

**Development and Availability of
DATABASES AT ISRIC**

Prepared for Participants
All World Data Centers Conference

Wageningen, October 1995



INTERNATIONAL SOIL REFERENCE AND INFORMATION CENTRE

Development and Availability of Databases at ISRIC

The following databases were developed and are present at ISRIC

1. Profile databases

- 1.1 ISIS - ISRIC Soil Information System
- 1.2 WISE - World Inventory of Soil Emission Potentials, profile component

2. Spatially explicit databases

- 2.1 GLASOD - Global Assessment of the Status of Human-induced Soil Degradation
- 2.2 ASSOD - Assessment of the Status of Human-induced Soil Degradation in South and Southeast Asia
- 2.3 SOTER - World Soils and Terrain Digital Database
- 2.4 WISE - World Inventory of Soil Emission Potentials, spatial applications

3. Others

- 3.1 STRING - Soils and Terrain Resources Information Network Generation
- 3.2 WOCAT - World Overview of Conservation Approaches and Technologies
- 3.3 DOCUMENTATION (Slides, Maps, Library)



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1.1 ISIS - ISRIC Soil Information System

BACKGROUND

Since its establishment in 1966, one of ISRIC's main objectives is to assemble, analyze and describe soil profiles representative for the main agro-ecological zones of the World. At present, the collection consists of about 800 monoliths from 60 countries.

About 80 are permanently exhibited, accompanied by physico-chemical data and environmental information.

Storage and handling of all data is carried out with ISIS.

DESCRIPTION

ISIS is a relational database management system which permits the handling and analysis of

- | | |
|--------------|--|
| site data | - 79 attributes describing location, geology, hydrology, landform, soil surface properties, land-use and vegetation; |
| climate data | - average monthly data of meteorological elements of one or more meteorological stations relevant to the site; |
| soil data | - 31 attributes about soil classification in FAO-Unesco Soil Map of the World Legend, USDA Soil Taxonomy and a local system,
- soil profile description according to FAO guidelines (99 attributes);
- 142 physical, chemical and mineralogical characteristics; |
| other | - a remarks section containing additional relevant information. |

ACTIVITIES

- *Software.* In 1988, ISIS version 3 was released. It served as a model for the FAO-ISRIC Soil Database (SDB) and several national databases, especially in Africa. Version 4.0 written in dBASE IV, is in operation. The program with its accompanying documentation will be released soon.
- *Data collection and verification.* Analytical data held in ISIS are determined in ISRIC's laboratory using standardized procedures. At present, data from about 550 profiles are entered. consistency, completeness and quality is required before release.
- *Copyright and distribution.* Data held in ISIS are copyright of ISRIC. Special selections can be made for third parties. Verified datasets are being compiled on a country basis into Country Reports.

- *Database expansion.* It is estimated that information of about 800 reference soils will be available at the end of 1996.
- *Applications.* A Series of Soil Briefs is being established. A Soil Brief presents a brief description of one or a few soils in their ecological setting in view of the potential uses of the soil(s). A set of soil and climate data diagrams can be generated from ISIS using the SOLGRAPH facility. At present a module is being developed to transfer data from ISIS into the ALES system, an automated land evaluation procedure. Data can be selected from ISIS to up-date the soil and climate data files necessary for running the crop growth simulation model WOFOST. ISIS data can be transferred to WISE and SOTER through the transfer facility LANDSLIDE

PUBLICATIONS

- Technical Paper 14. Guidelines for the description and coding of soil data. Revised edition in preparation.
- Technical Paper 15. ISRIC Soil Information System - user and technical manuals, with computer program. Revised edition in preparation.
- Technical Paper 25. SOLGRAPH: Soil and climatic diagrams and tabular single soil parameter assessments (with diskette) In preparation.
- SWEAP, see SOTER.

CONTACTS

Sjef Kauffman and Albert Bos.

1.2 WISE - World Inventory of Soil Emission Potentials Database, profile component

DESCRIPTION

The World Inventory of Soil Emission Potentials (WISE) Database is a georeferenced soil database for the geographic quantification of soil factors that control fluxes of greenhouse gases and other processes of global environmental change.

The WISE database is comprised of:

- A file with data on the type and relative extent of the component soil units of each $\frac{1}{2}^\circ$ latitude by $\frac{1}{2}^\circ$ longitude grid cell of the world (derived from edited digital version of FAO-Unesco Soil Map of the World (1991).
- A suite of soil profile data for the respective soil units of the world, with associated files listing the analytical methods used and source of primary data.

The properties of the component soil units of individual grid cells can be quantified using a set of regionally representative and georeferenced soil profiles (see 2.4). These profiles were compiled from 5 main sources: (a) ISRIC Soil Information System; (b) FAO Soil Database SDB; (c) the digital soil data set compiled by the Natural Resources Conservation Service (NRCS), USA; (d) profiles obtained from a data gathering activity coordinated by WISE staff, in which national soil survey organisations were asked to supply descriptions and analyses of profiles representative for the units of the Soil Map of the World in their countries; and (e) suitable profiles gathered from survey monographs.

Special attention was given to the systematic collection and recording of data as well as consideration of the laboratory methods used. For each set of data, the laboratory name and methods used were recorded.

The 4,353 profiles currently held in WISE originate Africa (1799); South, West and North Asia (522); China, India and Philippines (553); Australia and the Pacific Islands (122); Europe (492); North America (266); and South America and the Caribbean (599).

A subset of 1125 profiles, derived from the NRCS, ISIS and SDB databases is available in the public domain. This data set has been accepted as the foundation for a Global Soil Profile Database being developed by the Global Soil Data Taskgroup of IGBP-DIS.

Type: Point (primary data) and spatial (derived products)

Version: 2.1

Data type: measured (published data)

Updating: irregular, as new (auxiliary) data profile sets become available for inclusion

Spatial aspects

Coverage: world
Coordinates: geographic (lat, lon; degrees)
Units: metric

REFERENCES

- Batjes, N. H., 1995. *World Inventory of Soil Emission Potentials: WISE 2.1 - Profile Database User Manual and Coding Protocols*. Technical Paper 26, ISRIC, Wageningen.
- Batjes, N.H. (editor), 1995. A homogenized soil data file for global environmental research: a subset of FAO, ISRIC and NRCS profiles (Version 1.0). Working Paper and Preprint 95/10, International Soil Reference and Information Centre, Wageningen.
- Batjes, N. H. and E. M. Bridges, 1994. Potential Emissions of Radiatively Active Gases from Soil to Atmosphere with Special Reference to Methane: Development of a Global Database (WISE). *J. Geophys. Res.* **99(D8)**: 16,479-16,489.
- FAO, 1991. *Digitized Soil Map of the World*. World Soil Resources Report 67, FAO, Rome.

ACCESSIBILITY

Access: limited distribution of profile subsets (see WP95/10).
Copyright: ISRIC
Software: dBASE IV (soil profile data).
(proprietary software needed to access and manipulate the data sets)

CONTACT

N.H. Batjes.

2.1 GLASOD - Global Assessment of the Status of Human-induced Soil Degradation

DESCRIPTION

GLASOD has been carried out by ISRIC for the United Nations Environment Programme (UNEP) in cooperation with the Winand Staring Centre, ISSS, FAO, ITC and with scientific inputs from over 250 soil scientists worldwide. The interim product: the World Map of the Status of Human-induced Soil Degradation was published in 1990 at a scale of 1:15 Million at the Equator.

Subsequently the map was digitized and a soil degradation database was linked to the map units through a GIS.

Entries in the GLASOD database are:

Type of human-induced soil degradation (2 types of water erosion, 2 types of wind erosion, 4 types of chemical degradation, 4 types of physical degradation).

Degree of soil degradation (estimated in relation to agricultural suitability, declined productivity and in relation to its biotic functions). Four levels (light, moderate, strong, extreme).

Relative extent. For each type of degradation the relative extent within each mapped unit is given: infrequent = up to 5% of the unit affected; common (6-10%); frequent (11-25%); very frequent (26-50%); dominant (>50%).

Causative factors. The kind of human intervention which has caused the soil to be degraded: deforestation; overgrazing; improper management of agricultural land; over-exploitation of vegetation for domestic use; (bio) industrial activities.

Type: Spatial.

Data type:

Expert opinion, qualitative.

Updating:

- The European segment was updated in 1993 at the request of the Council of Europe and DG XII of the European Union.
- An Assessment of the Status of Human-induced Soil Degradation for South and Southeast Asia is carried out for UNEP and FAO at scale of 1:5 Million. Mapping units are defined using the SOTER methodology (completion: June 1996).

REFERENCES

- Oldeman, L.R., R.T.A. Hakkeling, W.G. Sombroek, 1991. World Map of the Status of Human-induced Soil Degradation: an Explanatory Note. Second revised edition, UNEP, Nairobi, ISRIC, Wageningen. 34p + 3 map sheets.
- Oldeman, L.R., 1994. Global Extent of Soil Degradation. In: Soil Resilience and Sustainable Land Use, ed. by D.J. Greenland and I. Szabolcs. CAB International, Wallingford. p. 99-118.

ACCESSIBILITY

Access: public domain.

Copyright

UNEP/GRID, Nairobi; ISRIC, Wageningen.

How to order

- * Hardcopy maps and explanatory note: ISRIC.
- * Digitized version: UNEP/GRID, P.O. Box 30552, Nairobi, Kenya.

CONTACT

L.R. Oldeman.

2.2 ASSOD - Assessment of the Status of Human-induced Soil Degradation in South and Southeast Asia

DESCRIPTION

Following a recommendation of the Expert Consultation of the FAO Asian Network on Problem Soils a Soil Degradation Assessment is undertaken for South and Southeast Asia, based on a revised methodology of the Global Assessment of Soil Degradation (GLASOD). The participating countries provide the information which is compiled and correlated at ISRIC.

A new (draft) physiographic map of Asia, developed by ISRIC for FAO, is used as base map for this inventory and a degradation database is generated containing degradation information for each physiographic unit, like type, degree, extent, cause and rate of degradation, and the presence or absence of eventual remediation measures. The database is linked to a GIS for further processing and publication of the results in map form. At the fourth meeting of the Asian Problem Soils Network in Manila, October 1995, the first preliminary results will be presented.

Coverage: Pakistan, India, Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar, P.R. China, Thailand, Vietnam, Laos, Cambodia, Malaysia, Indonesia, Philippines, South Korea, D.P.R. Korea.

REFERENCES

- FAO-RAPA, 1994. The collection and analysis of land degradation data. Report of the Expert Consultation of the Asian Network on Problem Soils. RAPA Publication: 1994/3.
- van Lynden, G.W.J. 1995. Guidelines for the assessment of the status of human-induced soil degradation in South and Southeast Asia. Working Paper and Preprint 95/02, ISRIC, Wageningen.

CONTACT

Godert van Lynden.

2.3 SOTER - World Soils and Terrain Digital Database

BACKGROUND

Policy-makers, resource managers and the scientific community at large have repeatedly expressed the need or ready access to soil and terrain resources through geo-referenced databases in order to make assessments of the productive capacity of soils, to have a better understanding about the risks and rates of soil degradation and to better quantify processes of global change.

The SOTER programme is a system which can store detailed information on natural resources in such a way that these data can be readily accessed, combined and analyzed from the point of view of potential use, in relation to food requirements, environmental impact and conservation.

SOTER has been initiated by UNEP, FAO, ISSS and ISRIC. The project's coordination training and assistance is provided by ISRIC.

OBJECTIVES

To make data on soils and terrain resources accessible. for (1) the assessments of productive capacity of soils, (2) a better understanding about the risks of soil degradation, (3) an estimation of soil degradational impacts on food production , and (4) an improved quantification of global change processes.

DESCRIPTION

SOTER provides an orderly arrangement of natural resource information through the creation of a computerized database containing all available attributes on physiography, soils, climate, vegetation and land use. This database is linked to a Geographic Information System, through which each type of information or combination of attributes can be displayed as a separate layer or overlay, or in tabular form. The scales range from 1:100,000 to 1:5,000,000.

For interpretation purposes a Water Erosion Assessment Program (SWEAP) has been developed. Other applications include an Automated Land Evaluation System (Rossiter).

Results

SOTER databases at different scales have been completed or are under construction in (parts of): most countries in Latin America, Hungary, Egypt, Kenya, Syria, Jordan.

REFERENCES

- Van Engelen, V.W.P. and T.T. Wen, 1995. Global and National Soils and Terrain Digital Databases (SOTER) - Procedures manual (revised edition). *Also available in French and Spanish.*
- Oldeman, L.R. and V.W.P. van Engelen, 1993. A world soils and digital database (SOTER) - An improved assessment of land resources. *Geoderma* **60**, 309 - 325

CONTACTS

L.R. Oldeman and V.W.P. van Engelen.

2.4 WISE - World Inventory of Soil Emission Potentials Database, spatial applications

DESCRIPTION

The World Inventory of Soil Emission Potentials (WISE) Database is a georeferenced soil database for the geographic quantification of soil factors that control fluxes of greenhouse gases and other processes of global environmental change (see 1.2).

At present, the WISE database is mainly used for generating a series of "derived" soil data sets with a spatial resolution of $\frac{1}{2}^\circ$ by $\frac{1}{2}^\circ$ (scale 1:5 M):

Spatial data sets:

a) Soil reaction (pH):

Batjes, N.H., 1995. A global data set of soil pH properties. Technical Paper 27, ISRIC, Wageningen.

b) Soil organic carbon and nitrogen pools:

Batjes, N.H. Total carbon and nitrogen in the soils of the world. *European Journal of Soil Science* (submitted).

Batjes, N.H., 1995. World soil carbon pools and global change. Working Paper and Preprint 95/11, ISRIC, Wageningen (prepared for UNEP workshop on Combatting Global Warming by Combatting Land Degradation (Nairobi, September 4-8, 1995).

c) Soil Moisture retention properties:

Batjes, N.H.. Development of a world data set of soil water retention properties using pedotransfer rules. *Geoderma* (submitted)

Type: Spatial data sets

Version: 2.1

Data type: measured (published data)

Updating: irregular, as new (auxiliary) data profile sets become available for inclusion

Spatial aspects

Coverage: world

Coordinates: geographic (lat, lon; degrees)

Units: metric

Accuracy: unknown

Scale: 1/5 M

Resolution: $\frac{1}{2}^\circ$ lat. by $\frac{1}{2}^\circ$ lon.

REFERENCES

see 1.2

ACCESSIBILITY

Copyright: ISRIC, Wageningen

Software: IDRISI (proprietary software needed to access and
manipulate the data sets)

Access: limited distribution of spatial products (a.o. Technical Paper
27).

CONTACT

N.H. Batjes .

3.1 STRING - Generation of a Cartographic and Bibliographic Information System of Soils and Terrain Resources Data for the Region of the Sahara and Sahel Observatory

DESCRIPTION

The project is carried out for the Sahara and Sahel Observatory (L'Observatoire du Sahara et du Sahel - OSS). It is concerned with the systematic inventory of existing cartographic and bibliographic documentation on soils and terrain resources, including organizational details of the national and regional institutions responsible for resources inventories.

STRING is working within the field of soils, vegetation and fauna. It is concerned with soil and terrain resources, including data on vegetation, land use and selected climatic data.

The objective of string is to strengthen communication between and among politicians, development officers and scientists in the region and to enable a more efficient use of existing cartographic and bibliographic information about soils and terrain resources.

The information system will, both at the national and international level,

- provide an information service for regional and national planning,
- directly benefit agricultural research agencies, soil and land conservation agencies, as well as agencies involved in nature conservation.
- help to reveal gaps in subject information and in cartographic coverage and to identify problems with compatibility of cartographic materials between countries.

Coverage: Algeria, Burkina Faso, Cape-Verde, Chad, Djibouti, Egypt, Ethiopia, Gambia, Guinea-Bissau, Kenya, Libya, Mali, Morocco, Mauritania, Niger, Senegal, Somalia, Sudan, Tunisia, Uganda

During the first operational phase (1992-1993) comprehensive inventories of the relevant documentation were made from Algeria, Burkina Faso, Chad, Egypt, Ethiopia, Kenya, Morocco, Mali, Niger, Senegal and Tunisia. Inventories of Cape-Verde, Djibouti, Gambia, Guinea-Bissau, Libya, Mauritania, Somalia, Sudan and Uganda still need additional material. Because of lack of funding, the project was discontinued.

REFERENCES

- Mulder, P.J.M. 1993. *Soil and Terrain Resources Information Network Generation*. Report on activities and results. ISRIC, Wageningen.
- Mulder, P.J.M. and Clabaut, M.B. 1993. *Soil and Terrain Resources Information Network Generation. Annex A: Cartographic Database*. ISRIC, Wageningen.
- Mulder, P.J.M. and Onderstal-Kuiken, F. 1993. *Soil and Terrain Resources Information Network Generation. Annex B: Bibliographic Database*. ISRIC, Wageningen.
- Mulder, P.J.M. 1993. *Soil and Terrain Resources Information Network Generation. Annex C: Institutional Database*. ISRIC, Wageningen.

ACCESSIBILITY

Copyright: OSS.

Software: CDS-ISIS

Access: public domain

CONTACT

L.R. Oldeman.

3.2 WOCAT - World Overview of Conservation Approaches and Technologies

DESCRIPTION

The WOCAT project was launched in 1992, as a project of the World Association of Soil and Water Conservation (WASWC). WOCAT is intended to promote the integration of successful soil and water conservation (SWC) into farming systems worldwide through a comprehensive evaluation of existing technologies (activities at field level) and approaches (the larger framework within which the activities are implemented). The project, in which many organizations and institutions are participating, is coordinated by the Group for Environment and Development of the Geographical Institute of the University of Berne, Switzerland.

Three exhaustive questionnaires have been developed to collect information on soil and water conservation approaches, technologies and the spatial distribution of soil and water conservation activities, respectively. The information will be stored in a database and (where spatial data are concerned) linked to a GIS. The intended outputs will be published in the form of a report on successful approaches, a "handbook" on all aspects of soil and water conservation technologies and a world map showing soil and water conservation in a spatial context. Digital outputs (e.g. hypertext format) will also be produced. A computerized soil and water conservation expert system is being developed simultaneously.

Coverage: Global. Implementation has recently started for the African continent

REFERENCES

- WASWC/GDE, 1994. WOCAT, Proceedings of the 2nd International WOCAT Workshop, Berne and Riederalp, October 1993. GDE, Institute of Geography, University of Berne.
- WASWC/GDE, 1995. WOCAT, A framework for the evaluation of soil and water conservation: Questionnaire on SWC Technologies. GDE, Institute of Geography, University of Berne.
- WASWC/GDE, 1995. WOCAT, A framework for the evaluation of soil and water conservation: Questionnaire on SWC Approaches. GDE, Institute of Geography, University of Berne.
- WASWC/GDE, 1995. WOCAT, A framework for the evaluation of soil and water conservation: Questionnaire on SWC World Map (draft). GDE, Institute of Geography, University of Berne.
- WASWC newsletter Vol. 9 N° 4, Vol. 10, n° 3, Vol. 11 n° 2

CONTACTS

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3.3 DOCUMENTATION

SLIDES

The collection has about 15000 slides of soils, landscapes, vegetation, land use and related subjects. About 9000 slides are registered in a database, using PerfectView.

MAPS

The collection has about 6000 maps, mostly small-scale maps on soils, but also on geology, vegetation, climate and related subjects. More than half is concerned with developing countries. It also contains a world coverage of 1:2,500,000 and 1:1,000,000 topographic maps. Only a small part is registered in a database, using Cardbox Plus.

LIBRARY

The collection has about 12,000 books and subscribes to about 350 journals, newsletters, etc. It concentrates on soils and related subjects and about one quarter concerns publications on soils in developing countries. The library holdings are registered in a database, using Cardbox Plus.

Accessibility of documents:

All holdings are accessible and can be consulted at ISRIC. Study and copying facilities are available. No lending services.

CONTACTS

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