

REPORT OF ACTIVITIES

2007



World Soil Information

ISRIC – World Soil Information is an independent foundation receiving funds from the Dutch Government. Our mandate is *to increase worldwide knowledge of the land, its soils in particular, to support their sustainable use and management.*

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Front cover: Soil monoliths representing all the major groups of the World Reference Base for Soil Resources

Back cover: Global land degradation 1981-2003 - preliminary output of the GLADA project

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INTRODUCTION

Continuing last year's theme of global soil issues, we again put our shoulder to the wheel of the UN Environment Program's *Global Environmental Assessment GEO-4*, which was formally launched in October, and contributed to the *Comprehensive Assessment of Water Management in Agriculture*. For GEO-4, the line-by-line negotiation of the text between all the authors (40 of them in the case of the land chapter), a searching high-level review and, finally, political reassembly of the main points for decision-makers by a large multi-stakeholder conference intent on finding comforting messages, were all far removed from our traditional observation, measurement, scrutiny and analysis of soils data - but necessary to carry scientific information into the public arena and to the point of decision. The end product may not be soil science, as we know it, but that's politics.

Alarming, several issues, written as outlook at the outset of this GEO round three or four years ago, have already come to pass: global food prices are now the highest in real terms since 1945, driven by the demand for bio-fuels, dietary shifts to animal protein by newly wealthy populations, and falling grain stocks; climate-driven tipping points in glaciers and some regional rainfall patterns; and the cumulative effects of land degradation and ambivalent data for land improvement revealed by the *Global Assessment of Land Degradation and Improvement* - all of these are threatening global food and water security, and political and economic stability.

The demand for traditional soil information has shrunk to vanishing point and, with it, the expertise that built up our knowledge of the land in the golden age of soil survey and land use planning (for my generation, from 1945 to the 1970s, which was the response of governments to the state of food and agriculture in 1945). This does not mean that soil information is now irrelevant or not wanted; the lesson to draw from the surging uptake of digital information from our website and the astonishing usage of our legacy soil maps made available through EuDASM is that we must provide the kind of information that can be used directly in decision-making - and provide it in today's digital format.

The success of the Green Water Credits proof of concept has led to support from IFAD for pilot operations in Kenya and a request from the Government of Kenya for a national program. We are attempting to create a market in environmental services - in this case, water management services - that will pay for good land husbandry and significantly increased water productivity. Land and water have been either grabbed or taken for granted. We have to change this way of thinking, persuade people to pay for something that they have always got free and, then, deliver food and water security - in the face of exponentially increasing demands and a legacy of land degradation.

We are also encouraged by success in winning EU Framework Program 7 funding for the digital earth observation platform *e-SOTER* which will support development of the next generation methods for land resources survey and analysis; they are going to be needed quite soon.

David Dent April 3 2008

WORLD SOIL MUSEUM: INFORMATION AND EDUCATION

Educational program

In 2007, more than 30 groups of students, teachers and others visited the World Soil Museum. Most of them took advantage of an introductory lecture and a guided tour through the exhibition, several groups also undertook field excursions around Wageningen. Eight German university groups visited the museum, each spending one or two days with us; others came from Belgium, UK, Iraq, and the USA. About one third of our student visitors are from Wageningen; exercises in the museum are now part of four regular courses of Wageningen University. Some 400 visitors from The Netherlands included university and college students from Free University (Amsterdam) and University Amsterdam, UNESCO-IHE (Delft), University Utrecht, ITC (Enschede) and Larenstein (Velp), local high school students, and welcome visits from the general public.

Alfred Hartemink organised two courses on scientific publishing for doctoral students and members of the CT de Wit Graduate school PE&RC; the same was also given for staff and students of Agriculture, Food & Natural Resources at the University of Sydney (April), UNESCO-IHE (July), and Hohenheim University, Stuttgart (November). Every year, Alfred teaches an introductory soil science course at UNESCO-IHE including a two-day excursion to Limburg, an introductory soil science course for international students at ILRI-Alterra, and at the National University of Rwanda as part of a NUFFIC project. Along with David Dent, he supervises MSc and PhD students from Wageningen University.

Public Information

Global Environmental Outlook

ISRIC - World Soil Information contributed to UNEP's [4th Global Environmental Outlook GEO-4](#), officially launched on 25 October 2007 at the UN Headquarters, New York. An online interactive feature enabled members of the public to submit questions to experts and join the global discussion. David Dent was one of the experts who participated in the online sessions and was Coordinating Lead Author of the Land chapter - to which Alfred Hartemink contributed the section on nutrient depletion; Godert van Lynden contributed to the section on land degradation, and Niels Batjes to biological cycles. The Chapter highlights the demands of burgeoning human population, economic development and global markets which have been met by unprecedented land use change. Unsustainable land use is driving land degradation: continued loss of tropical forest, soil erosion, nutrient depletion, water scarcity, salinity, disruption of biological cycles, and contamination by persistent pollutants such as heavy metals and organic chemicals. Demands on land resources will only intensify and climate change will increase water demands and, probably, the variability of rainfall. Potentially unmanageable threats include runaway biological cycles, climate-related tipping points, conflict and breakdown of governance. Opportunities to meet these challenges include the application of

existing knowledge as well as technological advances, diversification of land use to mimic natural ecosystems and take advantage of natural variability instead of ignoring it, and harnessing markets to the delivery of ecosystem services.

International Year of Planet Earth

ISRIC is a founder of the International Year of Planet Earth. David Dent sits on the Board; Alfred Hartemink chairs the Science Committee and is also a member of the Dutch National Committee. *Soil – Earth's living skin*, the introductory brochure for The International Year of Planet Earth written by David Dent, Alfred Hartemink and John Kimble has been translated and widely distributed in French, Portuguese, Romanian and Japanese, as well as in the original English version.

Alfred Hartemink

PhD study

Stephan Mantel's field studies in the framework of the CHARM project in Bangladesh served as a case study for his PhD research on *Design of decision-support tools on land management practices and planning for local land users*.

Projects in 2008

- *World of Soils*: Exhibition and educational material on the world-wide web; link to ISIS profile data and reference photo collections
- *International Year of Planet Earth*: advancement of the soils theme. In preparation for 2009 – Springer is publishing a book on all 10 science themes
- [World Soil Council](#): Initiative to raise the profile of soils at national and international policy level
- *Rwanda Agroforestry and Soil Management MSc* (NUFFIC project): partnership with Wageningen University
- *Publications*: Policy briefs - *Green Water Credits*, *Global Assessment of Land Degradation and Improvement*; *Digital Soil Mapping with Limited Data*; *Chernozem: soils and agriculture in Moldova*; publication of soils books for both teachers and students by SME advices under the GLOBE (Global Learning and Observations to Benefit the Environment) program

WORLD DATA CENTRE FOR SOILS

ISRIC - World Soil Information has maintained the World Data Centre for Soils since 1989. Some 50 [World Data Centres](#) (WDCs) collect, archive and distribute geophysical data for the benefit of the international scientific community according to the [principles](#) laid down by the [International Council for Science](#). We provide a locus for soil-related collections and information services as custodian of global soil information. Analogue data are held in the World Soil Library, which focuses on country documentation (including grey literature); digital data are held on servers of Wageningen UR and the EC Joint Research Centre (JRC).

Renewal of the library as the *World Soil Library* has continued in cooperation with Wageningen UR Library, concentrating on consolidating our regional and country documentation. In respect of holdings from Africa, this is now fully operational and there is a modest ongoing program of scanning key grey literature and map holdings. In 2007, our digital data were documented in the WDCs Global Change Master Directory (GCMD) portal using uniform metadata protocols and standards. This means that the associated [datasets](#) become freely available through the GCMD pages.

The ISRIC – World Soil Information Database became operational in May 2007. The full catalogue contains some 19 700 titles and, at the end of 2007, the database provided on-line access to some 3500 high-resolution maps and 500 full-text reports. This has been publicized through various media including the *IUSS Alerts* (June 2007), *IUSS Bulletin* (2007, 110:36-37), *Wageningen UR Library Newsletter*, as well as the ISRIC website.

Website development

Since May 2006, there have been about 50 000 visits to the new ISRIC website. On-line visitors come from all over the World (Figure 1) but inherently reflect regional differences in internet access: a quarter of requests for soil-related information came from Africa, Asia, Oceania and South America, one third from North America and the remainder from Europe (data in Figure 1 do not include use of our on-line data that are hosted by the JRC Institute of Environment and Sustainability, or requests for through e-mail or surface mail).

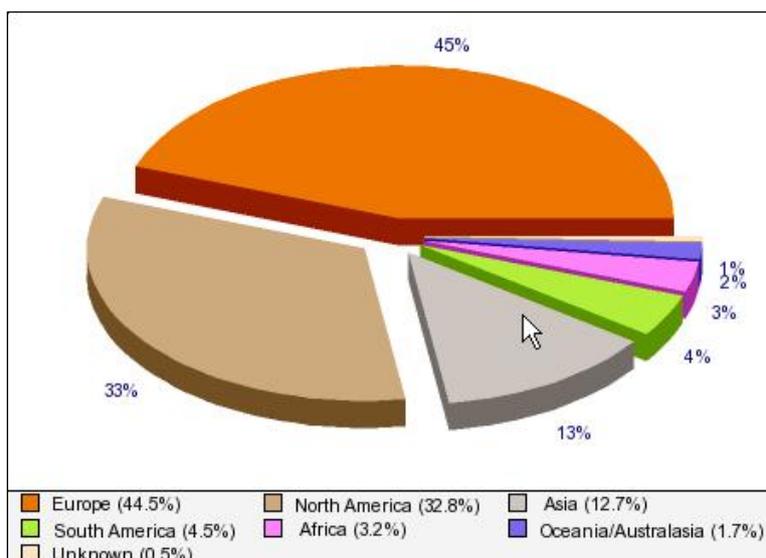


Figure 1. On-line visitors new ISRIC website

Since June 2007, website usage has been monitored to help us to focus our data development work and to inform users about new data releases and other developments, for example through targeted *ISRIC e-mail Alerts*. During the period monitored, over 1200 datasets have been downloaded from the ISRIC website: 47 per cent were WISE data, 22 per cent primary SOTER data, 13 per cent secondary SOTWIS data (GIS sets in which gaps in measured data in SOTER were plugged using taxotransfer procedures that use soil parameter estimates derived from WISE), 14 per cent land degradation assessments (GLASOD, ASSOD), and 4 per cent from the IGBP-DIS data set for pedotransfer function development. Requests came from 399 unique user communities (Table 1). The data are being used for an extraordinarily wide range of assessments including agro-ecological zoning, crop production, soil vulnerability to pollution, soil gaseous emission potentials, studies of impacts of soil degradation on food supply, Green Water Credits, and modelling of soil organic carbon stocks and changes; details may be found through www.isric.org.

Table 1. Main user groups of ISRIC datasets^a

User Group	Per cent
Universities/Colleges	45
National Research Institutes	19
Students	12
International Research Institutes	9
Non-Governmental Organizations	5
UN Organizations	2
Independent Scientists	2
Consultancy firms	2
Commercial Companies	2
Other	3

^a Period monitored: 12 June 2007 to 4 December 2007

Over the last three years, *daily* usage of our digital map collection through EuDASM, hosted by JRC, has been 285 for maps of Africa, 151 for Asia, 76 for Europe, and 71 for Latin America and the Caribbean. The most frequent single user has been the World Bank.

Niels Batjes

World Reference Base for Soil Resources

An updated version of the World Reference Base publication has been released through the [FAO](#). Translations have been made in Russian, Spanish and Latvian. Arabic, Chinese, French, German and Polish translations are in hand.

Otto Spaargaren participated in an excursion through Germany to review two new reference soil groups: Technosols (soils developed on man-made parent materials like slag heaps, coal tips and urban rubble) and Stagnosols (soils with impeded surface drainage).

Otto Spaargaren

Collections

Ongoing preparation and maintenance of the World Soil Reference Collection included work on the unique collection of soil monoliths from across the Soviet Union collected by KD Glinka for the First International Congress of Soil Science in Washington in 1927 but never exhibited. The monoliths, preserved in sugar, are of exceptional quality. ISRIC presented a selection of Glinka monoliths to the new Dokuchaev Museum in St Petersburg and a 2m chernozem profile now graces our display of representatives of the main groups of the World Reference Base for Soil Resources.

A monolith and samples for thin sections were collected from a unique dike constructed from seaweed, possibly in the 14th century. This was revealed by the archaeological excavation near Den Hoorn, south Texel, in the UNESCO Wadden Sea Biosphere Reserve.

Ad van Oostrum

All colour transparencies in the photo collection are digitised and catalogued, and will be available on the ISRIC web site

Wouter Bomer

The three established collections of thin sections – ISRIC, Jongerius-Stiboka, and Schmidt-Lorenz – were complemented in 2007 by the BenG collection of the former Dept of Soil Science and Geology of Wageningen University, comprising examples of soils, sediments and regoliths mostly from the Netherlands and Europe. This collection has been screened for subject, quality and documentation by Rienk Miedema and Toine Jongmans, who built up a large part of this collection and provided all the available information.

Another, smaller, collection was donated by Maja Kooistra, comprising 96 large thin sections from a transect across the marine intertidal zone in the southwest part of the Netherlands and some polder soils of former intertidal zones. This collection is well documented in her PhD thesis and related publications, all of which have been provided. Maja also donated all the thin sections produced since 2004 by Kooistra Micromorphological Services (KMS), fully documented except for contract research that is not yet officially released.

During 2007, most of the ISRIC and the Jongerius-Stiboka collection thin sections and blocks have been checked and reorganized. All reports on the Jongerius-Stiboka thin sections produced since 1998 have been recovered and are now available either in printed or digital form.

Research: Dr MJ Kooistra, guest researcher at ISRIC, and Dr MM Pulleman, Wageningen University Dept of Soil Quality, assisted by Wouter Bomer, completed the chapter: Features related to faunal activity in soils and regoliths - for the handbook *Interpretation of micromorphological features of soils and regoliths*, edited by Stoops and others, to be published by Elsevier in 2008. Maja also wrote a paper on Celtic Field Systems in the Netherlands to be published in the *Journal of Archaeological Science* in 2008.

Maja Kooistra

Niels Batjes was Acting Head of WDC for Soils from September 2006 to January 2007 and from May to October 2007. Otto Spaargaren was on sabbatical at the EU Joint Research Centre, Ispra.

Projects in 2008

1. *Library renewal*; selective digitisation
2. *Decentralised global digital archive of land resources data* – expansion of the European Digital Archive (EuDASM) in partnership with the European Soil Bureau, FAO and others; incorporation of viewing and analysis tool
3. *Map library* - completion of catalogue and meta-data
4. *Reference photo collection* – documentation
5. *ISIS database* – web application and link to the ISRIC *World of Soils* learning program
6. *Common digital data management system*
7. *Atlas of Northern Circumpolar Soil* – joint program with JRC, Agriculture Canada and the University of Vechta (Germany)
8. *Soils Atlas of Africa* - joint program with JRC

9. *Micromorphology* – Consolidation of collections; completion of checking and organisation of the ISRIC and Jongerius-STIBOKA collections, altogether about 1500 slides, short descriptions will be made as needed; on-line catalogue; completion of organization and storage of soil blocks; digitizing of some of rare publications with analyses of thin sections held in the collection
10. *World Soil Reference Collection* – implementation of re-sampling program coordinated with Global Carbon Benefits

APPLIED RESEARCH

Land resources data are fundamental to any land-related assessment, both in their own right and through their applications in relation to other data and knowledge. The Applied Research Program compiles and applies our own and other data to meet a wide range of needs including land use policy and planning, assessment of food and water security, and predictive models for global climatic change.

Global Assessment of Land Degradation and Improvement (GLADA)

Land degradation is always with us but its causes, and the extent and severity of the problem remain elusive – and contested. Land degradation may be defined as a long-term decline in ecosystem function and productivity, which may be assessed using remotely sensed NDVI data; deviation from the norm serves as a proxy indicator of land degradation and improvement if other factors that may be responsible, such as climatic changes, are accounted for. After long preparation, GLADA finally commenced in February 2007 with a Letter of Agreement between FAO and ISRIC for a three year project to produce:

1. A global analysis of trends in biomass production, at 8 km resolution, to identify *hot spots* of land degradation and their counterpoint - *bright spots* of land improvement;
2. Quality indicators of *hot spots* derived through stratification of the landscape according to land use, terrain and soils;
3. A validated global framework for the parent FAO project Land Degradation Assessment of Drylands (LADA), in which ISRIC is a partner.

Preliminary analysis of NASA's 23-year time series of NDVI data indicates a declining trend of greenness, adjusted for rainfall variability, over a quarter of the land surface. Five per cent of the land surface shows a negative trend at the 95 per cent confidence level and 7.5 per cent at the 90 per cent confidence level. Degrading areas are mainly in Africa south of the Equator, SE Asia, S China, N-central Australia and the Pampas; 1.5 billion people live in these areas. The results are very different from ISRIC's previous 1990 GLASOD assessment that compounded current with historical land degradation. That the two do not correspond indicates a cumulative threat to sustainable development.

Draft reports were produced for Argentina, China, Cuba, Senegal, South Africa, and Tunisia. Technical issues have been reviewed with our FAO and partner-country counterparts and a refined methodology will be applied in 2008.

SOTER activities within GLADA

The next stage of analysis will combine NDVI data with information on soils and terrain. A global landform map at scale 1:1 million was generated by analysis of the SRTM 90m Digital Elevation Model according to SOTER criteria (combining slope, relief intensity and elevation). Enhanced information on soils was compiled for LADA partner countries Argentina, Cuba and South Africa; contracts have been

made for the supply of representative soil data for Senegal, with the *Institut National de Pédologie*; and for China, with the *Institute of Soil Science - Chinese Academy of Sciences*. The SOTER compilation is due to be finished in the first quarter of 2008.

Godert van Lynden, Vincent van Engelen

Green Water Credits

Green Water Credits is a mechanism to pay land users for specified water management activities that determine all fresh water resources at source; these services are presently unrecognized and unrewarded. Regular payments from downstream water users enable farmers to adopt well-proven, sustainable *green water management* packages; at the same time they combat rural poverty by diversifying income. Water productivity can be significantly increased, the hazards of flood and drought mitigated, and rural livelihoods secured by two fundamental improvements in soil management: increasing infiltration of rainfall, thereby cutting storm runoff, and shifting unproductive evaporation to productive water use. More infiltration means banking water in soils and aquifers which feed river base flow; less storm runoff means less soil and bank erosion, less flooding, and less siltation of streams reservoirs.

A proof-of-concept study in Kenya funded by IFAD and Swiss Development Cooperation was concluded in partnership with the Agricultural Economics Research Institute (LEI) International Institute for Environment and Development, and Stockholm Environment Institute. It demonstrated practical ways to optimise water allocation and appraise costs and benefits. For the Upper Tana Basin, annual water benefits of green water management may reach \$12-95 millions, compared with costs of 2-20 millions; for a 20 per cent adoption scenario, annual water benefits are \$6-48 millions and costs only 0.5-4.3 millions. Seven reports are now published in the [Green Water Credits](#) series.

Three-year funding was secured from IFAD for pilot operations in Kenya, beginning in 2008, and the Government of Kenya has requested a national scheme to be managed by its Water Resources Management Authority.

David Dent and Sjef Kauffman

Soil organic carbon stocks and change at regional scale

Niels Batjes contributed to several papers presenting results from the GEF co-financed project Soil Carbon Stocks and Changes at National Scale; published in a special volume of *Agriculture, Ecosystems and Environment*.

The working version of the ISRIC-WISE global soil profile database was expanded to some 10 000 profile descriptions. The primary data were used to develop taxotransfer procedures to fill gaps in measured soil attribute data in SOTER; the procedure was applied to the recently released *Soil and Terrain Database for Central Africa*.

Niels Batjes

Land resources conservation and degradation

Carbon Sequestration Project (CSEQ): pastoral systems in the American Tropical Forest Ecosystem

This study for the CSEQ research network evaluating the carbon-fixing capacity of pastoral systems in the American tropical forest ecosystem, identified areas across Central and South America that are similar to the four CSEQ research stations (Andean hillsides and humid tropical forest in Amazonia, Colombia; humid tropical forest in the Atlantic Coast region and sub-humid tropical forest in the Pacific Coast region of Costa Rica) with a view to extrapolating research results and recommendation domains.

Similarity was based on climate, terrain and soils. Climatic conditions were characterized by the length of growing period; a 90m-resolution digital elevation model was used to define terrain; soil characterization employed the Soil and Terrain Database of Latin America and the Caribbean. Results will be published in the book *Carbon sequestration in tropical grassland ecosystems* (Wageningen Academic Publishers).

Vincent van Engelen

Chittagong Hill Tracts: Improved Natural Resources Management

The Chittagong Hill Tracts Improved Natural Resources Management project (CHARM) concluded with a stakeholder workshop in March 2007, in Dhaka. The 18-month project has provided better understanding of prospects for sustainable management of the natural resources in the Chittagong Hill Tracts, and improved information for decision making. Participation of local communities has been a focus of activities that included: 1) Facilitation of exchanges of knowledge and experience and creation of a stakeholder platform; 2) Assessment of the state of the environment; 3) Inventory of land management practices; 4) Assessment of socio-economic conditions and information needs for improved natural resources management; 5) Creation of a local natural resources management information system, part of which was an improved soils and terrain database; 6) A pilot study on participatory planning of management of natural resources.

In total, eleven technical reports were published, among which was *State of the environment of the Chittagong Hill Tracts* and *Assessing land degradation in the Chittagong Hill Tract, Bangladesh, using NASA GIMMS*. An implementation strategy was developed based on the pilot study and feedback from the stakeholders.

Land suitability for oil palm in Kalimantan

Land suitability assessment for oil palm plantations in Indonesian Borneo was carried out in collaboration with Alterra at the request of the Dutch Ministry of Agriculture, Nature, and Food Quality, Directorate International Affairs. The report, issued in June 2007, will be used to support policy development and to inform the debate on the sustainability of oil palm expansion and forestry issues.

Stephan Mantel

World Overview of Conservation Approaches and Technologies (WOCAT)

WOCAT is a professional network maintained in collaboration between ISRIC and CDE – University of Bern (coordinator); Godert van Lynden is a member of the Management Group. The book *Where the land is greener*, launched at FAO in Rome in November 2006 and widely distributed, presents case studies of 42 technologies and 28 approaches from all over the world.

WOCAT is also involved in the FAO project Land Degradation Assessment in Drylands (LADA) where ISRIC has been involved in extensive revision of the WOCAT mapping methodology, participating in three meetings on this subject (Bern, Rome, and Pretoria).

Godert co-coordinated the 12th annual WOCAT Workshop and Steering Meeting in the Philippines in November; there were some 40 participants from 20 countries. The meeting was followed by a training course for members of the Philippines WOCAT committee and some foreign delegates.

Desertification mitigation and remediation of land (DESIRE)

The EU-Framework Program 6 project [DESIRE](#), coordinated by Alterra, started in February 2007. This 5-year integrated project brings together 28 research institutes, NGOs and policy-makers from around the world. The aim is to devise alternative strategies for the use and protection of vulnerable areas. Eighteen study sites have been identified from the Mediterranean region, Australia, Chile, China, Botswana and the USA, covering a wide range of problems such as soil erosion, salinisation and drought.

Godert van Lynden and Stephan Mantel participated in the project launch in Crete. Godert coordinates Work Block 1: Environmental and socio-economic context; within this Block an information review was prepared by a Wageningen PhD student, Jantiene Baartman. The second Block concerns Assessment and Mapping and will be using a combination of the GLADA and WOCAT mapping methods. Stephan Mantel is involved in Blocks dealing with the identification of drivers of desertification, stakeholders and sustainability goals.

Godert van Lynden

New initiatives

e-SOTER

ISRIC leads a consortium of 14 natural resources institutes and universities in Europe, N Africa and China which won EU Framework Program 7 support for e-SOTER - a regional pilot platform contributing to a Global Soil Observing System. The 42-month project is expected to start in mid 2008. It will deliver a pilot platform and a portal providing access to: 1) a methodology and an enhanced soil and terrain database at scale 1:1 million; 2) an artefact-free 90m digital elevation model; 3) methodology to create 1:250 000-scale enhanced SOTER databases, and the databases themselves for four windows – two in Europe, one in Morocco and one in China; 4) advanced remote sensing techniques to obtain soil attribute data; 5) validation and uncertainty propagation analysis; 6) dedicated applications related to major threats to soil quality and performance.

Vincent van Engelen

GlobalSoilMap.net

A proposal embracing a new digital soil map of the world using state-of-the-art and emerging technologies for soil mapping and predicting soil properties at fine resolution has been submitted to the Bill & Melinda Gates Foundation. This map will be supplemented by interpreted information to support better policy and management decisions over a range of global issues like food production and hunger eradication, climatic change, and environmental degradation. ISRIC is the lead agency and will coordinate the global effort with nodes in six continents (Figure 2).

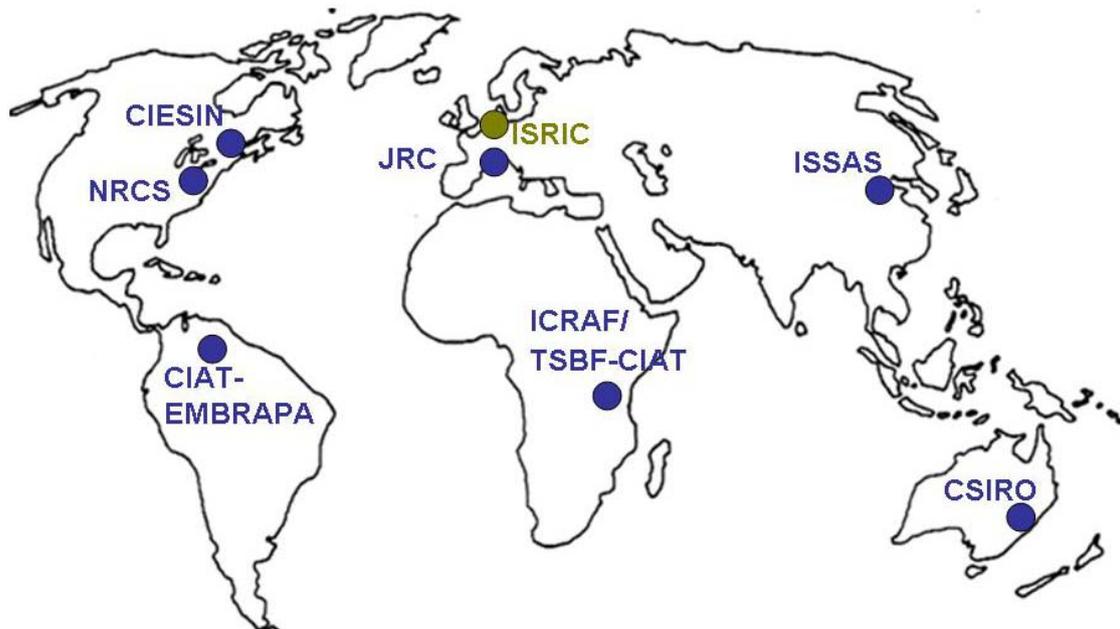


Figure 2. Nodes in the GlobalSoilMap.net project

Alfred Hartemink

Other activities

International Union of Soil Sciences

In his role as Deputy Secretary General, Alfred Hartemink edited and published two *IUSS Bulletins* and 12 *IUSS Alerts* for the IUSS. The website received more than 140 000 visits in 2007.

Dutch Society of Soil Science

Stephan Mantel is Secretary and Treasurer of the Dutch Society of Soil Science. A symposium *The past and present of land evaluation* was co-organized with and hosted by ITC in Enschede.

Alfred Hartemink is member of the 75th Anniversary committee of the Dutch Society of Soil Science, chaired by Prof. Johan Bouma.

Global Environment Fund

David Dent served on the Technical Advisory Committee of the Global Environment Fund, contributing to the definition of the GEF's strategy for the next 4 years.

Projects in 2008

1. *GLADA*: completion of the trends analysis of NDVI data and integration of soil, terrain and NDVI indicators of land degradation and improvement
2. *Green Water Credits*: design and capacity building for pilot operation in Kenya, start of operations in Morocco
3. *Desertification mitigation and remediation of land (DESIRE)* in consortium with Alterra. Review of desertification information; drivers; mapping and assessment
4. *WOCAT*: maintenance of network; start of WOCAT mapping in FAO LADA program
5. *SOTER*: Development and maintenance of global SOTER – revised procedures manual; web-based GIS tools for data surfaces; start of *e-SOTER* (EU Framework Program 7 project);
6. *GlobalSoilMap.net*: Start
7. *Global Carbon Benefits*: Project preparation for GEF funding

PUBLICATIONS

Alfred Hartemink is Editor-in-Chief of *Geoderma*; he is also Co-editor of the Elsevier series *Developments in Soil Science*. David Dent is an Associate Editor of *Soil Use and Management*.

Papers in primary journals

- Al-Adamat R, Rawajfih Z, Easter M, Paustian K, Coleman K, Milne E, Falloon P, Powlson DS and Batjes NH 2007. Predicted soil organic carbon stocks and changes in Jordan between 2000 and 2030 made using the GEFSOC modelling system. *Agriculture, Ecosystems and Environment* 122, 35-45
- Batjes NH, Al-Adamat R, Bhattacharyya T, Bernoux M, Cerri CEP, Gicheru P, Kamoni P, Milne E, Pal DK and Rawajfih Z 2007. Preparation of consistent soil data sets for SOC modelling purposes: secondary SOTER data sets for four case study areas. *Agriculture, Ecosystems and Environment* 122, 26-34
- Bhattacharyya T, Pal DK, Easter M, Batjes NH, Milne E, Gajbhiye KS, Chandran P, Ray SK, Mandal C, Paustian K, Williams S, Killian K, Coleman K, Falloon P and Powlson D 2007. Modelled soil organic carbon stocks and changes in the Indo-Gangetic Plains, India, between 2000 and 2030. *Agriculture, Ecosystems and Environment* 122, 84-94
- Cerri CEP, Easter M, Paustian K, Killian K, Coleman K, Bernoux M, Falloon P, Powlson DS, Batjes NH, Milne E and Cerri CC 2007. Predicted soil organic carbon stocks and changes in the Brazilian Amazon between 2000 and 2030. *Agriculture, Ecosystems and Environment* 122, 58-72
- Cerri CEP, Easter M, Paustian K, Killian K, Coleman K, Bernoux M, Falloon P, Powlson DS, Batjes NH, Milne E and Cerri CC 2007. Simulating SOC changes in 11 land use change chronosequences from the Brazilian Amazon with RothC and Century models. *Agriculture, Ecosystems and Environment* 122, 46-57
- Easter M, Paustian K, Killian K, Williams S, Feng T, Al-Adamat R, Batjes NH, Bernoux M, Bhattacharyya T, Cerri CC, Cerri CEP, Coleman K, Falloon P, Feller C, Gicheru P, Kamoni P, Milne E, Pal DK, Powlson D, Rawajfih Z, Sessay M and Wokabi S 2007. The GEFSOC soil carbon modeling system: a tool for conducting regional-scale soil carbon inventories and assessing the impacts of land use change on soil carbon. *Agriculture, Ecosystems & Environment* 122, 13-25
- Hartemink AE 2007. Letter to the editor; global soil issues. *Soil Science* 172, 167
- Goyens C, Verdoodt A, Wauw J van de, Baert G, Engelen VWP van, Dijkshoorn JA and Ranst E van 2007. Base de données numériques sur les sols et le terrain (SOTER) de l'Afrique Centrale (RD Congo, Rwanda et Burundi). *Etude et Gestion des Sols* 14, 207-218
- Milne E, Adamat RA, Batjes NH, Bernoux M, Bhattacharyya T, Cerri CC, Cerri CEP, Coleman K, Easter M, Falloon P, Feller C, Gicheru P, Kamoni P, Killian K, Pal DK, Paustian K, Powlson DS, Rawajfih Z, Sessay M, Williams S and Wokabi S 2007. National and sub-national assessments of soil organic carbon stocks and changes: The GEFSOC modelling system. *Agriculture, Ecosystems & Environment* 122, 3-12

- Milne E, Sessay M, Al-Adamat R, Batjes NH, Bernoux M, Bhattacharyya T, Cerri CC, Cerri CEP, Coleman K, Easter M, Falloon P, Feller C, Gicheru P, Kamoni P, Killian K, Pal DK, Paustian K, Powlson D and Rawajfih Z 2007. An increased understanding of soil organic carbon stocks and changes in non-temperate areas: national and global implications. *Agriculture, Ecosystems and Environment* 122, 125-136
- Minasny B, Hartemink AE & McBratney AB 2007. Soil Science and the h index. *Scientometrics* 73, 257-264
- Rutunga V, Janssen BH, Mantel S and Janssens M 2007. Soil use and management strategy for raising food and cash output in Rwanda. *Journal for Food, Agriculture & Environment* 5, 434-441

Contributions to edited books

- Dent DL, Asfary AF, Giri C, Govil K, Hartemink AE, Holmgren P, Keita-Ouane F, Navone S, Olsson L, Ponce-Hernandez R, Rockström J, Shepherd G, Abdelgawad G, Batjes NH, Beltran JM, Brink A, Dronin N, Essahli W, Ewald G, Illueca J, Kant S, Krug T, Kueper W, Wenlong L, MacDevette D, Nachtergaele F, Ndiang'ui N, Poulisse J, Schmulius C, Singh A, Sonneveld B, Sverdrup H, Brusselen J van, Lynden G van, Warren A, Bingfang W and Zhongze W 2007 *Chapter 3 – Land*, 81-114 in *Global Environmental Outlook (GEO4) - Environment for Development, Chapter 3 – Land*, UNEP, Nairobi
- Gerard M & Spaargaren O 2007. Soil descriptions. 127-128 in O Arnalds and others (Eds) *Soils of Volcanic Regions in Europe*. Springer, Berlin-Heidelberg
- Hartemink AE 2007. *Piper aduncum* fallows in the lowlands of Papua New Guinea. 96-97 in M Cairns (Ed): *Voices from the Forest - Integrating Indigenous Knowledge into Sustainable Upland Farming*. RFF Press, Washington DC
- Hartemink AE 2007. Nutrient depletion. 96-97 in Chapter 3, *Global Environmental Outlook (GEO-4)*. UNEP, Nairobi
- Hartemink AE 2007. Soil science, population growth and food production: some historical developments. 85-97 in A Bationo and others (Eds) *Advances in integrated soil fertility management in sub Saharan Africa: challenges and opportunities*. Springer, Berlin
- Hope GS & Hartemink AE 2007. Soils of Papua. 166-176 in AJ Marshall & BM Beehler (Eds) *Ecology of Papua*. Periplus, Hong Kong
- Quantin P and Spaargaren O 2007. Classification of the Reference Pedons: World Reference Base for Soil Resources and Soil Taxonomy. 231-249 in O Arnalds and others (Eds) *Soils of Volcanic Regions in Europe*. Springer, Berlin-Heidelberg

Contributions to conference proceedings and other publications

- Batjes NH 2007. ISRIC - World Soil Information: soil maps and reports on-line. *Bulletin of the International Society of Soil Science* 2007, 36-37
- Mantel S, Alam M, Khan FMA and Olarieta JR 2007. Improving information access for innovation of the *Jhum* farming system in the Chittagong Hill Tracts of Bangladesh. *2nd International conference on Sustainable Sloping Lands and Watershed Management: Linking Research to Strengthen Upland Policies and*

Practice, 12-15 December 2006. National Agriculture and Forestry Research Institute, Luang Prabang, Lao PDR, 26 p

Minasny B, Hartemink AE & McBratney AB 2007. Declining impact of (soil) geostatistics? *Pedometron* 23: 21-22

Minasny B, McBratney AB & Hartemink AE 2007. Soil science is in great shape. *Profile - Newsletter of the Australian Society of Soil Science*: 16

Minasny B, McBratney AB & Hartemink AE 2007. Soil bibliometrics - How much do we love cite ourselves? *Pedometron* 22: 11-13

Minasny B, McBratney AB & Hartemink AE 2007. Soil bibliometrics - The h index. *Pedometron* 21: 18-21

Book reviews

Batjes NH 2007. Encyclopedia of Soil Science (Second Edition), edited by R Lal, Taylor and Francis/CRC Press, Boca Raton. *Geoderma* 139, 251

Reports

Bai ZG and Dent DL 2007. *Land degradation and improvement in South Africa. 1: Identification by remote sensing*. Report 2007/03, ISRIC – World Soil Information, Wageningen, 54p

Bai ZG and Dent DL 2007. *Land degradation and improvement in Cuba. 1: Identification by remote sensing*. Report 2007/04, ISRIC – World Soil Information, Wageningen, 48p

Bai ZG and Dent DL 2007. *Land degradation and improvement in Argentina. 1: Identification by remote sensing*. Report 2007/05, ISRIC – World Soil Information, Wageningen, 50p

Bai ZG and Dent DL 2007. *Land degradation and improvement in China. 1: Identification by remote sensing*. Report 2007/06, ISRIC – World Soil Information, Wageningen, 52p

Bai ZG and Dent DL 2007. *Land degradation and improvement in Senegal. 1: Identification by remote sensing*. Report 2007/07, ISRIC – World Soil Information, Wageningen, 48p

Bai ZG and Dent DL 2007. *Land degradation and improvement in Tunisia. 1: Identification by remote sensing*. Report 2007/08, ISRIC – World Soil Information, Wageningen, 47p

Batjes NH 2007. *SOTER-based soil parameter estimates for Central Africa – DM of Congo, Burundi and Rwanda (SOTWIScaf, ver. 1.0)*. Report 2007/02, ISRIC – World Soil Information, Wageningen, 34p + dataset

Choudhury EH, Engelen VWP van, Shaoib JM and Rahman MM 2007. Terrain and soil resources. In: Khan MFA, S Mantel and EH Choudhury (editors), *State of the environment of the Chittagong Hill Tracts*. CHARM Project Report 2. CHARM project, Dhaka, 29-55

De Goede van Delft RB, Dirven L, Hartemink AE, Meijberg W, Hoeven N van der, 't Hoen J, Hulst L van & De Haan I 2007. *Bodem - Voortgezet onderwijs (Docentendeel, leerlingendeel)*. Het GLOBE programma, SME advies, Utrecht, 225p

- Dent DL, Kauffman J 2007 *The spark has jumped the gap: Green Water Credits proof-of-concept*. Green Water Credits Report 7, ISRIC – World Soil Information, Wageningen, 65p
- Hoff H, Noel S and Droogers P 2007. *Water use and demand in the Tana Basin: analysis using the Water Evaluation and Planning tool (WEAP)*. Green Water Credits Report 4, ISRIC – World Soil Information, Wageningen, 39p
- Huting JRM, Dijkshoorn JA and van Engelen VWP 2007. *GIS-procedures for mapping SOTER landform*. GLADA Topical Report 2, ISRIC - World Soil Information, Wageningen, 20p
- Islam SM, Alam M and Mantel S 2007. *Land use planning and environmental control in the Chittagong Hill Tracts*. Chittagong Hill Tracts Improved Natural Resources Management (CHARM) Project Report 3, Bangladesh Center for Advanced Studies (BCAS), Dhaka, 34p
- Kauffman JH, Droogers P, Odada E, Macharia P, Gicheru P, Dijkshoorn JA 2007. *Green and blue water resources and assessment of soil and water management scenarios using an integrated modelling framework*. Green Water Credits Report 3, ISRIC – World Soil Information, Wageningen, 130p
- Khan FMA and Mantel S 2007. *Planning for improved natural resources management: pilot study in Bandarban Sadar Upazilla*, CHARM Project Report 8, Dhaka, 56p
- Khan FMA, Mantel S and Chowdhury EH (Eds) 2007. *State of the environment of the Chittagong Hill Tracts*. CHARM Project Report 2, Dhaka, 156p
- Mainuddin K, Alim MA, Alauddin SM, Alam M, Ahmed F, Rahman MM and Mantel S 2007. *Stakeholders' Information Needs for Planning and Management of Natural Resources in the CHT*. CHARM Project Report 5, Bangladesh Centre for Advanced Studies, Dhaka, 27p
- Mantel S 2007. Conservation and Production Priorities. In: FMA Khan, S Mantel and EH Choudhury (Eds) *State of the environment of the Chittagong Hill Tracts*. CHARM Project Report 2, Dhaka, 156p
- Mantel S, Wösten H & Verhagen J 2007. *Biophysical land suitability for oil palm in Kalimantan, Indonesia*. Report 2007/01, ISRIC – World Soil Information, Wageningen, 27p
- Meijerink G, Muchena F, Njue E, Noel S, Onduru D and Porras I 2007 *Political, institutional and financial framework for Green Water Credits in Kenya*. Green Water Credits Report 6, ISRIC –World Soil Information, Wageningen, 48p
- Porras I, Grieg-Gran M and Meijerink G 2007 *Farmers' adoption of soil and water conservation: potential role of payments for watershed services*. Green Water Credits Report 5, ISRIC – World Soil Information, Wageningen, 73p
- Rashid M, Alam M, Mantel S, Olarieta JR and Khan FMA (Eds) 2007. *Proceedings of the capacity-building and consultation workshop on improved natural resources management in the Chittagong Hill Tracts, 28-29 November Bandarban, Bangladesh*. CHARM Project Report 10, Dhaka, 26p

TRAVEL AND MEETINGS

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

Staff	Event	Venue	Period (2007)	Organized by
Dent	Board meeting International Year of the Planet Earth	London	09-10 Jan	IYPE
Dent	Green Water Credits – pilot operation: Discussions with Kenyan partners	Nairobi	16-19 Jan	ISRIC
Dent	Global Environment Fund and World Bank consultancy	Washington DC	13-16 March	GEF
Dent	Green Water Credits and GLADA discussions	Rome	17-18 May	IFAD/FAO
Dent	GEO-4: High-level review meeting	Copenhagen	23-25 May	UNEP
Dent	World Bank presentations and panel discussions: <i>Diagnosis DC monitoring and evaluation of land degradation, and Sustainable land management: what works and why</i>	Washington DC	28 May-1 Jun	World Bank
Dent	Green Water Credits management	Nairobi	12-18 August	ISRIC
Dent	International Forum <i>Soils Society and Global Change</i>	Selfoss	31 Aug-4Sept	Intl Forum Soils Society and Global Change
Dent	GEO-4: Multi-stakeholder meeting	Nairobi	23-28 Sep	UNEP
Dent	JRC-ISRIC collaboration	Ispra	1-2 Oct	JRC
Dent	Green Water Credits management	Stockholm	13-14 Dec	ISRIC/SEI
Dent, Kauffman	Green Water Credits: Management Committee	Delft	29 Nov	ISRIC
Hartemink	Rwanda NUFFIC project	Butare	13-21 Jan; 2-10 Jun	Wageningen University
Hartemink	GlobalSoilMap.net evaluation	Seattle	21–30 Sep	Gates Foundation
Hartemink	Teaching, Hohenheim University	Stuttgart	19-20 Nov	Hohenheim University
Hartemink	GlobalSoilMap.net: proposal preparation	Sydney	21 Apr-10 May	ISRIC

Staff	Event	Venue	Period (2007)	Organized by
Kauffman	Green Water Credits management	Nairobi	13-21 Aug	ISRIC
Kauffman	Green Water Credits management	Nairobi	18-25 Nov	WRMA
Mantel	DESIRE launch	Crete	4-9 Mar	DESIRE
Mantel	CHARM project meeting	Dhaka	7-19 Jan	CHARM
Mantel	UNCCD COP meeting	Madrid	1-6 Sep	UNCCD
Mantel	DESIRE management	Bern	13-14 Oct	DESIRE
Mantel	CHARM stakeholder workshop	Rangamati	12-23 Mar	EU-CHARM
Spaargaren	European Soil Bureau Network Plenary Meeting	Hannover	23-25 Apr	BRG
Spaargaren	World Data Centres Conference	Bremen	7-9 May	University of Bremen
Spaargaren	WRB Technosols/Stagnosols Field Tour	Germany	25 Aug – 1 Sep	Universities of Essen, Halle and Hohenheim
Spaargaren	College on Soil Physics	Trieste	22-24 Oct	ICTP
Spaargaren	Kick-off Meeting on Soil Atlas of Africa	Ispra	5-8 Nov	JRC
Spaargaren	Preparation for IUSS Soil Classification Conference 2008 and monolith sampling	Santiago	29 Nov – 14 Dec	University of Santiago
van Engelen	EU FP7 GEO info day	Brussels	15 Jan	EU
van Engelen	e-SOTER project proposal	Ispra	19 Jan	JRC/ISRIC
van Engelen, Batjes, Dijkshoorn	e-SOTER project proposal	Wageningen	14-15 Feb	ISRIC
van Engelen, Batjes	e-SOTER project proposal	Amsterdam Schiphol	16 Mar	ISRIC
van Lynden	WOCAT/LADA/DESIRE management	Rome	15-16 Jan	FAO
van Lynden	DESIRE launch	Crete	5-9 Mar	DESIRE
van Lynden	WOCAT/LADA/DESIRE management	Bern	5-6 Jul	ISRIC/CDE
van Lynden	UNCCD COP meeting	Madrid	3-7 Sep	UNCCD
van Lynden	DESIRE management	Bern	11-12 Oct	DESIRE
van Lynden	WOCAT/LADA/DESIRE management	Pretoria	14-18 Oct	WOCAT/LADA/DESIRE
van Lynden	WOCAT Annual Workshop & Steering Meeting	Manila / Bohol	10-22 Nov	WOCAT

PERSONNEL

(As of January 2008)

Board of Trustees

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- Prof. Dr S Nortcliff (University of Reading, representing the International Union of Soil Sciences)

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Prof. Dr P Sanchez

Staff

- Dr DL Dent – Director
- Ir JH Kauffman – Deputy Director; *Green Water* engineer

- Dr ZG Bai – Global assessment of land degradation and improvement
- Ir NH Batjes – Land resources information systems, soils and global change
- WCWA Bomer – Graphic design, in-house publishing
- J Brussen – Secretariat, finance
- Ir JA Dijkshoorn – Soil and terrain databases
- Ir IJ Haas – Webmaster
- Dr AE Hartemink – Head, World Soil Museum; soil fertility
- Ir IIM Huibers-Govaert – Library
- JRM Huting – GIS database management; modelling and mapping
- YGL Karpes – Secretariat, communications
- S Mantel MSc - Land evaluation and decision support
- AJM van Oostrum MSc – Curator of collections
- Dr OC Spaargaren – Head, World Data Centre for Soils; taxonomy of soils
- Ir P Tempel - Systems analysis, programming
- Drs VWP van Engelen – Research Team Leader; land resources information systems
- Drs GWJ van Lynden – Land, water and environmental management

Staff change:

Mateen Ahmad retired in September 2007 but continues on short-term contract for preparation and maintenance of soil monoliths

Temporary Staff

M Ahmad MSc (Sep 2007-Sep 2008) - soil monolith workshop
M van Genderen (Oct 2007-Apr 2008) - library

Guest researchers

Drs JHV van Baren - Philosophy of soil science (IUSS program)
Dr LP van Reeuwijk – Laboratory methods and quality control
Dr MJ Kooistra – Soil micromorphology
Dr V Rutunga – Soil fertility

Internship

S Omran, Faculty of Agriculture, Suez Canal University, Egypt - soil monolith preparation (Apr-May 2007)

ABBREVIATIONS

ASSOD	Assessment of Human-induced Soil Degradation in South and Southeast Asia
BenG	Bodemkunde en Geologie / Dept of Soil Science and Geology, Wageningen University, the Netherlands
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe / Federal Institute for Geosciences and Natural Resources, Hannover, Germany
CDE	Centre for Development and Environment, University of Berne, Switzerland
CHARM	Chittagong Hill Tracts Improved Natural Resources Management project
CHT	Chittagong Hill Tracts, Bangladesh
CIAT	International Center for Tropical Agriculture, Cali, Colombia
CIESIN	Center for International Earth Science Information Network, USA
CSEQ	Carbon Sequestration Project, The Netherlands cooperation
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia
DEM	Digital Elevation Model
DESIRE	Desertification Mitigation and Remediation of land project
EC	European Commission
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária / Brazilian Agricultural Research Corporation, Rio de Janeiro, Brazil
EU	European Union
EuDASM	European Digital Archive of Soil Maps
FAO	Food and Agriculture Organization of the United Nations, Rome, Italy
GCMD	Global Change Master Directory
GEF	Global Environmental Facility
GEO	Global Environment Outlook Program, UNEP
GIMMS	Global Inventory Modelling and Mapping Studies
GIS	Geographic Information system
GLADA	Global Assessment of Land Degradation and Improvement
GLASOD	Global Assessment of the status of humand-induced Soil Degradation
GLOBE	Global Learning and Observation to Benefit the Environment
GWC	Green Water Credits project
ICRAF	World Agroforestry Centre, Nairobi, Kenya
ICSU	International Council of Scientific Unions, Paris, France
ICTP	International Centre for Theoretical Physics, Italy
IFAD	International Fund for Agricultural Development, Rome, Italy
IGBP-DIS	International Geosphere-Biosphere Program – Data Information Service
ILRI	International Institute for Land Reclamation and Improvement, Alterra Wageningen, The Netherlands
ISIS	ISRIC Soil Information System
ISRIC	International Soil Reference and Information Centre, Wageningen, The Netherlands
ISSAS	Institute of Soil Science, Chinese Academy of Sciences, Nanjing, PR China
ITC	International Institute for Geo-Information Science and Earth Observation, Enschede, The Netherlands
IUSS	International Union of Soil Sciences

IYPE	International Year of Planet Earth
JRC	Joint Research Centre of the European Union, Ispra, Italy
JRC-IES	EC Joint Research Centre - Institute for Environment and Sustainability, Ispra, Italy
LADA	Land Degradation Assessment for Dryland Areas
LEI	Landbouw-Economisch Instituut / Agricultural Economics Research Institute, Wageningen UR, The Hague/Wageningen, The Netherlands
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
NGO	Non-governmental Organization
NRCS	Natural Resources Conservation Service (USA)
NUFFIC	Netherlands Organization for International Cooperation in Higher Education
PE&RC	Production Ecology and Resource Conservation, Wageningen University
SDC	Swiss Agency for Development and Cooperation
SEI	Stockholm Environment Institute, Sweden
SOTER	Soil and Terrain Database
SRTM	Shuttle Radar Topographic Mission, NASA
TSBF-CIAT	Tropical Soil Biology and Fertility Institute of CIAT, Nairobi, Kenya
UN	United Nations Organisation, New York, USA
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme, Nairobi, Kenya
UNESCO	United Nations Educational, Scientific and Cultural Organization, Paris, France
UNESCO-IHE	UNESCO-IHE Institute for Water Education, Delft, The Netherlands
Wageningen UR	Wageningen University and Research Centre, The Netherlands
WDC	World Data Centre
WEAP	Water and Evaluation and Planning Tool
WISE	World Inventory of Soil Emission potentials database
WOCAT	World Overview of Conservation Approaches and Technologies. CDE, Berne, Switzerland
WRMA	Water Resources Management Authority, Ministry of Water and Irrigation, Nairobi, Kenya

Global land degradation between 1981 and 2003

