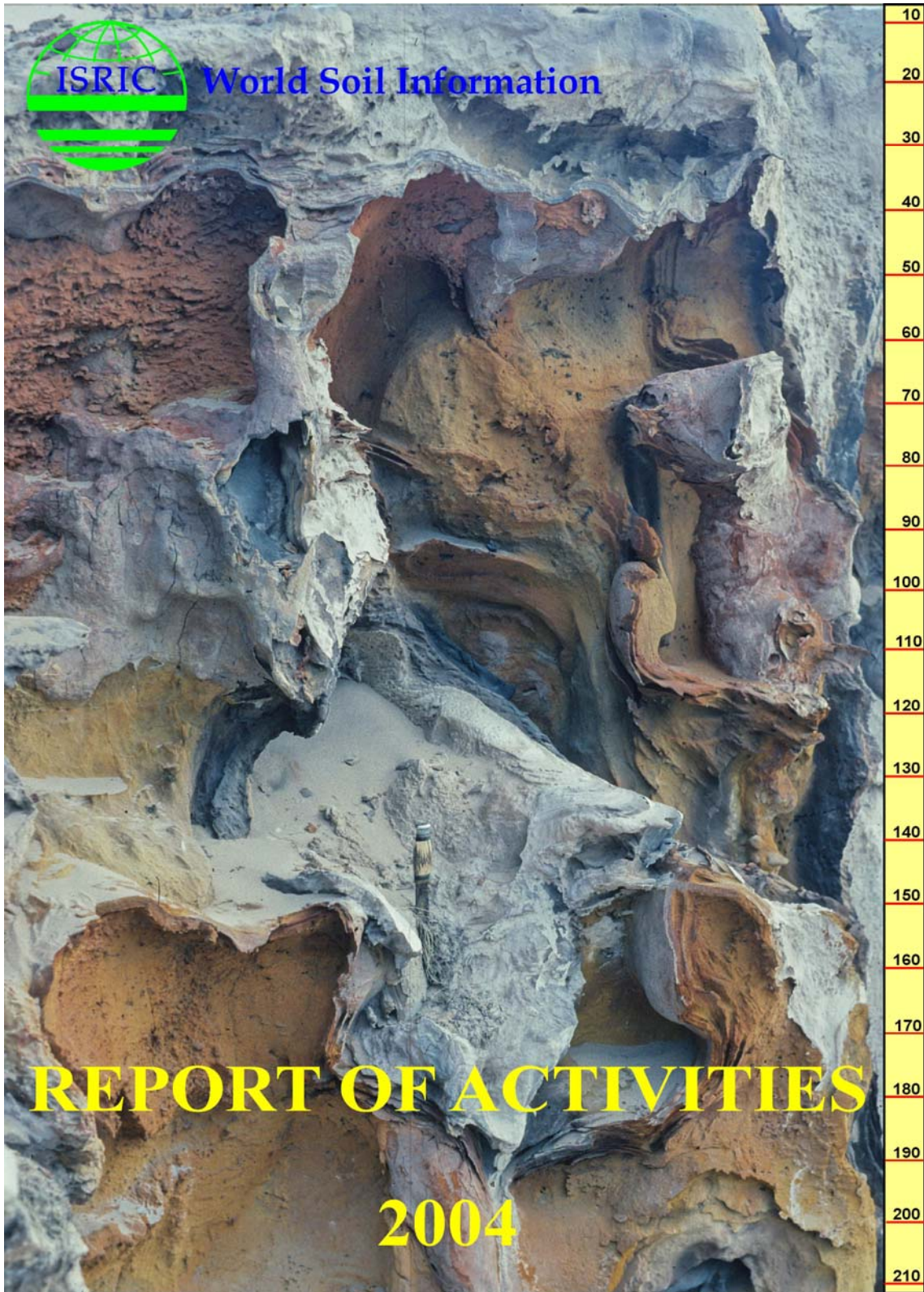




ISRIC World Soil Information



REPORT OF ACTIVITIES

2004

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Front cover: Giant Podzol in Pleistocene coastal sands, northern New South Wales, Australia. During 2004 reference soils were collected from Australia and Iceland

Back cover: 1) Why the Yellow River is yellow! Ploughing and sowing wheat on the Loess Plateau, China. Soil erosion is exacerbated by lack of ground cover at the onset of the rains and cultivation up-and-down slope. 2) Management to increase infiltration held in the soil and accessible to plants (*green* water) and recharges groundwater and stream base flow (*blue* water). Pilot studies for a global assessment of land degradation and improvement were undertaken during 2004 in northern China, straddling the Loess Plateau and Mu Us Desert.

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INTRODUCTION

Science should inform policy and management. But, first, the scientific information has to be carried to the point of decision. Rarely is this done by the scientists themselves; the result is confusion and frustration - on both sides. This year, we have grasped this nettle with new, policy-relevant research that is firmly grounded on physical principles and fundamental soil data and, also, direct participation in international policy-making. New research initiatives in train include: 1) *Global Assessment of Land Degradation and Improvement (GLADA)* and 2) *Green Water Credits*, to develop a global facility for paying land managers for hitherto unrecognized water management services - introducing market forces into environmental management.

GLADA is a quantitative assessment and monitoring program using satellite data, approved by the Global Environment Facility as part of the *Land Degradation Assessment in Drylands (LADA)* program of FAO. A pilot has been completed in northern China and the project is expected to start in late 2005 in partnership with the Centre for Geo-Information in Wageningen. *Green Water Credits* is being developed in partnership with the International Fund for Agricultural Development (IFAD) and several national donors. Everyone knows that soils yield crops and natural vegetation but they also yield water. Most of the world's fresh water is *green* water held in the soil and accessible to plants; soils also deliver *blue* water that can be tapped for irrigation and burgeoning cities, and that maintains the ecosystems underpinning economies and societies. So farmers and graziers are also water managers - unrecognized, unrewarded. Green Water Credits is a mechanism to pay them for specified water management activities, diversifying the income of poor rural people and enabling them to manage the resource better - for example to make use of the experience of soil and water management held within the *World Overview of Conservation Approaches and Technologies*. ISRIC - World Soil Information and IFAD held a side event at the FAO-Netherlands Conference on *Water for Food and Ecosystems* out The Hague, January 2005 to mobilize political support for this program.

In support of the European Union thematic soils strategy, we took part in scientific conclaves in Vienna and the advisory meeting for national heads of soil policy under the Netherlands Chairmanship of the EU, in Scheveningen in November 2004. Ways of carrying information about soils into the public arena were also discussed within the IASUS group of concerned scientists. The Intergovernmental Panel on Climate Change has demonstrated the value of authoritative, apolitical advice to inform policy and, ultimately, action. Land and water resources cry out for the same attention; still, there is only lukewarm support for an intergovernmental panel on soils - responsibilities remain parochial and there is not yet a heavyweight international champion.

A different approach is being taken by the international earth sciences societies. A Draft Resolution adopted by the governing council of UNESCO invites the Director General to 'support all efforts leading to the United Nations General Assembly declaring 2007 the *International Year of Planet Earth*'. This will be a world-wide

program of research and, perhaps more importantly, public information and participation. Ten themes range from Environmental Hazards to Megacities. ISRIC – World Soil Information, representing the International Union of Soil Sciences, has taken the lead in the theme *Soil - Earth's Living Skin*.

In our traditional fields of activity, this has been a year of re-tooling. We are making our collections better and more accessible to more people: bringing collections up-to-date and digitizing our holdings so that they may be searched and studied on-line. This work is not glorious but it is essential.

Work has begun, in earnest, on the *ISRIC World of Soils* - an educational web site drawing upon our unique reference collections. The first step has been the conversion of the ISRIC soil profile database (ISIS) into structured query language (SQL) so that it may be queried to illustrate various themes; this will also enable web delivery of the original data as part of the services of the World Data Centre for Soils. Maybe it was inevitable that the translation of the databases proved to be more complex than anticipated; at least the rethinking and reworking has resulted in a more robust tool. In the same vein, it is good to be able to report collaboration with the European Soil Bureau in the digitization of our map holdings; all of Africa is now complete and publicly available as a set of DVDs.

We were pleased to be able to add to our global micromorphology collection the Jongerius-STIBOKA collection - 14 000 large thin sections representing the soils of the Netherlands. Work is now in hand to prepare a common catalogue and facilities for microscopy have been refurbished. The micromorphology collection is a unique resource for research across a range of issues from biodiversity to climatic change, to human impacts on hydrology and water resources.

It is a particular pleasure to report the election of three Honorary Fellows, all of whom have close ties with FAO: Prof. Rudy Dudal, Prof. Klaas-Jan Beek, and Dr Robert Brinkman. The Chairman of the Board of Trustees, Dr Stein Bie, made presentations to the new Fellows and to Mrs Willemijn Sombroek, widow of our first honorary fellow Dr Wim Sombroek, during the ISRIC seminar on *Applications of airborne and satellite imagery to assessing land and water resources*.

Finally, a Memorandum of Understanding was signed with the Food and Agriculture Organization of the United Nations, reflecting our partnership since the foundation of the Institute and the scope of current work together. It is now up to us and our international partners to make the agreement a driving force of research that makes a difference.

David Dent

18 March 2005

1 WORLD SOIL MUSEUM: INFORMATION AND EDUCATION

One of our goals is to set world standards in collection, maintenance and exhibition of a comprehensive reference collection of the soils of the world. More than this, the collection should be an accessible, exciting resource to inform, to educate, and to entertain. Educational activities have continued to expand, embracing visiting groups from universities and polytechnics in Western Europe, school parties from our own locality, and the general public. Few of these visitors are interested primarily in pedology but, rather, a broad school of environmental sciences, both the built and natural environment. We are following up their comments to improve our exhibition and the supporting information. The World Reference Base for Soil Resources is being introduced as the primary technical classification and, at the same time, we are providing a coherent system of common names in plain English.

Educational program

In 2004, some 40 groups with students, teachers and others visited the World Soil Museum. Most took advantage of an introductory lecture and a guided tour through the exhibition; 5 groups also undertook half-day field excursions.

Eight German universities visit the World Soil Museum every year, usually spending one or two days with us. Other foreign university groups came from Portsmouth (UK) and Leuven (Belgium). About one-third of our student visitors are from Wageningen; exercises in the museum are now part of at least three regular courses of Wageningen University.

More than 250 visitors came from The Netherlands. These included university, college and high school students, as well as visits from PROBUS and members of the general public.

Lectures and Courses

Alfred Hartemink organised two courses: *Introduction to Soil Science* for high school geography teachers; *Trends and ethics in scientific publishing* for the PE&RC research school - this course will be given twice per year; also a two-day excursion to Limburg for IHE-UNESCO, Delft, and an annual lecture at Gent University. Along with David Dent, he supervised several Wageningen University MSc and PhD students.

Sjef Kauffman lectured on *Green Water* and demonstrated evaporation-transpiration relationships to participants of the annual ILRI Land Drainage course.

Otto Spaargaren gave a course on soil survey to the European Summer School at Ispra, in Italy, and a two-week course on SOTER methods and applications for the University of Zagreb and the Ministry of Physical Planning in Croatia. He also lectured on Drainage Characteristics and Soil Properties to the ILRI Land Drainage course.

The Netherlands Commission for UNESCO endorsed a proposal from ISRIC to host a UNESCO Chair in Land Resources to act as a focal point international training.

Conferences

A seminar – *Applications of airborne and satellite imagery: assessing land and water resources* – was held on 26 February 2004, with some 60 participants. Papers will be included in a forthcoming special edition of *Applied Earth Observation and Geoinformation*.

Publications

Alfred Hartemink is review editor of *Geoderma* with overview of discussion papers and book reviews and Co-editor in Chief of *Developments in Soil Science*. David Dent is an Associate Editor of *Soil Use and Management*.

Projects in 2005

1. *Exhibition*: Thematic arrangement including representation of the World Reference Base for Soil Resources
2. *World of Soils*: Exhibition and educational material on the world-wide-web
3. *Education*: Visiting groups, courses, research students
4. *Rwanda Agroforestry and Soil Management, MSc*: In partnership with Wageningen University
5. *International Year of Planet Earth*
6. *Publications*: policy briefs, *Booker Soil Manual*

2 WORLD DATA CENTRE FOR SOILS

World Data Centres operate under the International Council for Science to support the scientific community, in particular ICSU programs in global change, climate and the environment. Data from ICSU programs and related data sets are maintained and made freely available.

These days, less and less new soil data and information are being produced; the older data and information being pumped around more and more. Therefore, it is vital to preserve the older data that are the foundation of most current information. The December 2004 report of the ICSU Committee on Scientific Planning and Review (CSPR) on *Scientific Data and Information* also makes the point: 'Many types of data, including extant historical data, which have newly appreciated scientific importance for the analysis of changes over time, are not being used for research because they are not available in digital formats. Digitization, data rescue, transcribing, and improved management of traditional or historical data are necessary to preserve these types of data for current and future scientific research.' All users of soil and land resources information need easy access to that source material, if only to assess the reliability of the derived information. We are responding with a major program to digitise our holdings and make them available through the world-wide web.

Maintenance and completion of the data, verification, and continual acquisition of new data from international programs is the task of the World Data Centre. Making the data work is the goal of our Applied Research Program.

Holdings of the World Data Centre for Soils

- **World Soil Reference Collection:** since its establishment, a main task of the Institute has been to create and maintain a world soil reference collection and accompanying analytical information. The World Soil Reference Collection comprises about 950 profiles: physical representatives of the mapping units of the *FAO-UNESCO Soil Map of the World*. This is a unique educational and cultural resource. In 2004, seven new profiles were collected from Iceland, including the three European Reference Andosols; four from the Netherlands, including one from under a Hilversum pavement; one from Italy, which was used as an instruction profile during the European summer school on Soil Survey; one from England; and five from Queensland, Australia.
- **ISIS dataset:** computerised data management system holding data on the World Soil Reference Collection. ISIS has been operational since 1986; data for some 80 reference soils were added in 2004. Some 880 reference soil profiles are currently available in an MS-Access database; conversion to SQL will be complete early in 2005.

- **WISE dataset:** data from selected soil profiles compiled for global climatic change studies. These are continually updated. Subsets include:
 - Publicly accessible *WISE Global Soil Profiles*: a harmonized set of 4382 profiles suitable for a wide variety of environmental studies;
 - A working data set of more than 9500 profiles. In 2004, this dataset was used in the development of taxotransfer functions for preparing secondary SOTER databases.

- **SOTER datasets:** South and Central America, Central and Eastern Europe, and Southern Africa – comprising spatial mapping units and geo-located point data at scales from 1:1million to 1:5 million. Data for Brazil, Kenya, Southern Africa, and the Gangetic Plain of India were harmonised by filling gaps in measured data using taxotransfer and expert rules. Boundaries have been re-located according to the standards of the Digital Chart of the World.

- **Reference soil samples:** ISIS profiles soil samples, fully analysed by standard methods. Full documentation and an on-line catalogue of these 5000 samples were completed in July 2004.

- **Micromorphology collection:** A unique collection of the major soils of the world, comprising:
 - Systematic collection of large thin sections from the ISIS profiles;
 - Schmidt-Lorentz collection of more than 15 000 small thin sections of soils, mainly from Europe, Africa, Asia and Australia;
 - Jongerius-STIBOKA collection of some 14 000 samples, mostly large thin sections and blocks, mainly from the Netherlands, added in November 2004. A common catalogue is in preparation and facilities for the study of thin sections have been expanded.

- **Kubiena collection:** samples from 11 profiles from Russia in display boxes

- **Mohr collection:** hundreds of display boxes with soil materials, mainly from the former Dutch East Indies and Africa

- **Colour transparencies:** 20 000 items including systematic photographic records of sites and profiles of the ISIS data set

Documentation

ISRIC maintains a systematic collection of soil maps and reports including the so-called grey literature, specialist texts, and journals that hold important contributions to soils and land resources survey, especially from tropical countries. Negotiations are in hand with UNESCO and Wageningen University Library to establish a scholarship for information specialists from developing countries to gain experience in managing scientific documentation. It is anticipated that this will be operational in 2005.

We are cooperating with the European Soil Bureau at Ispra, in Italy, to make digital copies of all ISRIC map holdings. Thematic/geographic collations will be available on DVD and good quality paper copies can be printed, on request. Our collection from Africa is completed and will be launched by the UNCCD in 2005.

World Reference Base for Soil Resources

The International Conference on Soil Classification 2004 in Petrozavodsk, Russia, signaled the start of a major revision of the World Reference Base for Soil Resources (WRB). Working groups were formed to scrutinize and update the definitions and subdivisions of the reference soil groups. Internet dialogues started by the end of the year, and it is planned to complete an updated and revised version of WRB by the end of 2005.

Internet

ISRIC – World Soil Information maintains a site on the World Wide Web: www.isric.org. Work is in progress to translate data holdings to SQL to facilitate internet delivery.



*International Conference on Soil Classification 2004:
John Galbraight (USA) and Ragnhild Sperstad (Norway)
inspecting a soil profile in Karelia, northern Russia
(Photo: Zueng-San Chen)*

Projects in 2005

1. *Geoloket* – Transformation of databases, maps and documents for on-line delivery; linkage with other geo-data providers; in partnership with Wageningen UR Centre for Geo-Information
2. *Map and document catalogue and search facility*
3. *Map collection digitisation* – In partnership with the European Soil Bureau
4. *Reference photo collection* – Documentation and digitisation
5. *Reference soil sample collection* – On-line catalogue, relocation to a secure site
6. *Guidelines for Soil Profile Description* – Fourth edition to be published by FAO, September 2005
7. *World Reference Base for Soil Resources (WRB)* – Revision and expansion as the international soil classification for publication by FAO 2006
8. *Reference monolith collection* – Maintenance, acquisition to fully represent WRB: completion of Andosols
9. *ISIS database* – Conversion to SQL and link to *ISRIC World of Soils*
10. *Common digital data management system*
11. *Micromorphology collection* – Common catalogue

3 APPLIED RESEARCH

Fundamental data are vital but they are not enough: 'Soil by itself does not fly'. Its importance lies in context and that means applications.

The Applied Research program makes extensive use of our databases and compiles such data in support of land use planning and policy, assessment of food and water security, the efficient development of infrastructure, and predictive models for global climatic change. This year, SOTER databases have been used in studies of the impact of desertification on food security in Zimbabwe; in assessments of soil carbon stocks in Amazonian Brazil, Kenya, Jordan and India. The WISE database has been used in the improved version of the SOTER database of Southern Africa, and for soil parameter inputs to the RIVM IMAGE model of global environmental change.

Appreciation is also being raised, world wide, of the interdependence of soils, their use and management, and water resources - in the creation of *green* water, held by soils and available *in situ* to plants, and the delivery of *blue* water that can be tapped for use elsewhere for irrigation, domestic and industrial supply, and environmental flows.

Development and use of soil and terrain databases - SOTER

SOTER is a long-standing program of IUSS, FAO, ISRIC and UNEP to develop a global, soil and terrain spatial database, compiled according to standard procedures. To date, about half of the world has been covered at scales between 1:1M and 1:5M; also, several larger scale national surveys have been completed.

A second edition of the SOTER handbook will be published in 2005. Landform units, formerly difficult to quantify, have now been defined by four quantitative attributes derived from digital elevation models (DEMs). A case study based on the 1 km *ETOPO30* grid was presented during an international conference on innovative techniques in soil survey in Thailand (van Engelen and Huting 2004); a further case study using the 90 m SRTM DEM and comparison with the coarser DEM was shown during the Eurosoil conference in Germany. The method was evaluated and a further testing program defined during a workshop in cooperation with the European Soil Bureau.

Harmonized SOTER database

In the framework of a project with FAO, parameter estimates for 18 soil attributes are being generated for all existing regional and continental SOTER and similar databases using the procedure developed by Batjes (2003); parameters are generated according to the taxonomic similarity between soil profiles lacking particular data and the comprehensive set of profile data in the WISE database.

National-scale activities

Most activities described at continental scale actually started with a SOTER program at national scale, involving the national soil survey organisations supported by ISRIC.

- *Impact of Desertification on Food Security in Southern Africa: a Case Study for Zimbabwe*. Under a UNEP project, the national SOTER database at a scale of 1:1 million has been used to assess the production levels of maize under present circumstances of low inputs and simple technology. A further assessment has been made of the impact of soil erosion over a 20-year period on future maize production (van Engelen *et al.* 2004).
- The SOTER databases of Nepal (scale 1:250 000) and Iran (1:1M) have been compiled by the national institutes, with some support from ISRIC.

Land resources conservation and degradation

World Overview of Conservation Approaches and Technologies (WOCAT)

WOCAT is a global network of soil and water conservation specialists that share their expertise and experience of sustainable land management and make it available for planners and decision makers. ISRIC's contribution is in coordination, development of methodology, and production of the WOCAT newsletter.

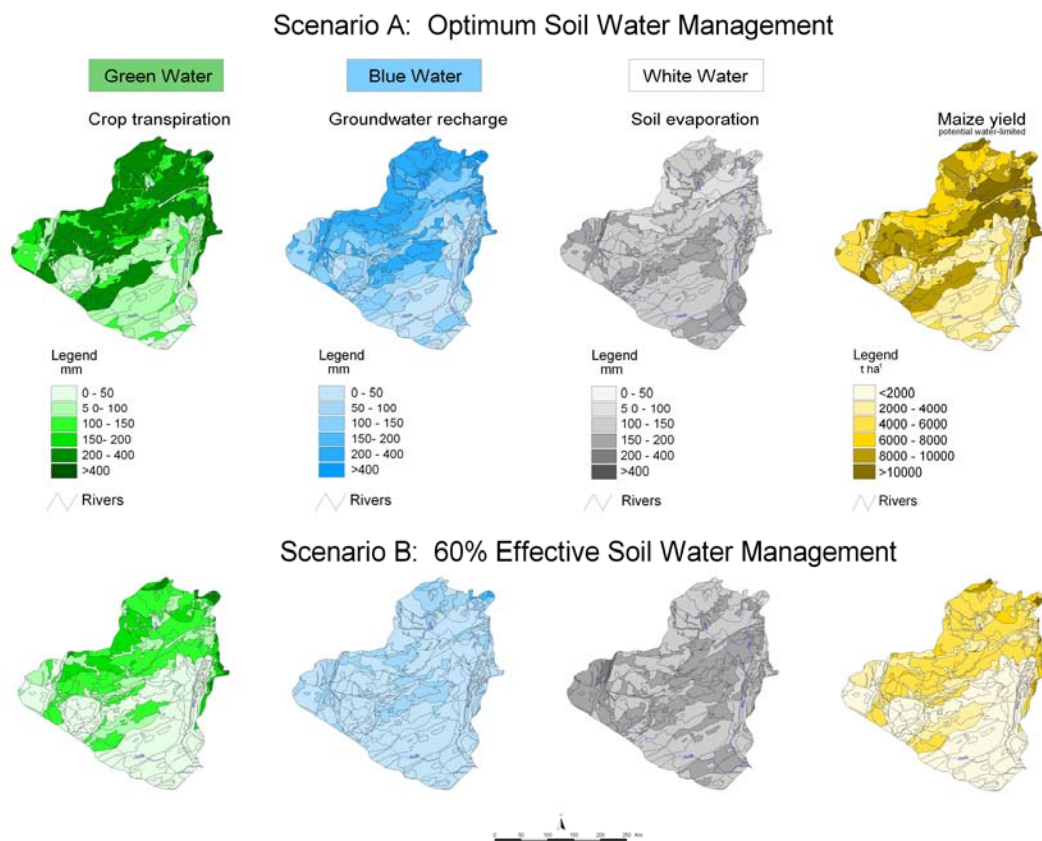
Godert van Lynden continued coordinating network activities, co-organised the Annual Workshop and Steering Meeting in China (November), gave a training course in Bangladesh (March) and contributed to the regional *HIMCAT* meeting in Nepal (March).

Soil and Water Protection (SOWAP)

SOWAP is a joint project for environmental protection in Belgium, Hungary and the UK, funded by the EU and Syngenta. Godert van Lynden was responsible for developing, coordinating and implementing the dissemination strategy and WOCAT activities within SOWAP – including a training course in Leuven (April). He attended plenary meetings in Leuven (February) and Stamford (October).

Green Water

A pilot study of the Save basin, Zimbabwe, used the regional soils and terrain database SOTERSAF, climatic data and the world soil and water conservation database (WOCAT) to analyze water flows under various soil and crop management scenarios. The WOFOST simulation model was used to calculate crop yields and components of the water balance. Soils and farmers' use of *green* water management techniques such as minimum tillage, mulching, tied ridging, terracing, and crop management determine the partitioning of rainwater into runoff, *green* water, and groundwater recharge.



Green and *blue* water flow maps under various soil water management scenarios, Save basin, Zimbabwe
(Kauffman *et al.* 2004)

Assessment of soil organic carbon stocks and change at national scale (SOC-GEF)

This project is co-funded by GEF (2002-2005) and implemented by UNEP. It aims to develop tools to quantify the impact of land management and climatic scenarios on change in soil carbon stocks at national and sub-national level. Scientists from Brazil, India, Jordan, and Kenya are working with data management and modelling groups in Austria, France, the Netherlands (ISRIC), the United Kingdom, and USA. ISRIC's input is funded by the Dutch Ministry of VROM.

Niels Batjes with national partners completed the secondary SOTER databases for Kenya, Brazil and the Indo-Gangetic Plains of India. These secondary data sets were used to estimate national-scale carbon stocks. Changes in stocks of soil organic carbon according to land use and management were projected empirically using Kenya as a case study.

Other groups within the consortium will use the secondary SOTER data to quantify the impact of defined land use changes on carbon stores in soils in the four countries, using dynamic models.

Global data set of soil parameter estimates

Niels Batjes prepared a harmonized global set of soil parameter estimates, at a resolution of 5 by 5 arc-minutes, for use with RIVM's IMAGE model. The data set was derived from a combination of soil geographic data from the FAO 1:5M scale digital *Soil Map of the World* and soil parameter estimates derived from the WISE soil profile database.

A standardized procedure for filling gaps in measured data in primary SOTER databases, elaborated in the framework of the SOC-GEF project, was applied to the *Soil and Terrain database for Southern Africa* at 1:1 and 1:2M scale. The resulting secondary data set, comprising estimates for 18 soil parameters commonly required for environmental modelling, is available through ISRIC website.

Bioinvasion

Alfred Hartemink spent three weeks at the Australian National University in Canberra to map and assess the degree of invasion of *Piper aduncum* in Papua New Guinea.

Projects 2005

1. *SOTER Procedures manual*
2. *Harmonized SOTER databases* – Co-funded by FAO
3. *DEM landforms analysis* - Procedures development
4. *SOTER Latin America update* - Redefinition of landform units
5. *Andean carbon sequestration* - Partnership with CSEQ
6. *Soil organic carbon stocks and change (SOC-GEF)* - Funded by Dutch Ministry of Housing, Spatial Planning and the Environment
7. *Spatial WISE-based data set*
8. *Soil and Water Protection (SOWAP)* - Funded by Syngenta

9. *World Overview of Conservation Approaches and Technologies (WOCAT)* Partnership with CDE, Bern, funded by Syngenta
10. *Land evaluation, Cambodia* - Support to Ministry of Planning and Cambodian Agricultural Research and Development Institute, funded by GTZ
11. *Chittagong Hills land use planning (CHARM)* – Funded by the EU
12. *Green water pilot, Tugela Basin, South Africa*: Testing dynamic hydrological models with regional SOTER data
13. *Green water pilot, Save Basin, Zimbabwe*
14. *Green Water Credits*
15. *Global assessment of land degradation and improvement*

Other activities

International Union of Soil Sciences and Dutch Society of Soil Science

Alfred Hartemink is Deputy Secretary General of the International Union of Soil Sciences. During 2004, IUSS bulletins 104 and 105 were edited, printed and mailed, and the website was expanded; during 2004 the number of visitors was 50 000.

For the Dutch Society of Soil Science (NBV), newsletters XI and XII were edited, two thematic days organised, a financial overview 2001-03 presented to the general meeting, and the website updated and expanded.

Stephan Mantel has been appointed Secretary/Treasurer for NBV, as of January 2005, as successor of Alfred Hartemink.

Consultancies

David Dent conducted an independent scientific review of the remediation by controlled tidal flooding of acid sulphate soils at East Trinity, near Cairns, Queensland. Also, he participated in a national forum on *Land Evaluation* in Phnom Penh, Cambodia, and provided expert advice for policy development through GTZ and AUSAID.

Alfred Hartemink undertook an evaluation of IITA projects in Eastern and Southern Africa.

Vincent van Engelen made an evaluation of the SOTER database compilation of Libya by ACSAD, Damascus.

4 PUBLICATIONS

Papers in primary journals

- Batjes NH 2004. Estimation of soil carbon gains upon improved management within croplands and grasslands of Africa. *Environment, Development and Sustainability* 6, 133-143
- Batjes NH 2004. Soil carbon stocks and projected changes according to land use and management: a case study for Kenya. *Soil Use and Management* 20, 350-356
- Cresswell RG, Dent DL, Jones G and Galloway D 2004. Three-dimensional mapping of salt load in the Murray-Darling Basin, 1 Steps in calibration of airborne electromagnetic surveys. *Soil Use and Management* 20, 133-143
- Hartemink AE 2004. Nutrient stocks of short-term fallows on high base status soils in the humid tropics of Papua New Guinea. *Agroforestry Systems* 63, 33-43
- Hartemink AE 2004. Soils of the Tropics. *Geoderma* 123, 373-375 (extended book review)

Contributions to edited books

- Deckers J, Spaargaren O and Dondeyne S 2004. Soil Survey as basis for land evaluation. In: Land cover and land use of the *Encyclopedia of Life Support Systems (EOLSS)*, UNESCO/EOLSS Publishers, Oxford [<http://www.eolss.net>]
- Dent DL 2004. Air photography. In: McKenzie NJ, Ringrose-Voase AJ and Grundy MJ (editors) *Australian soil and land survey handbook, Guidelines for conducting surveys, 2nd edition*. CSIRO, Canberra, Ch22
- Hartemink AE 2004. Soil fertility research in tropical and temperate regions – achievements and differences. In: Bationo A, Kimetu J and Kihara J (editors) *Improving human welfare and environmental conservation by empowering farmers to combat soil fertility degradation*. TSBF, Nairobi, 6-7

Contributions to conference and workshop proceedings

- Deckers J, R Dudal, F Nachtergaele, O Spaargaren and Berding F 2004. Towards a revised WRB-2006: A proposal for non-exhaustive lists of qualifiers and ranking principles. In: Krasilnikov PV (editor) *Soil classification 2004*, Petrozavodsk, Russia, 16-17
- Dent DL 2004. Earning our salt: new techniques to assess land and water resources. In: Eswaran, H, Vijarnsorn P, Vearasilp T and Padmanabhan E (editors) *Innovative techniques in soil survey: developing the foundation for a new generation of soil resource inventories and their utilization*. Land Development Department, Chattuchak, Bangkok, 287-298
- Dent DL, Cresswell RG, Macaulay S, Kellett J, Mullen I and Jones G 2004. *Putting salt on the map*. Supersoil 2004 abstracts, 3rd Australian and New Zealand Soils Conference, Sydney 71-2
- Engelen VWP van and Huting JRM 2004. The use of DEMs in SOTER: a tool for delineation of landform for soil and terrain databases. In: Eswaran H, Vijarnsorn P, Vearasilp T and Padmanabhan E (editors) *Innovative techniques in soil survey*. Land Development Department, Chattuchak, Bangkok, 153-159
- Hartemink AE 2004. Soil fertility decline on agricultural plantations in the tropics. *Proceedings IFA Regional Conference for Asia and the Pacific*. IFA, Paris

- Kauffman J, Mantel S and Dijkshoorn JA 2004. Applications of regional soil and terrain and soil management databases for *green* and *blue* water resource scenarios. In: *14th Stockholm Water Symposium: Drainage basin management – regional approaches for food and urban security, Abstract Volume*. Stockholm International Water Institute, Stockholm, 208-209
- Lynden GWJ van, Jones C and Leake A 2004. A case study of soil and water protection using conservation tillage from the SOWAP project. In: *Proceedings of the 4th International Congress of the ESSC*. Hungarian Academy of Sciences, Geographical Research Institute, Budapest, 137-139
- Lynden GWJ van and Lane M 2004. Soil and water protection using conservation tillage in Northern and Central Europe. In: Raine SR *et al.* (editors) *Conserving Soil and Water for Society: Sharing Solutions. Proceedings 13th ISCO Conference*, 4-9th July, Brisbane. ASSSI/ IECA. Paper 418, 5 p
- Spaargaren OC 2004. Andosols in the World Reference Base for Soil Resources and their correlation with other classification systems. In: Óskarsson H and Arnalds Ó (editors) *Volcanic soil resources in Europe. COST Action 622 final meeting*. RALA Reports 214, Agricultural Research Institute, Akureyri / Egilsstaðir, Iceland, 25-26

Lecture notes and readers

- Hartemink AE 2004. *Scientific publishing. Reader introductory course for PhD students and young authors*. PE&RC Research School, Wageningen University, 147p
- Spaargaren O 2004. Soil profile description. In: Michéli E *et al.* (editors) *European Summer School on Soil Survey*. Office for Official Publications of the European Communities, Luxembourg, 9-15
- Spaargaren O 2004. Mineral soils conditioned by limited age - Cambisols. In: Michéli E *et al.* (editors) *European Summer School on Soil Survey*, 117-119; also in: Jones AR *et al.* (editors), *2nd European Summer School on Soil Survey*, 89-91. Office for Official Publications of the European Communities, Luxembourg
- Spaargaren O 2004. Mineral soils conditioned by wet tropical climate - Nitisols, Alisols, Acrisols, Lixisols. In: Michéli E *et al.* (editors) *European Summer School on Soil Survey*. Office for Official Publications of the European Communities, Luxembourg, 127-133
- Spaargaren O 2004. Mineral soils conditioned by (semi-) arid climate - Gypsisols, Durisols, Calcisols. In: Michéli E *et al.* (editors), *European Summer School on Soil Survey*, 141-146; also in: Jones AR *et al.* (editors) *2nd European Summer School on Soil Survey*, 113-118. Office for Official Publications of the European Communities, Luxembourg
- Spaargaren O 2004. Mineral soils conditioned by parent material - Andosols, Arenosols. In Jones AR *et al.* (editors) *2nd European Summer School on Soil Survey*. Office for Official Publications of the European Communities, Luxembourg, 93-97
- Spaargaren O 2004. Mineral soils conditioned by human activity - Anthrosols. In: E Michéli *et al.* (editors) *European Summer School on Soil Survey*, 89-91; also in: Jones AR *et al.* (editors) *2nd European Summer School on Soil Survey*, 73-76. Office for Official Publications of the European Communities, Luxembourg

Reports

- Batjes NH 2004. *SOTER-based soil parameter estimates for Southern Africa (ver. 1.0)*, Report 2004/04, ISRIC - World Soil Information, Wageningen
- Batjes NH 2004. *Development of a 5 by 5 arc-minutes global data set of soil parameter estimates for use with the IMAGE model (ver. 1.0)*. Report 2004/05, ISRIC - World Soil Information, Wageningen

- Batjes NH, Bernoux M and Cerri CEP 2004. *Soil data derived from SOTER for studies of carbon stocks and change in Brazil (ver. 1.0; GEFSOC Project)*. Report 2004/03, ISRIC - World Soil Information, Wageningen
- Batjes NH and Gicheru P 2004. *Soil data derived from SOTER for studies of carbon stocks and change in Kenya (ver. 1.0; GEFSOC Project)*. Report 2004/01, ISRIC - World Soil Information, Wageningen
- Batjes NH, Bhattacharyya T, Mandal C, Dijkshoorn K, Pal DK, Milne E and Gajbhiye KS 2004. *Soil data derived from SOTER for studies of carbon stocks and change in the Indo-Gangetic Plains (India) (ver. 1.0; GEFSOC Project)*. Report 2004/06, ISRIC - World Soil Information and NBSS&LUP (ICAR, India), Wageningen
- Dent DL 2004. *Preliminary science review of the East Trinity acid sulphate soil remediation activity*. External review commissioned by the Queensland government, Dept Natural Resources and Mines, Indooroopilly, 8p
- Dent DL 2004. *Land resource assessment in Cambodia 1) Principles; 2) Guidelines framework*. Expert consultation, Cambodia Agricultural Research Institute, Phnom Penh, 8p
- Engelen VWP van, Mantel S, Dijkshoorn JA and Huting JRM 2004. *The impact of desertification on food security in Southern Africa; a case study in Zimbabwe*. ISRIC Report 2004/02, ISRIC - World Soil Information, Wageningen
- Hartemink AE 2004. *Research for Development Enabling Environment*. Centre-Commissioned External Review Project D, IITA, Kampala, 9p
- Kirkby M, Jones RJA, Irvine B, Gobin AGG, Cerdan O, Van Rompaey JJ, Le Bissonais Y, Daroussin J, King D, Montanarella L, Grimm M, Vieillefont V, Puidefabregas J, Boer M, Kosmas C, Yassoglou N, Tsara M, Mantel S, Lynden GWJ van and Huting JRM 2004. Pan-European Soil Erosion Risk Assessment for Europe: the PESERA map, version 1 October 2003. Explanation of Special Publication Ispra 2004 No. 73 (S.P.I.04.73). European Soils Bureau Research Report No. 16, 21176, Office for Official Publications, Luxembourg
- Lynden GWJ van, Mantel S and Oostrum A van 2004. Guiding principles for the quantitative assessment of soil degradation with a focus on salinization, nutrient decline and soil pollution. FAO AGL/MISC/36/2004, International Soil Reference and Information Centre and Food and Agriculture Organization of the United Nations, Rome.

Articles in magazines and bulletins

- Mantel S and Lynden GWJ van 2004. Europese landbouw en bodemerosie. Zoeken naar een basis voor beleid op pan-europees niveau. *Bodem. Tijdschrift over duurzaam bodembeheer* 14:2, 77-78

Contributions to e-conferences

- Proceedings of the FAO E-Forum in preparation for the FAO/Netherlands conference *Water for food and ecosystems: make it happen*, December 2004
[http://www.fao.org/ag/wfe2005/casedb_en.asp]
- Kauffman S. Farmers use and deliver water: case study in the Save catchment, Zimbabwe
- Dent DL. Green Water Credits

5 TRAVEL AND MEETINGS

In connection with program activities, ISRIC staff participated in training, workshops, and presented papers and posters at international conferences and symposia.

Name	Event	Venue	Period (2004)	Organized by
Batjes	GEFSOC Workshop 4: Model/GIS coupling (Assessment of Soil Organic Carbon Stocks and Change at National scale)	Dead Sea, Jordan	2-7 May	BRDP/HCST (Jordan) and University Reading
Batjes	Third Meeting of the Project Steering Committee (GEFSOC)	Wageningen, Netherlands	23-26 Jun	University Reading and ISRIC
Batjes	GEFSOC Workshop 5: Scenario Formulation	Vienna, Austria	26-29 Sep	Univ. Reading
Dent	PROLAND Supervisory Board	Pulawy, Poland	22-24 Apr	PROLAND/IUNG
Dent	ISRIC Board business	Bern, Switzerland	6-7 May	CDE
Dent, Houtman	LADA planning meeting IFAD/Global Mechanism	Rome	20-28 May	FAO/UNEP
Dent	Monolith collection	Suffolk, England	12 Jul-10 Aug	
Dent, Kauffman	Conference: <i>World Water Week</i> ; poster presentation, collaboration IFAD-Stockholm Environmental Institute	Stockholm, Sweden	16-18 Aug	Stockholm International Water Institute
Dent	Conference: <i>Eurosoil</i> , paper to IASUS symposium and panel	Freiburg, Germany	9-10 Sep	IASUS
Dent	Expert consultation: land evaluation; Cambodian Agricultural Research and Development Institute	Phnom Penh	14-18 Sep	AUSAID/GTZ
Dent	European Soil Directors, Netherlands EU Chairmanship	Scheveningen, Netherlands	18-19 Oct	Dutch Presidency and European Commission
Dent	Collaboration with European Soil Bureau, map digitization, SOTER meeting	Ispira, Italy	21-22 Oct	ESB
Dent	Conference: <i>Supersoil</i> , monolith collection	Sydney, Queensland, Australia	5-17 Dec	ASSS and NZSSS, Queensland Dept Natural Resources and Mines
van Engelen, Dent	Conference: <i>Innovative techniques in soil resources inventories</i>	Cha-am / Bangkok, Thailand	22-29 Mar	LDD-NRCS
van Engelen	Discussion with ISS-AS staff on potential projects in China	Kiel, Germany	18-19 May	ISS-AS/ISRIC
van Engelen, Huting	Conference: <i>Eurosoil</i>	Freiburg, Germany	6-10 Sep	German Society of Soil Science

Name	Event	Venue	Period (2004)	Organized by
van Engelen, Dijkshoorn	SOTER procedures modification meeting	Ispra, Italy	21-22 Oct	European Soil Bureau
van Engelen	Evaluation of SOTER-Libya	Damascus, Syria	12-15 Dec	ACSAD
Hartemink	UNESCO meeting on the proposed <i>Year of Planet Earth</i>	Paris, France	11 Feb	UNESCO
Hartemink	Univ of Nebraska, NRCS, Earth Inst of Columbia University; IUSS mid-congress meeting	USA	19 Apr-1 May	IUSS
Hartemink	Conference: <i>Improving human welfare and environmental conservation by empowering farmers to combat soil fertility degradation</i>	Yaounde, Cameroon	17-21 May	African Network for soil biology and fertility network (AfNet)
Hartemink	<i>Digital soil mapping</i> workshop	Montpellier, France	13-19 Sep	INRA
Hartemink	Project evaluation: <i>Promoting food security and income generation through sustainable production and commercialisation of starchy and grain staples in Eastern and Southern Africa</i>	Kampala, Uganda	25 Sep–2 Oct	IITA
Hartemink	IFA conference, <i>SuperSoil</i> , Visiting ANU, PPI	Australia, New Zealand, Singapore	18 Nov–17 Dec	IFA, ANU, IUSS
Kauffman	EU Commission	Brussels, Belgium	2-3 Mar	
van Lynden	WOCAT training / Regional WOCAT meeting	Bangladesh/Nepal	9-26 Mar	CHTDB / ICIMOD
van Lynden	WOCAT training for SOWAP staff	Leuven	20-23 Apr	
van Lynden	Seminar: <i>Integrated Soil And Water Management For Orchards</i> ; GECAP meeting	Mosciano S. Angelo, Italy	9-13 May	University of Teramo/GECAP
van Lynden	ESSC conference	Budapest, Hungary	24-28 May	Hungarian Academy of Sciences
van Lynden	WOCAT meeting with South African team (CDE)	Bern, Switzerland	28-29 Jun	WOCAT
van Lynden	ISCO conference	Brisbane, Australia	4-8 Jul	ISCO
van Lynden	Conference: <i>Soil and Compost Eco-biology</i> (SoilACE)	Leon, Spain	15-17 Sep	University Leon and Biomasa Peninsular
van Lynden	SOWAP plenary meeting	Stamford, England	5-7 Oct	SOWAP, ARET
van Lynden	WOCAT annual workshop & Steering Meeting	Yichang, China	8-13 Nov	WOCAT
Mantel	Asia Pro Eco briefing	Brussels, Belgium	26 Mar	EC–Asia Pro Eco
Mantel	<i>Green</i> water networking and ACRU course	Pietermaritzburg, Pretoria, South Africa	20 Sep–1 Oct	ISCW

Name	Event	Venue	Period (2004)	Organized by
Spaargaren	Training in the establishment of a Croatian Soil and Terrain database (CROSOTER)	Zagreb, Croatia	9-13 Febr	NMCP
Spaargaren	2nd European Summer School on Soil Survey	Ispira, Italy	12-17 Jul	JRC
Spaargaren	<i>Cost 622</i> Iceland	Iceland	4-20 Jun	RALA
Spaargaren	WRB Trans-Ural Polar Tour and Soil Classification conference	Vorkuta, Labytnangi, Petrozavodsk - Russia	26 Jul-10 Aug	Institute of Biology at Syktyvkar and Petrozavodsk
Spaargaren	ESB collaboration, map digitisation, soil monolith sampling, WRB discussion	Ispira, Italy	20-23 Oct	European Soil Bureau
Spaargaren	EU workshop <i>Towards harmonized management of European soil resources: Research agenda for soil protection</i>	Vienna, Austria	28-29 Oct	Universität für Bodenkultur

6 PERSONNEL

(as of January 2005)

Board of Trustees

- Dr SW Bie (Chairman)
- Prof. Dr J Bouma (Environmental Sciences Group, on behalf of Wageningen University)
- Prof. Dr H Hurni (National Centre of Competence in Research North-South, Berne, Switzerland, on behalf of the International Union of Soil Sciences)
- Ir GJA Nieuwenhuis (Centre for Geo-Information, on behalf of Alterra BV)
- Ir W van Vuure (on behalf of the Ministry of Agriculture, Nature and Food Quality)

Changes in Board

Prof. Bouma will be retiring as Board member in April 2005; a replacement has been proposed by the Executive Board of Wageningen UR for approval of the ISRIC's Board meeting, April 2005.

Staff (alphabetical order of last name)

- M (Mateen) Ahmad MSc – soil monolith preparation
- Ir NH (Niels) Batjes – database applications, soils and global change
- WCWA (Wouter) Bomer – graphic design and in-house publishing
- J (Jan) Brussen – finance
- Dr DL (David) Dent - Director
- Ir JA (Koos) Dijkshoorn – soil and terrain databases
- Drs VWP (Vincent) van Engelen - Research Team Leader
- Ir IJ (Ingrid) Haas – webmaster and programmer
- Dr AE (Alfred) Hartemink – Head, World Soil Museum
- JRM (Jan) Huting – GIS database management and map production
- YGL (Yolanda) Karpes - secretariat
- Ir JH (Sjef) Kauffman – Deputy Director, databases applications, soil and water management
- Drs GWJ (Godert) van Lynden – land, water and environmental management
- S (Stephan) Mantel MSc - land evaluation and decision support
- AJM (Ad) van Oostrum MSc – collections management and quality control
- Dr OC (Otto) Spaargaren – Head, World Data Centre for Soils
- Ir P (Piet) Tempel - systems analyst and programming

End employment contract

1 December 2004: Iraj Manuchehri, early retirement (documentation, data quality control and management of the soil sample collection). Iraj joined the ISRIC laboratory in 1992.

Jubilees

- 1 March 2004: Niels Batjes (12.5 years)
- 1 July 2004: Iraj Manucehri (12.5 years)
- 1 September 2004: Jan Brussen (25 years)

Guest researchers

- Dr Bai Zhanguo – GLADA pilot study in PR China – algorithms development
- Drs JHV (Hans) van Baren - Philosophy of Science (IUSS program), library and documentation
- Dr LP (Piet) van Reeuwijk – laboratory methods and quality control
- Dr V (Venant) Rutunga – feasibility study of linking QUEFTS system to ISRIC's data bases for quantitative evaluation of soil fertility
- Dr MJ (Maja) Kooistra, as from 1 Nov 2004 – soil micromorphological thin sections; completion of publication: Reading the Archives of Quaternary Soils and Sediments. Micromorphological contributions to the study of Quaternary soils and sediments in the series of Developments in Quaternary Science (Elsevier).

Internship

16 August 2004–15 January 2005: Gunnar Jenet, agreement ISRIC – University of Applied Sciences, Osnabrück, Germany. Activities: conversion of SOTER profile data of Brazil from FAO classification to WRB classification, completion of data to full SOTER sets from source publications.

Honorary Fellows

Honorary Fellows are appointed in recognition of mutual long and fruitful relationship with ISRIC – World Soil Information:

- Dr Wim G. Sombroek (*in memoriam*) – First Honorary Fellow - in view of outstanding contributions to the Institute by optimising the earned recognition worldwide
- Professor Dr Rudy Dudal – as contributor to the *Soil Map of the World* and to the *World Reference Base for Soil Resources*
- Professor Dr Ir Klaas-Jaan Beek – in view of seminal work of land evaluation and through the trusteeship as Rector of the International Institute for Geo-information Science and Earth Observation (ITC)
- Dr Robert Brinkman – in view of seminal work carrying soil survey through land evaluation to land use planning; and support as Chief of FAO Land Resources.

Staff Development

Sjef Kauffman, Jan Huting and Piet Tempel participated in a course "GIS applications in Land Resource and Land Use studies" (12-23 April 2004). Knowledge acquired was used in the green water pilot study of the Save basin.

Otto Spaargaren attended a two-day training workshop on the transformation "From library to modern information centre" (23, 24 November 2004), organised by the GO Foundation, The Hague.

LIST OF ACRONYMS

Abbreviation	Description
ACRU	Agricultural Catchments Research Unit model
ACSAD	The Arab Center for the Studies of Arid Zones and Dry Lands, Damascus, Syria
ALES	Automated Land Evaluation System
ANU	Australian National University, Canberra
ARET	Allerton Research and Education Trust, Leicestershire, United Kingdom
ASSS	Australian Society of Soil Science
AUSAID	Australian Agency for International Development
BFMP	Berau Forest Management Project, Indonesia
BRDP	Jordan Badia Research and Development Programme
CDE	Centre for Development and Environment, University of Berne, Switzerland
CHARM	Chittagong Hill Tracts improved natural Resources Management
CHTDB	Chittagong Hill Tracts Development Board, Bangladesh
CSEQ	Carbon Sequestration Project, The Netherlands
DEM	Digital Elevation Model
ESB	European Soils Bureau, Ispra, Italy
ESSC	European Society for Soil Conservation
EU	European Union
FAO	Food and Agriculture Organization of the United Nations, Italy
GECAP	Gramoxone Environmental Conservation Agriculture Project
GEF	Global Environmental Facility
GEFSOC	Global Environmental Facility project, Soil Organic Carbon
GIS	geographic information system
GLADA	Global Assessment of Land Degradation and Improvement
GO	Stichting Gemeenschappelijke Opleidingen
GTZ	Gesellschaft für Technische Zusammenarbeit, Eschborn, Germany
HCST	Higher Council for Research and Technology, Jordan
IARC	International Agricultural Research Centres
IASUS	International Actions for the Sustainable Use of Soils, IUSS Working Group
ICARDA	International Center for Agricultural Research in the Dry Areas, Syria
ICIMOD	International Center for Integrated Mountain Development, Nepal
ICSU	International Council for Science, Paris, France
IFA	International Fertilizer Industry Association, Paris, France
IFAD	International Fund for Agricultural Development, Rome, Italy
IHE	International Institute for Infrastructural, Hydraulic and Environmental Engineering, Delft, The Netherlands
IITA	International Institute of Tropical Agriculture, Nigeria
ILRI	International Land Reclamation Institute, Wageningen, The Netherlands
IMAGE	Integrated Model to Assess the Global Environment (RIVM)
IMCS	Institute of Marine and Coastal Sciences, New Jersey, USA
INRA	Institut National de la Recherche Agronomique / <i>National Institute for Agricultural Research</i> , Paris, France
ISCO	International Soil Conservation Organisation

Abbreviation	Description
ISCW-ARC	Institute of Soil, Climate and Water of the Agricultural Research Council, Pretoria, South Africa
ISIS	ISRIC Soil Information System
ISRIC	International Soil Reference and Information Centre, Wageningen, The Netherlands
ISS-AS	Institute of Soil Science-Academia Sinica, Nanjing, PR China
ITC	International Institute for Geo-information Science and Earth Observation, Enschede, The Netherlands
IUNG	Instytut Uprawy Nawożenia i Gleboznawstwa / <i>Institute of Soil Science and Plant Cultivation</i> , Pulawy, Poland
IUSS	International Union of Soil Sciences
JRC	Joint Research Centre of the European Union
LADA	Land Degradation Assessment for Dryland Areas
LDD	Land Development Department, Bangkok, Thailand
LEI	Landbouw Economisch Institute / <i>Agricultural Economics Research Institute</i> , Wageningen UR, The Hague/Wageningen, The Netherlands
NBV	Nederlandse Bodemkundige Vereniging / <i>Dutch Soil Science Society</i>
NMCP	Netherlands Management Cooperation Program
NRCS	Natural Resources Conservation Service, Lincoln, USA
NZSSS	New Zealand Society of Soil Science
PPI	Phosphate and Potash Institute, Singapore
PROBUS	Stichting Probus Nederland Informatie Centrum, Delft, The Netherlands
PROLAND	EC Centre of Excellence Protection of Land and Water Quality and sustainable Development of Rural Areas, Poland
QUEFTS	Quantitative Evaluation of the Fertility of Tropical Soils
RALA	Rannsóknastofnun Landbúnaðarins/ <i>Agricultural Research Institute</i> , Reykjavik, Iceland
RIVM	Rijksinstituut voor Volkshuisvesting en Milieu / <i>National Institute of Public Health and Environmental Protection</i> , Bilthoven, The Netherlands
SOC-GEF	Soil Organic Carbon, Global Environmental Facility project
SOTER	Soil and Terrain Database
SOTERSAF	SOTER database for Southern Africa
SOWAP	Soil and Surface Water Protection Using Conservation Tillage in Northern and Central Europe
SQL	Structured Query Language
SRTM, NASA	Shuttle Radar Topographic Mission, National Aeronautics and Space Administration, USA
STIBOKA	Stichting voor Bodemkartering / <i>Netherlands Soil Survey Institute</i> (now: Alterra research instituut voor de Groene Ruimte, Wageningen UR, The Netherlands)
TSBF-CIAT	Tropical Soil Biology and Fertility Institute, International Center for Tropical Agriculture, Nairobi, Kenya
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification, Bonn, Germany
UNDP	United Nations Development Programme, New York, USA
UNEP	United Nations Environment Programme, Nairobi, Kenya
UNESCO	United Nations Educational, Scientific and Cultural Organization, Paris, France

Abbreviation	Description
VROM	Ministerie voor Volkshuisvesting, Ruimtelijke Ordening en Milieu / <i>Netherlands Ministry of Housing, Spatial Planning and the Environment</i> , The Hague, The Netherlands
Wageningen UR	Wageningen University & Research Centre, The Netherlands
WATSAT	Water Sufficiency Assessment Tool
WISE	World Inventory of Soil Emission potentials
WOCAT	World Overview of Conservation Approaches and Technologies. CDE, Berne, Switzerland
WOFOST	World Food Study model
WRB	World Reference Base for Soil Resources

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