscow-University Esperanto Society and student in soil science of their interest. The address is:

L. Medvedev  
7 Str. Borodinskaja  
St. Nemchinovka  
Moscow Region, USSR.

*copy 2/15*

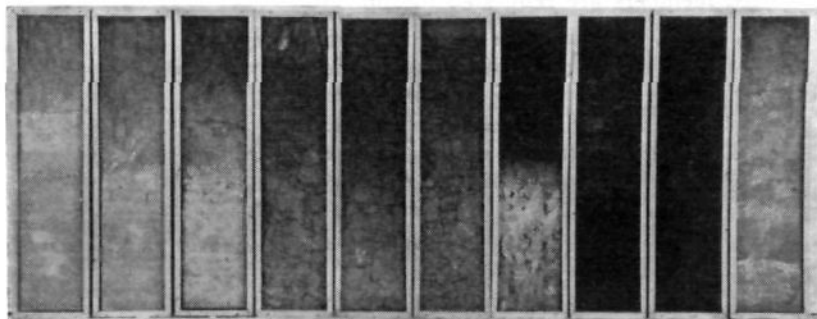
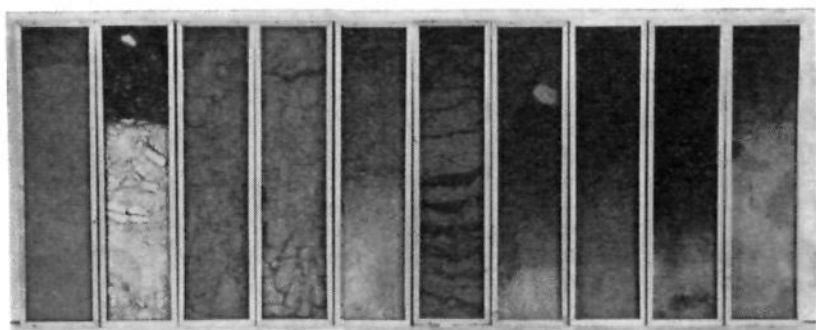
### The International Soil Museum

Progress of this world-embracing project is steadily growing, although the material problems regarding the construction of adequate housing are not fully solved. In the meantime interest is concretized as follows from the fact that a representative collection of Hungary has been prepared, and is now stored in the Soils Institute of the Utrecht University. Hungarian soil scientists collaborated most efficaciously by preparing monoliths of twenty profiles, whereas the Hungarian Academy of Sciences generously supported this work through the "no-charge" cooperation of the Soil Research Institute at Budapest, directed by Prof. Dr. I. Szabolcs.

The pictures show the collection as now in custody for later exhibition. Full chemical and physical data of main horizons of each of the profiles were made available as an indispensable annexe to the monoliths.

By the Division of Soils of C.S.I.R.O., Australia, headed by Past President Dr. E. G. Hallsworth, 70 profiles have been specifically collected for the Museum and will arrive in the Netherlands shortly after the dispatch of this bulletin.

Both the Hungarian and Australian activities are most rejoicing examples of international interest and cooperation.



**INTERNATIONAL CONFERENCES OF ALLIED SCIENCES**  
**CONGRES INTERNATIONAUX DE SCIENCES CONNEXES**  
**INTERNATIONALE KONGRESSE VON VERWANDTEN WISSENSCHAFTEN**

**International Commission on Irrigation and Drainage**

The Czechoslovak National Committee of the International Commission on Irrigation and Drainage organizes in June 1970 in Prague an International Water Erosion Symposium.

The topics are:

**1. Theory of surface water runoff.**

Relation between precipitation and surface runoff. Formation of surface runoff. Evaluation of surface runoff (computation of surface runoff volume, surface runoff distribution to time). Relation between surface runoff and the loss of soil.

**2. Relation between surface runoff, loss of soil and erosion factors.**

Effect of slope inclination, length of the slope, form of the slope, soil properties, vegetation cover, soil cultivation, organization of the soil fund and other factors on the formation of surface runoff and soil erosion.

**3. Theoretical basis for the design of anti-erosion measures.**

Analysis of design values for the respective types of erosion control measures. Efficiency of erosion control measures and their economical effectiveness.

Mapping of erosion phenomena.

**Provisional programme**

Sunday,	14 June:	9.30 a. m. ) 9.30 a. m. )	Registration.
Monday,	15 June:	8.00 a. m. ) 6.00 p. m. ) 10.00 a. m. ) 14.00 p. m. )	Registration. Inaugural Session. Technical Discussions.
Tuesday,	16 June:	9.00 a. m.	Technical Discussions.
Wednesday,	17 June:	9.00 a. m.	Technical Discussions. Closing Session.
Thursday,	18 June:		Special Programme.
Friday,	19 June:		Morning departure for Study tour to Moravia (Brno). Study tour ends Sunday, 21 June in Brno.

In addition to the programme of the International Water Erosion Symposium, there will be special programmes for the accompanying ladies.

Interested members are requested to apply to:

**Czechoslovak National Committee ICID,**  
**Organizing Committee of the International**  
**Water Erosion Symposium,**  
**Technical University**  
**Department of Irrigation and Drainage**  
**Karlovo nám. 3**  
**Prague 2**  
**Czechoslovakia**

**Agricultural Engineering**

The 7th International Congress of Agricultural Engineering will be held in Baden-Baden (Federal Republic of Germany) from 6—9 October, 1969. For further information please contact the Secretariat for scientific questions, 655 Bad Kreuznach, Am Kauzenberg, F.R.G.



**NEW EDITIONS — NOUVELLES EDITIONS — NEUE AUSGABEN**

(The books reviewed are to be ordered through your bookseller

**NOT through the Office of the I.S.S.S.)**

The Israel Program for Scientific Translations, P.O.B. 7145, Jerusalem, Israel, published another series of translations of soil science textbooks from Russian into English, thus promoting the internationalization of a prominent source of knowledge. An enterprise which undoubtedly merits great appreciation. 91 ✓

**V. V. ROMANOV. Hydrophysics of Bogs. Translated by N. Kaner, edited by Prof. Heimann. IPST Cat. no. 1967, pp. 299, Jerusalem 1968. Price US \$ 14.—.**

The total area of bogs in the USSR is 71.5 million hectares as compared to 30.7 million in Western Europe and North America. This fact warrants the publication of this monograph, which reports studies on the physical properties of the active layer of peat deposits and on the hydrophysical processes occurring in highmoor and lowmoor peat bogs. Such phenomena as freezing, evaporation, capillary movement of water and filtrational runoff are discussed in relation to water and heat conditions. Published in 1960 in the USSR, it presented a comprehensive study and although considered by the author to be a first attempt at summarizing data in bog hydrophysics, it offers a very interesting picture of peat science that merits attention of all specialists in this field.

**A. V. ALBENSKII and P. D. NIKITIN, Editors. Handbook of afforestation and soil melioration. Translated by Prof. Gourevitch. IPST Cat. no. 1610; pp. 516, Jerusalem 1967. Price US \$ 29.—.** ✓

This is a translation of the original Russian 3rd edition, that was published in Moscow 1956. The literature references comprises 312 titles, with one 1890 USA exception all of Russian origin. The textbook presents a detailed account of the experiences acquired and the results achieved in studying silvicultural problems in the vast territory of the USSR. It is organized in XVI chapters. The first and second deal with the development of forestation and natural condition in the steppe and forest-steppe region. The chapters III, IV and V are devoted to the various aspects of shelterbelts, reporting on pure silvicultural angles, their influence on climatic conditions and their location. The protective role of the forest in agriculture, also with regard to erosion hazards, is discussed in chapters VI, VII and VIII. The reclamation of sands through afforestation is treated in chapter IX. The remaining part of the book contains details of more specific silvicultural nature, including an account of the planning and the organization of the work in protective silviculture in kolkhozes. All in all an indispensable handbook for any one who likes to become familiar with methods, experiments and results of afforestation and soil amelioration in the Soviet Union.

**D. G. VILENSKII. The Russian school of soil cartography and its influence on the soil cartography of the world. Translated by N. Kaner, pp. 92, IPST no. 1908, Jerusalem 1967. Price US \$ 7.50.** ✓

This is a translation of the late Vilenskii's textbook that was published in 1945. This Russian soil scientist of world reknown presents a very worth reading history of soil cartography based on a review of 117 Russian papers bearing on the scientific studies and achievements in the USSR and on 70 publications in other languages covering soils of other parts of the world. Although 22 years have passed since the original text was published, the book makes most interesting and enlightening reading. Numerous quotations from early Russian literature justify statements as to be found indirect or direct in textbooks all over the world that the USSR, with Dokuchaev as the initiator, indeed is the cradle of soil cartography. In a final chapter the influence of Soviet soil science on the development of world soil cartography is reviewed in a very attractive, objective way. Indeed a book which merits a place in the library of any soil scientist interested in the scope of work as embraced by Commission V of the I.S.S.S.

✓ **I. V. TYURIN, I. N. ANTIPOV-KARATAEV and M. G. CHISHEVSKI. Reclamation of solonets soils in the USSR. Translated by Prof. A. Gourevitch, pp. 281, IPST no. 1910, Jerusalem 1967. Price US \$ 12,75.**

Published in Russian in 1960, this book is a general work describing some basic theoretical aspects of the genesis and melioration of solonets in the USSR. The scientific and practical results of tests made with combined improvement measures on the basis of arable-grass crop rotation, are described. There is a discussion on the principal results achieved in long-range tests at the Malouzenskii station for solonets research, under irrigation, as well as the results of many-sided experiments performed in the Ukraine without irrigation. A very up-to-date record of Soviet experiences specifically useful in view of the present-day's activities of the Sub-commission on Salt Affected Soils of the I.S.S.S.

✓ **E. V. LOBOVA. Soils of the desert zone of the USSR. Translated by N. Kaner, edited by Prof. Heimann. IPST Cat. no. 1911, pp. 405, maps, tables, lit. Jerusalem 1967. Price US \$ 15,25.**

With the publication of this English version of Mrs. Lobova's textbook the world literature is enriched by the work of one of the great specialists in desert soils. Chapter I (160 pages) deals with the soils and geography of the desert region of the USSR. Of the 7 main regions described representative soil profiles and their chemical characteristics are discussed. The vegetational cover as predominant in each of the examples is likewise recorded. In chapter II (118 pages) a systematic description of the grey-brown soils (serozems) and takyr is presented, again accompanied by soil profile descriptions, chemical and vegetational data. Chapter III (96 pages) deals with the genetic properties of the serozems recording data on organic matter, micro-organisms, carbonate, moisture content and water permeability, mineralogical composition of soil forming rocks, here indicating the 5 groups of sedimentary material: sandy-clay ancient alluvial deposits, eolian sands, blanket loams, proluvial deposits and lacustrine sediments. A few D.T.A. thermograms of the fraction < 0.001 mm (incorrectly named X-ray patterns, page 317) are added. The textbook concludes with chapter IV (10 pages) on the provinces and regions as recognized in the desert zone. A map of the soil districts 1 : 5.000.000 is inserted. A bibliography of 347 Russian titles and 24 publications in other languages, a list of abbreviations of Russian institutions and journals referred to in the text and an extremely useful glossary of less common Russian terms contribute to the outstanding nature of this book.

✓ **THE SOIL RESOURCES OF TROPICAL AFRICA. Edited by R. P. Moss, pp. 225. With french summary. Cambridge University Press, 1968. Price U.K. £ 2.—; U.S.A. \$ 7.—.**

This book contains the papers presented at the symposium of the African Association of the United Kingdom, held at London on September 20, 1965. At that occasion a great number of specialists in tropical soils and agriculture discussed the various aspects of the soils of Africa as a natural resource in the light of the ever increasing population density and, consequently, the increasing demand for food production. The book is very well organized, dividing the material into two parts: I. The characteristics of the resources, and II. The Use of the Resources. This allowed an interesting approach by presenting in chapter 1 The classification of tropical soils (Dr. d'Hoore, Editor-in-Chief of the Soil Map of Africa), followed by a chapter on soils, slopes and surfaces (Dr. Moss), conjointly offering the reader a most interesting review of the environmental African situation. Chapter 3 by Dr. Landale-Brown deals with the relationship between soils and vegetation, a subject which deserves the interest of soil-minded ecologists. In chapter 4 a discussion on the three chapters, edited by Dr. Morgan, concludes part I. The second part starts in chapter 5 with a discussion on shifting cultivation (Dr. Vine), followed by an evaluation of some agricultural problems of semi-arid areas (Dr. E. W. Russell). The use of fertilizers is reviewed by Dr. Richardson whereas the fertilizer requirement of some permanent crops in West and Central Africa is dealt with by Dr. Hartley. Chapter 9 concludes with a discussion on the subjects mentioned, compiled by the editor. A low priced valuable contribution to fairly up-to-date information on African soil resources.

**J. A. BONNET.** *La ciencia del suelo*, pp. 249, fotogr., etc. Published by Colegio de Ingenieros, Arquitectos y Agrimensores de Puerto Rico, GPO — Apartado 3845, San Juan, Puerto Rico, 1968. 291

This Spanish textbook on soil science is in a sense a supplement to the volume on saline and alkali-soils, published by the same author in 1960. The book is specifically composed for Latin-American students of Agricultural Colleges. It is clearly written and presents the most salient aspects of soil and soil life, even touching on the nucleated acids in plant and animal. Soil water, plant nutrition and alkali and saline soils are likewise discussed, whereas a chapter on soil classification concludes the volume. It gives proof of the wide experience of the author who dealt over a period of 35 years with soil and plant production problems as a collaborator and later chief of the Soils Department of the Agricultural Experiment Station of the University of Puerto Rico.

**FERTILIZER AND FERTILIZATION IN JAPAN.** Edited by Dr. Shiro Shita. Special issue No. 6 of *Agriculture Asia*, pp. 111. Published by the Association of Agricultural Relations, Asia, 11 Funakawara-cho, Shinjuku, Tokyo, Japan, 1968. Price US \$ 10.— ✓  
291

This volume, composed by 10 specialists in the various items discussed, presents an up-to-date picture of the subject-matter as given in the title. Starting with a review of the Japanese fertilizer industry (I), the issue continues with a paper on the development of fertilization technique (II), followed by a discussion on the characteristics and effect of fertilizers (III). The larger part (IV) deals with the fertilization of five main types of crop production: lowland rice, main upland crops, vegetable crops, main fruit trees and pastures. Secondary fertilizer elements and micro-elements are treated in a final chapter. An interesting account of Japanese experience and achievements with worthwhile information for any one active in the field of plant production.

**E. M. WILSON.** *Engineering Hydrology*, pp. 182, MacMillan, London, 1969. Price 55 s. ✓  
291

The textbook on hydrology written by Dr. Wilson has at least two merits on which everyone will readily agree. It is the most recent textbook on hydrology in a rapidly growing series of books on this discipline and it is the most concise one of the text books of the same scope published up to now.

In the opinion of the reporter another merit lies in conspicuous clarity with which important hydrologic concepts are explained. Thus the objective of the author to present a textbook the material of which can usefully be absorbed by final year undergraduates in two hours a week is well attained.

Most readers will appreciate the prevailing use of the metric system together with some application of the ft-lb-sec system. American readers are assured that "one becomes bi-lingual very rapidly".

The outline of the book follows the traditional division into hydrologic elements, surface runoff, hydrograph analysis, flood routing and hydrologic forecasting. There is included a brief but very good chapter on ground water.

A. VOLKER

**R. H. J. SELLIN.** *Flow in Channels*, pp. 135, MacMillan, London, 1969. Price 55 s. ✓  
291

This first of a group of books, edited by Dr. E. M. Wilson, is intended for advanced students in hydraulic engineering and for junior engineers. In this volume, conveniently arranged and illustrated by clear figures, the following subjects are treated: Uniform flow, Gradually varied flow, Rapidly varied flow, Control and measurement of open channel flow, Flow in erodible material and Unsteady flow in open channels. What is being elucidated in the text is expressed in formulae by means of secondary school mathematics, a fact that may be welcome to many readers. The author hardly touches upon the backgrounds of the theory and consistently maintains one and the same level. To those readers who nevertheless might want to dig a little deeper the listed references give a lead. All in all these handy lecture notes in book-form dealing with a specific subject of hydraulics will be readily borrowed by many a student from libraries who do not object to the price.

DELFT HYDRAULICS LABORATORY

15 ✓  
**INTERNATIONAL TECTONIC MAP OF AFRICA**, published by UNESCO and The Association of African Geological Surveys, Paris, 1969. 9 sheets, complete set US \$ 50.—, £ 15.—, F. 180.—.

Although relatively remote from the disciplines as organized within the I.S.S.S. this historic event of the publication of the first tectonic map of Africa merits to be paid attention to in this Bulletin as geology as such is a very allied science and many are the instances that understanding of pedological phenomena cannot dispense of information supplied by this sister branch of earth sciences. The map consists of nine sheets, dividing the area between longitudes 20°W - 70°E and latitudes 40°N - 40°S in 9 equal parts. The price is not too high for such an outstanding accomplishment which offers the latest information on the structure of the African continent acquired by the most modern methods used in geochronological studies.

✓  
15 ✓  
**K. MENGEL. Ernährung und Stoffwechsel der Pflanze. 3rd ed., pp. 436, 134 fig., 20 col. plates. Fischer Verlag, Jena, 1968. Price M. 34.— (US \$ 15.—).**

This is another German textbook which sees a third fully modernized edition in a few years after the first edition was published (1960). It is divided into three parts: I, dealing with the biochemistry of the most important metabolic processes in plants; II, The plant nutrition physiology and III, The specific effect and function of single plant nutrients. The book is, as could be expected from its author, a very thorough treatment of the utmost complex phenomena which are an integral part of plant growth. To name a few: enzymatic reactions, metabolism of lipids, of nitrogen compounds, water transport in the plant, effect of nutrition on the quality of vegetable products and, finally, the role of no less than 20 different elements, be it favourable or unfavourable. Minor elements as molybdenum, boron, fluor, silicium, aluminium, even nickel and selenium get adequate attention. Indeed a most valuable source of information on the nutrition and metabolism of plants.

✓  
**R. V. KOVALEV. Editor. Genesis of the Soils of Western Siberia. Translated by Prof. Gourevitch, IPST No. 5269, pp. 173. Jerusalem 1969. Price US \$ 8.—.**

This volume contains a collection of 16 papers on the peculiarities of soil formation in some regions of Western Siberia by collaborators of the Soils Section of the Biological Institute of the Siberian Branch of the Academy of Sciences of the USSR. They deal with such widely divergent subjects as the genesis and geography of peculiar mountain soils of Altai; the Manganese distribution as well as the Nitrogen-dynamism in the Gorno-Altai Region; the genesis of the podzolic soils of the Ob-Irtyusk divide; problems of salinity in Kulunda and Baraba; the erosion processes in the Novosibirsk Region and finally with the agrophysical properties of the principal soil types in the Novosibirsk Region. The reviews presented allow the reader to become acquainted with the soils as natural bodies, as well as with important landscape features of the part of Siberia studied.

mei  
L/6/4  
**J. PAPADAKIS. Soils of the World. 46 maps and 9 tables. 10 x 14". pp. 208. Geographical and subject index. Elsevier Publishing Company. Amsterdam, 1969. Price Dfl. 70.—.**

Dr. Papadakis, author of a number of books and papers on climate and soils, during the past few years crop ecologist of the FAO, has undertaken the tremendous job of compiling classificational data of soils on a worldwide scale and constructing soil maps of various continents and separate countries. This effort resulted in the present volume with no less than 48 black and white maps inserted in the covering text. Studying the material available he could not but observe that in the various parts of the world different systems of classification had been and still are used. This lead him to synthesize a new classification based on his earlier climatic conception, over and again correlating his major units with those used in existing continental or regional maps. Taking the 7th Approximation of the American Soil Survey Staff 1960 as a guide, he concluded that a soil classification system should give more information related to the theory of soil formation than the 7th Approximation does. This explains that chapter I is devoted to the various factors of pedogenesis, dealing in 15 pages with: Clay synthesis, Humification, Leaching, Adding processes, Processes involving iron, Podzolization, Influence of Climate,

Drainage and Moisture regime, Parent material and Time. In order to cover all these rather complex and complicated subjects in a few pages asks for a concision that may lead to peculiar statements as e.g. *Volcanic ashes produce andosols and duripans*. Chapter II emphasizes the need for laboratory data as being indispensable for soil diagnosis. In chapter III 53 diagnostic horizons are enumerated as compared to 12 in the 7th Approximation. This results in a system composed of 15 "highest groups of soil classification", further subdivided into 245 subgroups, with indications of thickness or depth of occurrences of characteristic horizons. The system in the system and its pedogenetic basis is, however, not clearly exposed. As there are no profile descriptions nor profile data it is difficult to understand why e.g. a "Russian meadow solonchak solonetz" better be named "slightly saline chernozemic rendzina alkaline to the surface" or why spodic quartzzopsamment of the 7th Approximation is less indicative than "aeolian humus podzol 11 inches illuvial". In this chapter soils with a degree of leaching 1—2 are classified, whereas in the chapters IV and V strongly leached soils and halomorphic, gleisolic and organic soils are respectively dealt with. In chapter VI the author presents his concept of the fundamental patterns of soil distribution, separating 6 regions: (1) podzolic, (2) cinnamonic, (3) chernozemic, (4) kaolinitic, (5) deserts and (6) mountainous. The next chapter VII contains a review of the soils of the world country by country as a text to the maps. However, printing the list of symbols on a lay-out sheet, would have substantially added to an easier map reading. Chapter VIII on Agricultural Potentialities finally terminates this volume, which allows the student in soil geography to study, on a comparable classificational basis, maps of all regions of the world including such inaccessible countries as Thailand, the mainland of China, Asiatic USSR, next to France, Luxembourg etc. The author is well aware that his maps are only approximations, but he expresses the hope his work may contribute to the unification of our concepts. Time will have to prove whether he succeeded, but it will be anyhow interesting to compare the mapping units of the FAO/UNESCO Soil Map of the World as presented in this Bulletin, page , which are the result of compromising between existing systems, with those introduced by Dr. Papadakis in his Soils of the World.

**LAND EVALUATION.** Edited by G. A. Stewart. Papers of a UNESCO sponsored CSIRO Symposium. August 1968, pp. 392, fig., fotogr. MacMillan of Australia, Melbourne, 1968. Price £ 10. net. ✓  
291

This book contains 32 papers presented at the symposium, with a foreword of the editor. The object of the symposium was to explore the potential of recent advances in science and technology for land evaluation. For that purpose basic concepts and principles were examined, the potential use of automatic data processing and interpretation was assessed, land parameters and sensors were discussed. This approach is reflected in the well organized proceedings. The subject matter is divided into five main sections: I. Principles of land classification and evaluation (6 papers), II. Land evaluation reviews and case studies (8 papers), III. Data handling and interpretation (5 papers), IV. Land parameters (7 papers) and V. Sensors for land parameters (6 papers). The volume thus presents a valuable contribution to an up-to-date appraisal of the possibility to assess the suitability of land for man's use in agriculture, forestry, engineering, regional planning, etc.

**MINERALOGY IN SOIL SCIENCE AND ENGINEERING.** SSSA Special Publication Series No. 3, pp. 106. Published by Soil Science Society of America, 677 South Segoe Rd., Madison, Wisconsin 53711. Price US. \$ 3. plus 50 c. postage (prepaid orders). ✓  
291

This volume contains five papers presented at a special symposium held on November 6, 1967 during the annual meeting of the Soil Science Society of America in Washington, D.C. The first paper, by Philip F. Low, deals with "Mineralogical Data Requirements in Soil Physical Investigations" discussing in detail and on a mathematical basis in which way and to what extent clay minerals have a decisive influence on most if not all physical properties of clay and soil systems. Hans F. Winterkorn emphasizes in paper 2 the importance of soil minerals, their actual and potential interaction with the water substance in practically all engineering uses. The third paper is by R. J. McCracken who discusses the application of soil mineralogy to soil classification investigations, most explicitly at the family level of the USDA system but also to differentiate certain taxa at other categorical levels.

Soil mineralogy and soil chemistry and fertility investigations get adequate treatment in paper 4 by C.I. Rich who reports on the role of the well-known clay minerals of both the 2 : 1 and 1 : 1 type, oxydes, allophane and, to be noted specifically, on zeolites and feldspars. Fertility and mineralogy is briefly commented on. In the final paper W. F. Bradley discusses the trend in mineralogical analysis providing examples for the recent development of instrumental methods.

The little volume offers a wide range of informative data to all who are interested in this special field of soil science.

## OBITUARY — NECROLOGIE — NEKROLOGIE

Firman E. Bear †

(1884—1968)



Firman E. Bear, Professor Emeritus of Agricultural Chemistry, Rutgers University, and Emeritus Editor-in-Chief of *Soil Science* died suddenly on April 6, 1968. Born May 21, 1884 he received his B. Sc. (1908) and M. Sc. (1910) degrees from Ohio State University, pursued graduate studies in physical, analytical, and organic chemistry at Ohio State University and Cornell University, and at the University of Wisconsin, where in 1917 he was awarded the degree of Doctor of Philosophy. Later he was to receive honorary Doctor of Science degrees from both the University of Chile and Rutgers University.

Following work in extension and teaching at Ohio State University, Bear became chairman (1914) of the Department of Soils at West Virginia University. Two years later he returned to teach and do research at Ohio State University for nearly thirteen years. While at Ohio State he received national recognition in the field of agricultural chemistry, particularly in connection with fertilizer chemistry and crop production.

During a sabbatical leave (1926) he studied at the *Institut Agronomique* in Paris, and a year later (1927), with his reputation as one of the world's leaders in fertilizer chemistry firmly established, he accepted an invitation to spend six months in Berlin as a consultant to the *Stickstoff Syndikat*.

In 1929 Bear became director of Agricultural Research for the American Cyanamid Company. During his nearly ten years with this company, he traveled extensively throughout this country, Central America, and Europe. Before returning to the academic field in 1940 he served for two years as science editor to the *Country Home Magazine*.

In 1940 Dr. Bear was appointed Professor of Soil Chemistry and Chairman of the Soils Department at Rutgers University, where he remained until his official retirement in 1954. Following his "retirement", Bear maintained a university office from which he continued his many professional interests, served as editor and chief of *Soil Science*, and functioned in many advisory capacities.

Bear was the author of a number of important books. First published in 1924, his *Soils and Fertilizers*, served as a college text for over forty years. His *Theory and Practice in the Use of Fertilizers* enjoyed wide university use during the 1928—1950 period. In 1955 the American Chemical Society asked him to select authors and edit a monograph on the chemistry of the soil in order to make available to the investigator who was primarily a chemist, a ready reference on the complexities of soil chemistry. This monograph proved to be also highly useful to the professional soil scientist. Bear also authored or co-authored some 78 research papers.

The honors bestowed on Dr. Bear were many. He was one of seven men in the world who held honorary membership in the International Society of Soil Science. He was a fellow in the American Society of Agronomy and in the American Association for the Advancement of Science. He was a member of Phi Beta Kappa; of the honorary scientific society Sigma Xi; and of the Soil Conservation Society of America. The Philadelphia Society for Promoting Agriculture, the Cooperative Grange League Federation, and the Malabar Farm Association honored him with awards and medals.

Dr. Bear was not only a scientist of the highest quality, but indeed a world figure in the field of soils. Why this was the case may best be explained by the

fact that he loved life and people. He was as at home with executives of large corporations as he was in scientific societies or in talking to farmers in the field. He knew the lonesome 10-hour day of a farm boy just as he knew the laboratory or the executive suite of a corporation. He was erect, dignified, and stately, serving as the natural focal point of any gathering. He had the great faculty of speaking or writing with clarity, precision and in simple language. Above all he always had something worthwhile to say. People of all walks of life gravitated to him. He had all the necessary qualities of a natural-born leader. The many who knew him and who worked with him will remember him with admiration and affection, and will hear now what he so often counselled, "Now let's get on with the job!"

**Prof. Dr. David Lvovich Askinazi †**

**(1896—1969)**



On December 4th, 1968, after a wearing illness, Professor Dr. D. L. Askinazi passed away. Distinguished scientist, he was a pupil of Academician D. N. Pryanishnikov, an active member of the All-Union Society of Soil Science, former Secretary of the section of the Soviet Chemistry Commission of the ISSS.

Professor Askinazi was born in Minsk, Byelorussia, in 1896. He became agronomist in Kharkov after graduating from the Agricultural Institute in 1921. Two years later he began independent scientific work at the plant nutrition research station of the Timiryazev Agricultural Academy, Moscow, under the guidance of Academician D. N. Pryanishnikov, working at the same time in the Scientific Research Institute for Fertilizers. He joined the staff of the Agrochemistry Laboratory of the V. V. Dokuchaev Soil Institute in 1937, where he continuously headed studies on lime and phosphorous. In 1935 he received the title of Professor.

Prof. D. L. Askinazi was especially well versed in the fields of soil chemistry and agrochemistry. He has published more than 100 original scientific works in these fields. His fundamental monograph "Phosphate Status and Acidic Soil Liming" reviews investigations on soil acidity, liming and phosphorizing acidic soils, phosphate status and application of phosphorous fertilizers. Prof. Askinazi was author of methodical papers on determination of cation and anion absorption capacity of soils, phosphate forms, etc.

In the last few years he directed researches on: the phosphorous absorption by various components of the mineral and organic parts of soil; secondary absorption of phosphorus when preparing soil extracts; different phosphate forms content in the soils, etc. by employing modern (including the radioisotope) methods.

Prof. Askinazi was amongst the authors and editors of the book "Agrochemical Methods of Soil Analysis". He was friend and teacher of a large group of scientists exploring soil phosphate status and application of phosphorous fertilizers.

For his great merits in the field of science Prof. D. L. Askinazi was decorated with the Order of V. I. Lenin and other governmental awards. He was D. N. Pryanishnikov prize laureate.

**Prof. A. V. Sokolov**  
(Corresponding-member of the USSR  
Academy of Sciences)

**K. E. Ginzburg**  
(Candidate of Sciences)



## Dr. Doc. Mircea Popovatz †

(1901—1968)



Dr. doc. Mircea Popovatz died on August 12, 1968, at the age of sixty-seven. He was former Head of the Soil Science section of the Geological Survey, former Professor of Soil Cartography, Systematics and Geography, founder-member of the Romanian Soil Science Society, member of the I.S.S.S. At the international congress of ISSS held in Bucharest, 1964, Professor Mircea Popovatz served as Vice-President of the V-th Commission of Soil Genesis, Classification and Cartography.

Prof. Mircea Popovatz started his activity in 1928 with studies on the mechanical composition of soils and their parent materials. He carried out numerous analyses and introduced by means of deduction starting from an original graphic plotting of mechanical analysis data, two texture indices: the mean diameter of the particles and the degree of homogeneity of the size of these particles, establishing values characteristic of various soil types. Professor Popovatz showed that from the Chernozem up to the Reddish-Brown Forest soil, the main soil genesis process is that of forming and leaching of clay, the difference consisting only in the intensity of the process and not in its nature. At the same time he has undertaken studies on loess, analyzing several loess profiles from South Romania. With the purpose of giving a more minute characterization of soils, Professor Mircea Popovatz determined three climatic indices: the humidity index and two others showing the thermal and pluviometrical particularities of a region and applied them to the territory of Romania. Devoting himself primarily to the pedological research in the field, he contributed also to the training of most of the soil scientists who are at present working in Romania. In collaboration with the recently deceased Professor Nicolas Cernescu, he laid the foundation for the scientific soil cartography at medium and small scales in Romania and took an active part during the last twenty years in the construction of soil maps.

A man of vast erudition and great knowledge, endowed with exceptional qualities as a researcher and leader, a faithful and eminent member of the State Committee for Geology, in which he worked for about four decades, Professor Mircea Popovatz has been an outstanding representative of soil science in Romania. His untimely death is a new heavy loss for Romanian Soil Science.

Prof. Dr. C. D. Chiriță, Bucharest.

## IMPORTANT NEWS

The Transactions of a number of International Congresses have been out of print for a long time. Plans are now being studied to publish reprints of the following proceedings:

**2nd International Congress, Leningrad 1930**, 7 volumes, 1996 pages. To be published in 3 volumes.

Institutional price and non-members \$ 65.—.

**Special price for members \$ 47.50.**

**3rd International Congress, Oxford 1935**, 3 volumes, 892 pages. To be published in 1 volume.

Institutional price and non-members \$ 30.—.

**Special price for members \$ 22.50.**

**4th International Congress, Amsterdam 1950**, 4 volumes, 1114 pages. To be published in 2 volumes.

Institutional price and non-members \$ 40.—.

**Special price for members \$ 30.—.**

**6th International Congress, Paris 1956**, 5 volumes, 3105 pages. To be published in 3 volumes.

Institutional price and non-members \$ 95.—.

**Special price for members \$ 70.—.**

As indicated there is a special price for members. Whether this programme of reprinting can be made effective, depends on the sympathy it receives.

Any one who might wish to make use of the possibility to fill the gaps in his library, is kindly requested to inform the Office in Amsterdam at an early convenience of his interest. The number of positive reactions will be decisive for the realization of the reprinting-project.

**PRE WAR EDITIONS  
OF THE I.S.S.S.**

Only to be ordered with  
the sole agent:

**EDITIONS  
DE LA S.I.S.S.  
D'AVANT GUERRE**

Seulement en vente chez:

**VORKRIEGS  
VERÖFFENTLICHUNGEN  
DER I.B.G.**

Alleinverkauf

**MARTINUS NIJHOFF - DEN HAAG - NEDERLAND**

---

**PROCEEDINGS.** New Series. Edited by the Executive Committee of the International Society of Soil Science. Editor in Chief: F. Schucht, Berlin. Assistant Editors: E. M. Crowther, Harpenden and A. J. Demolon, Versailles.

Vols. I and II of the Proceedings (1925 and 1926) contain chiefly original papers and further reports, literature, and communications regarding the Society.

Vol. I 1925. 306 pp. with numerous fig. and 8 coloured plates. In 4 parts. roy. 8vo. English or Spanish edition. Price 10.50 guilders

Vol. II. 1926. 376 pp. with 37 fig. and 3 plates. In 4 parts. roy. 8vo. English, French, Spanish or Italian edition. Price 8.40 guilders

From Vol. III onward no more separate editions were published and the Proceedings were divided into two Sections: I. Communications; II References to papers. Since then all communications and references have been written in either English, French or German.

Vols. III-XIII. 1927-1938. Each vol. contains from 200 to 400 pp. roy. 8vo. Price per vol. in 4 parts, instead of 11.50 guilders, now 8.40 guilders, with the exception of vol. IV, which costs 10.50 guilders.

---

**SOIL RESEARCH.** Supplements to the Proceedings. One vol. is published every two years. Contains original papers in either English, French or German.

Vols. I-VII 1928-1942. Each vol. contains from 250 to 450 pp. with numerous ill. and plates some of which are coloured. roy. 8vo. Price per vol. in parts, (vol. VI and VII in 6 parts) instead of 11.50 guilders, now 8.40 guilders.

*Back numbers of several issues of the Proceedings and of Soil Research are still available, at the price of 2.60 guilders per number.*

---

**OFFICIAL COMMUNICATIONS.** Supplements to "Soil Research"  
Vol. I-III, 1939-1943. Price per vol. in 4 parts 2.10 guilders

**TRANSACTIONS** of the different Commissions and Sections. The articles are in either English, French or German.

*First Commission* (for the study of Soil Physics).

Meeting in VERSAILLES, July 1934. 332 pp. with many ill. roy. 8vo. (9 guilders) 6.30 guilders

Meeting in BANGOR, Wales, 1939, Vol. A. 1938 60 pp. roy. 8vo. 2.60 guilders

*Second Commission* (for the Study of Soil Chemistry).

Meeting in Groningen, April 1926. Vol. A. 1926 and vol. B. 1927. Together 540 pp. with many ill. roy. 8vo. (11.50 guilders) 8.40 guilders

Meeting in BUDAPEST, July 1929. Vol. A., Vol. A. of the Alkali-Subcommission and vol. B. of both Commissions. 3 parts of together 488 pp. with many ill. roy. 8vo. (15 guilders) 10.50 guilders

Meeting in KØBENHAVN, August 1933. Vol. A. 1933 and vol. B. 1937 of the Second Commission and of the Alkali-Subcommission. 2 parts of together 264 pp. with many ill. roy. 8vo. 5.25 guilders

