

Annual Highlights 2010



World Soil Information

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ISRIC Staff (Nol in 't Bos, 2010)

Front row from left to right: Johan Leenaars, Ingrid Haas, Zhanguo Bai, Johanna Martinez, Prem Bindraban, Alfred Hartemink, Niels Batjes, David Jacquier (visiting scientist), Jan Huting, Bob MacMillan, Tomislav Hengl, Ger Naber, Godert van Lynden, Piet Tempel.

*Back row: Klaas-Jan Beek (ISRIC Honorary Fellow), Stephan Mantel, Johan Bouma (ISRIC Honorary Fellow), Hannes Reuter, Koos Dijkshoorn, Vincent van Engelen, Sjef Kauffman, Ad van Oostrum
Not in picture: Yolanda Karpes, Rogier de Jong, Ruth Krause, Wouter Bomer*

Building on solid ground

There is sufficient awareness in policy circles and society at large about the important role of soils for production of food, fiber and timber, biological diversity and provision of eco-systems services. Soils have entered national and international policy agenda's and various programs with a concomitant, increased demand for soil information systems. ISRIC – World Soil Information is the ICSU-designated World Data Centre for Soils with a mandate to serve the international community as custodian of global soil information and to increase awareness and understanding of soils in major global issues.

ISRIC has collated, stored, processed and disseminated global soil and terrain information for research and development of sustainable land use. Its strategy is to strengthen this role by expanding its data holdings, enhancing internet-based access to its freely available data sources, and developing advanced methodologies

for digital soil mapping. Data of defined quality and reliability, with documented accuracy, is vital for understanding and identifying effective interventions in agro-ecosystems for sustainable exploitation of soil resources. ISRIC will expand its efforts in collaborative projects that address the efficient and sustainable use of soil water, nitrogen and phosphorus, and identify options to reduce soil degradation and enhance carbon sequestration. ISRIC is also in the process of strengthening its role as advocator of the importance of soils through new storage facilities and a modernized World Soil Museum. Importantly, the expertise of ISRIC's staff is strongly developing towards the use and development of new methods and techniques, with substantial changes in staff composition.

ISRIC has actively built on the path set out in its Strategic Plan for the period 2009-2012. Main achievements are highlighted here.

ISRIC Global Soil Information Facility

ISRIC – World Soil Information was responsible for science coordination and fund raising for the *GlobalSoilMap.net* project.

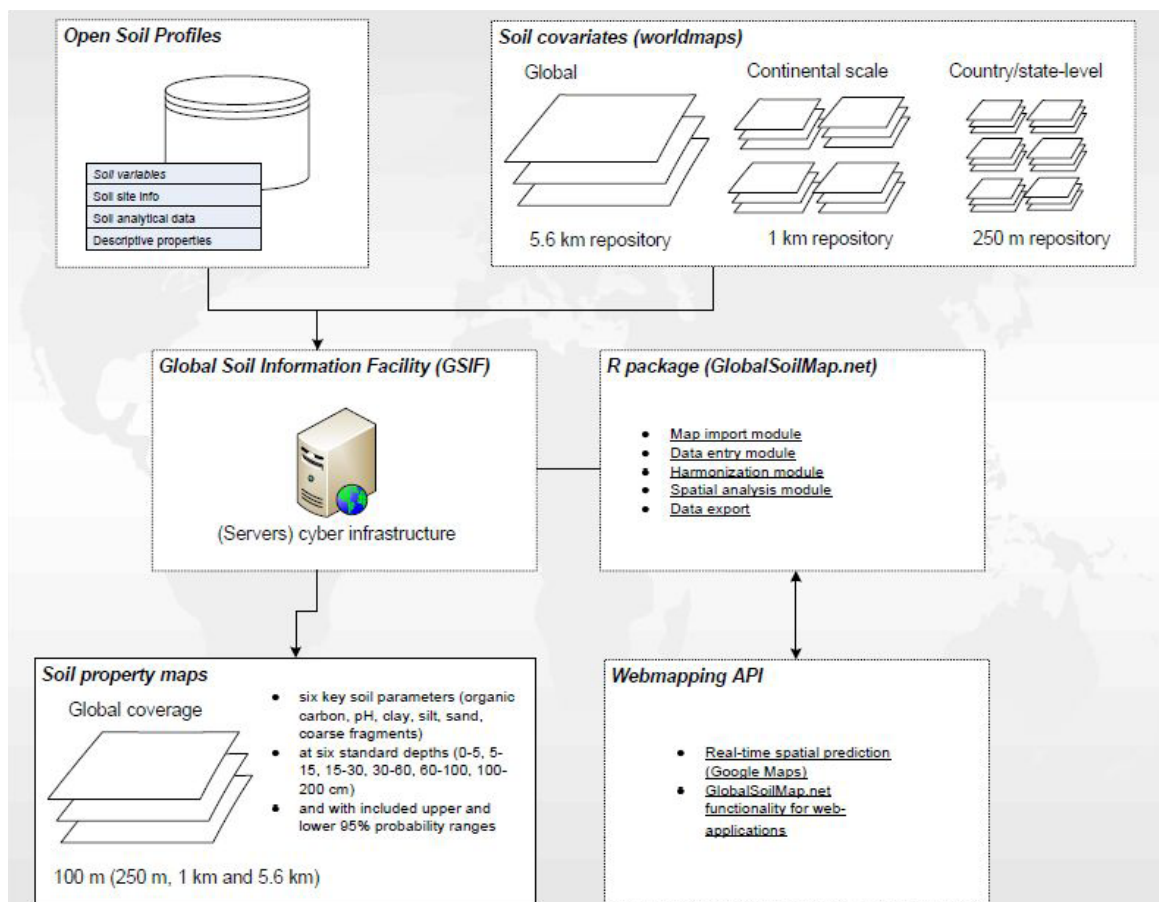
ISRIC has proposed and demonstrated the functionality of a new Global Soil Information Facility (GSIF) – soil profile and soil covariate data portal and software packages – designed to act as a framework for collating and harmonizing legacy soil profile and map data, creating and serving global covariates and producing globally consistent maps of soil properties. Major components of the GSIF are expected to be fully operational in early 2012.

The functionality of the GSIF framework was demonstrated by producing grid maps of soil properties at 100 m for all reference depths and the selection of soil properties included in the *GlobalSoilMap.net* specifications for a showcase study area in Malawi. The hierarchical, multi-scale regression kriging model developed as part of GSIF and applied to produce maps for Malawi has led to an

agreement with the AFSIS node of the *GlobalSoilMap.net* project to adopt GSIF functionality to support the production of soil property maps across Africa.

The proposed Open Soil Profiles database (OSP) represents one component of ISRIC’s new enterprise soil database (WoSIS) which will be used to store and manage all legacy soil profile data compiled by any data provider in the world for use in producing global soil property maps.

The concept of compiling maps of environmental covariates into an open and freely accessible public repository of gridded maps has tremendous potential to serve a broad range of users, in addition to supporting on-going global soil mapping activities. Packages are being developed in the R programming environment to provide a wide range of functionality for visualizing soil profile and map data and for producing soil property maps using digital soil mapping (DSM) methods.



Enterprise database

ISRIC maintains a number of (soil information) databases that are freely available on-line to the scientific community and other non-commercial groups. To enable the use of web technologies that permit faster and new forms of soil information delivery, ISRIC is implementing a centralized and user-focused database (WoSIS – World Soil Information Service) that will contain only validated and authorized data derived from current and future data sources – databases, publications, projects, etc. Thus, all data managed or maintained by ISRIC will be made available on-line from one central database environment in one uniform format that will allow access, processing and visualization through one set of tools. Instrumental to enhanced usability and accessibility of the data will be the future harmonization of soil properties, their values (i.e., their domain), as well as standardization of analytical procedure descriptions. GeoServer will be used to serve geospatial data from the database. A stack of open RESTful web services will be specified, supporting (exchange) data models that are currently existing or under development.

The centralized database design for WoSIS consists of 70 interrelated tables, organized in 10 schemas that mimic a federated database system (a type of meta-database management system which transparently integrates multiple autonomous database systems into a single virtual database). The design which has been implemented in PostgreSQL and contains some 22,000 profile descriptions and 4 SOTER maps is currently under international peer review.

Database expansion

ISRIC is compiling legacy (historic) soil profile data for Sub Saharan Africa as a project activity of AfSIS (Globally integrated Africa Soil Information Service, *africasoils.net*).

The first version of Africa Soil Profiles includes some 11,000 geo-referenced soil profiles collated from a wide variety of digital and analogue data sources, with soil analytical data available for 7350 profiles. Soil property values were standardized according to e-SOTER conventions and validated according to basic rules; the data set will be added to WoSIS in 2011. Updates of the continuously growing dataset were shared with *africasoils.net* to update spatial soil property prediction modeling.

Website, data downloads, visitors

The website is essential in ISRIC's data dissemination. In 2010, we had some 57,408 on-line visitors in comparison to 51,427 in 2009, bringing the total number of visitors

to over 181,000 since the site was launched in June 2006. Most on-line visitors came from Europe (37%) and North America (21), with some 23% coming from Africa, Asia and South America (Fig. 1).

Our data sets were downloaded 4915 times in 2010, bringing the total number of downloads to some 15,000 (since June 2006). Consistent with 2009, most requests for data arose from universities and colleges (34%), students (30%), and national and international research organizations (15%). The down-loaded materials are being used for many and diverse purposes, as reflected in the peer-reviewed literature (e.g., agro-ecological zoning; assessments of crop production; assessments of impacts of soil degradation on food supply; modelling of soil organic carbon stock and changes; soil gaseous emission potentials; payments for environmental services).

ISRIC is redesigning its website for improved provision of information and access to its new map services and WoSIS. The new website will be launched in mid-2011 and should reach maturity by the end of 2011. The underpinning information will be continuously updated; please use the option to provide us with information to improve on our services.

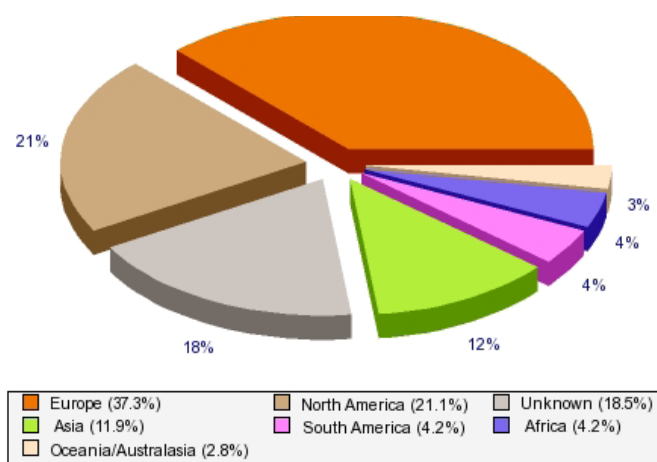


Figure 1 Source of on-line visitors by continent

Library and Map Collections

The collection includes some 15200 reports, of which 3300 are scanned and available on-line, and some 7800 maps of which 4900 have been digitized so far. It is freely accessible through <http://library.wur.nl/isric>. In 2010, the library database was consulted by 36,000 users. Special attention was paid to documenting and digitizing soil maps and reports for Africa, published between 1950 and 1980, in support of the AfSIS project.

Expansion of the ISRIC World Soil Reference Collection

ISRIC is enlarging the *World Soil Reference Collection* with some 200 profiles; funding comes from the Netherlands Ministry of Economic Affairs, Agriculture and Innovation (ELI), Wageningen University, and ISRIC.

The three year project (2010-2013) is aimed at filling both geographical and taxonomic gaps. It involves clustered collection of new soil profile information – site and soil description, sampling, soil chemical analytical and physical analyses, spectral analyses; also supporting information such as high resolution photographs and soil survey reports – based on purposive sampling. The project is being implemented in close collaboration with partner institutes worldwide, with regional soil-related mandates, to optimize efficiency of time and resources. Upon completion and publication, all primary data will be made freely accessible through ISRIC's new web services and portal of the ICSU World Data Centre System. Newly collected monoliths will be used for thematic displays in the ISRIC – World Soil Museum, focussing on key global issues.

Applying soil information

Green Water Credits

Green water management comprises all soil and water conservation activities that improve rainwater management in agricultural land – aiming to reduce runoff, maximize infiltration, reduce evaporation and enhance ground water recharge. The aim is to generate benefits both upstream for the land users and downstream for public and private water users. *Green Water Credits (GWC)* is a financial mechanism that supports upstream farmers to invest in improved soil and water conservation activities.

GWC project activities, granted by IFAD, included the consolidation of Phase 1 (Proof of Concept) in Morocco and of Phase 2 (Design) in Kenya. An increasing number of ISRIC staff is engaged in the innovative GWC project. In Kenya an intensive process is pursued to move towards actual implementation of the concept. In Morocco meetings were organized to warrant the commitment of policy makers at the initiation of the project as implementation of research outcomes should ultimately receive policy support. Technical workshops were organized and preliminary agro-hydrological analyses carried out. Further, options for implementing GWC activities were initiated in China.

Carbon stocks and changes

At the moment, it is difficult to compare the net carbon benefits of different land management interventions as a wide range of different methods are used to measure them. *The Carbon Benefits Project (CBP, 2009-2012)*, a Global Environment Facility (GEF) co-financed project

which is being led by the United Nations Environment Programme (UNEP) and implemented by a large consortium, is developing a standardized system for GEF and other sustainable land management projects to measure, model, monitor and forecast carbon stock changes and greenhouse gas emissions. The web-based system will be applicable at all stages of a project cycle, cost effective and user friendly. The tools will be applicable at various levels of scale, from national to the project level. ISRIC is contributing a framework of soil organic carbon stocks under native vegetation – across the range of world climate zones and soil types – as required for IPCC Tier I level inventory assessments in data poor countries.

Soil phosphorus

Phosphorus (P) is an essential element critical to ensuring food security and human livelihood. P-minerals are mined, processed and applied as phosphates to the soil as fertilizer; phosphorus mines may be exhausted in the coming 50-100 years. ISRIC has initiated research aimed at identifying whether it is feasible to present representative values for soil-P, determined according to defined extraction methods, for major soil types for possible use in model-based assessments of resource scarcity and distribution in relation to food security. This work is carried out in support of a quantitative modelling analysis, initiated by Plant Research International, part of Wageningen UR, to assess input requirements for enhancing agricultural productivity on the African continent (Project funded by the Netherlands Ministry of Economic Affairs, Agriculture and Innovation (ELI)).

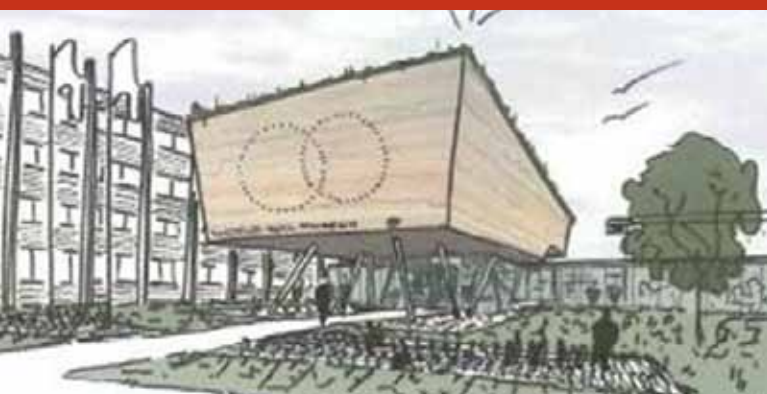
Combatting land degradation

- *WOCAT* (World Overview of Conservation Approaches and Technologies), coordinated by the Centre for Development and Environment (Berne), is an established global network of Soil and Water Conservation specialists, contributing to sustainable land management. ISRIC has participated in the Management Group since the start of the project in 1992 and contributes to various project activities. In 2010, ISRIC's contributions to WOCAT were largely made through the DESIRE (Desertification Mitigation and Remediation of Land), LADA (Land Degradation Assessment in Drylands) and Green Water Credits project. Special attention was paid to inputs to the WOCAT mapping component.
- The *DESIRE project*, coordinated by Alterra, part of Wageningen UR, aims to establish promising alternative land use and management conservation strategies in eighteen degradation and desertification hotspots around the world, based on a close participation of scientists with local stakeholder groups. ISRIC's activities in DESIRE mainly related to development of degradation and conservation maps of the study sites, an assessment of drivers and policies, and a study on stakeholders.
- ISRIC's inputs to GLADA (Global Assessment of Land Degradation and Improvement), implemented within the framework of FAO's larger *LADA* (Land Degradation Assessment in Drylands) project came to an end in 2010.
- *e-SOTER*, a collaborative research project of 14 partners in Europe, China and Morocco with European Union funding coordinated by ISRIC (2009-2012), is developing a web-based regional pilot platform with data, methodologies, and applications, using remote sensing to validate, augment and extend existing data. Applications will focus on threats identified by the EU Soil Thematic Strategy: erosion, compaction, flooding, landslides, loss of organic matter, salinization and sealing.
- Definitions and methodologies to support the identification of high carbon value land, degraded and heavily contaminated land in support of the new Renewable Energy Directive (RED) of the European Commission (EC) were prepared in the framework of a project coordinated by Ecofys.
- A module for quantification of the influence of soil processes on land use and productivity is being developed and tested within the collaborative project 'Ecosystem Services and Biodiversity' of the Netherlands Environmental Assessment Agency.

A new World Soil Museum

For over 40 years, the ISRIC World Soil Museum has served as an entry to the world of soils and soil-related research and education. ISRIC is proud to announce that it initiated the construction of a new building for the World Soil Museum. The new museum will tell the story of soils by artistically presenting their importance in

Impression of the new World Soil Museum



global development issues, such as food production, climate change mitigation, biodiversity conservation, and reducing water scarcity. It will include exhibits on soil formation and degradation, seen in relation to ISRIC's major projects, and display a range of soil reference monoliths with details about their classification and uses. The underpinning materials, including soil monoliths, soil analytical and morphological data, soil samples, micro-morphological collections, and associated maps and reports may be consulted for research and educational purposes. Intensive use will be made of electronic and digital technologies. ISRIC aims to attract professionals from a wide range of environmental disciplines to visit the museum for their lectures; a new target group will be students from secondary education. The new soil museum should be open to visitors by the end of 2012; meanwhile, a temporary museum will provide the essential services.

Governance

The managing board of ISRIC has undertaken an intensive process to identify members for its International Scientific Advisory Council (ISAC) aimed at widening the scope of the membership to represent the research community, UN organizations, private enterprises, policymaker and representatives from Civil Society Organizations. ISAC is an advisory body to help set out the overall strategy for

ISRIC and to provide advice about, and actively support actions to implement ISRIC's strategy plan. Specific areas for recommendation and actions are: 1) International institutional strategy, 2) Science policy and funding strategy (with 3, 5 and 10 year goals), and 3) Support for operational activities, primarily fund-raising opportunities. Annual meetings will be planned.

Publications

Scientific output includes edited books, papers in primary Journals, book chapters, and technical reports; for details see our website. Two colleagues are member

of the Editorial Board of scientific journals (*Geoderma; Outlook on Agriculture; Pedosphere; Agriculture Ecosystems and Environment*).

Staff

Together with scholars and guest researchers, ISRIC – World Soil Information carried out its activities as a team of 24 people, with support on financial, legal, human resource affairs of Wageningen UR (University & Research centre).

ISRIC had eight senior scientists, four scientists, and six support staff for collections, database and website management and project administration. Two new colleagues (digital soil mapping; modeling soil use and applications) were recruited and two went on full-time retirement (graphic design, monolith preparation).

Accounts and results for 2010

Balance sheet

Assets

fixed assets	€	4,118
current assets	€	150,415
liquid assets	€	1,222,679
Total assets	€	1,377,212

Liabilities

capital	€	391,339
provisions	€	330,000
current liabilities	€	655,872
Total liabilities	€	1,377,211

Profit & loss account

Turnover

base funding	€	1,249,350
research projects	€	896,434
Total income	€	2,145,784

Expenses

Personnel costs	€	1,475,291
General costs	€	715,827
Material expenses on research	€	236,977
Total expenditure	€	2,428,095

Net result **-€ 282,311**



World Soil Information

ISRIC – World Soil Information is an independent foundation with a global mandate for collecting, storing, processing and disseminating soil information in support of global research and development.

ISRIC obtained its mandate at the UNESCO General Conference in 1964, and has been supported by the Netherlands Government since 1966. ISRIC is the ICSU-designated *World Data Centre for Soils* since 1989.

It coordinates a number of global soil programs through grants from major institutions and donors. ISRIC has a strategic association with Wageningen UR (University & Research Centre) and collaborative agreements with a range of institutions including FAO and JRC.

Additional information may be obtained through www.isric.org.

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Contact c/o The Director, ISRIC - World Soil Information
PO Box 353, 6700 AJ Wageningen, the Netherlands

E-mail soil.isric@wur.nl