

# Annual Highlights 2011



World Soil Information

Strategic developments consolidated	2	New software packages	5
New research methodologies and training	2	Co-organization of international events	6
Soil exploration and sampling for science and education	4	International Scientific Advisory Council	6
Towards a new World Soil Museum	5	Staff and visiting scientists	7
		Accounts and results for 2011	7



Photo by P. Droogers

# Strategic developments consolidated

ISRIC – World Soil Information has made good progress with the implementation of its strategic plan for 2009-2012. This plan was presented in our Annual Highlights for 2009 and the initial developments were listed in our overview for 2010. In 2011, we have built and launched several software packages and tools, including components of the Global Soil Information Facilities, and launched our renewed website. We have updated and automated the registration of our reference collections and instigated a collection development plan. The quality requirements for our workshop for monolith preparation have been detailed and the workshop will be finished by June 2012. A professional museum specialist is guiding the design of the new soil museum, scheduled to be opened towards the end of 2013. We are emphasising the development of new methodologies and concepts in our research projects and are re-structuring our training program. ISRIC has consolidated its international network. In 2011, we have been accredited as the World Data Centre for Soils by the new ISCU World Data System.

## World Data Centre for Soils

Upon international review, ISRIC was accredited as a regular member of the new *ICSU World Data System* (WDS). The WDS supports the mission and objectives of the International Council for Science (ICSU) by “ensuring the long-term stewardship and provision of quality-assessed data and data services to the international science community and other stakeholders”. The WDS builds on the 50-year legacy of the ICSU World Data Centre system (WDC) and the ICSU Federation of Astronomical and Geophysical Data-analysis Services. Within WDS, ISRIC will remain known as WDC-Soils, a role it has held since 1989 (<http://www.isric.org/content/world-data-centre-soils>).

## Global Soil Partnership

Mandated by the Committee on Agriculture of the FAO, a Global Soil Partnership, led by the FAO, was launched in 2011. The GSP aims to support and facilitate joint efforts towards sustainable management of soil resources for food security and climate change adaptation and mitigation. Endorsed by the Netherlands Government, ISRIC has partnered in this initiative and has committed to make a considerable contribution to the aims of the GSP, in particular with regard to activity pillars to enhance the quantity and quality of soil data and information and to the pillar on harmonization of methods, measurements and indicators for sustainable soil management.

## UNCCD accreditation

ISRIC renewed its accreditation with the United Nations Convention to Combat Desertification (UNCCD). The UNCCD Executive Secretary will be actively involved in the work of the ISRIC through his participation in the International Scientific Advisory Council (ISAC). ISRIC will contribute to the process of refinement of the UNCCD set of impact indicators, notably those related to soil. In the context of the Committee for the Review of the Implementation of the Convention, a delegation of the World Overview of Conservation Approaches and Technologies (WOCAT) program, with ISRIC as an important contributing partner, discussed the possible role of WOCAT in the UNCCD reporting system (PRAIS), and in the Knowledge brokering system UNCCD wants to set up.

# New research methodologies and training

## Loss of productivity due to soil degradation

The rate of global soil degradation, the economic losses, and the impact on food security are difficult to predict. As a result, soil degradation appears to be underemphasized on policy agendas and the investments required to safeguard future food security are unknown.

Within the context of FAO-led (Global) Land Degradation project ((G)LADA), ISRIC has developed a methodology to assess land degradation based on trends in NVDI

(Normalized Difference Vegetation Index), scientifically supported by several peer-reviewed papers. However, soil characteristics were not considered explicitly in this approach. For the Netherlands Environmental Assessment Agency (PBL) project on *Biodiversity, Ecosystem Services and Development*, ISRIC and Plant Research International of Wageningen UR, have developed a quantitative methodology that is more precise in relating soil degradation to biomass production and the world-wide loss of productivity. This method

incorporates global patterns and trends in satellite measurement of biomass production. It also incorporates simulated biomass production using weather and soil data such as rooting depth and water holding capacity. The method can be applied on a global scale.

### Digital soil mapping

ISRIC has invested in Digital Soil Mapping (DSM) in 2011 by appointing new personnel qualified in DSM methods and by refocusing its contribution to the Africa Soil Information Service project (<http://www.africasoils.net/>) towards the construction and application of web-based, open source platforms to support the DSM of soil properties according to *GlobalSoilMap.net* specifications. Substantial progress was made with respect to the collection of legacy soil profile data and high-resolution gridded maps of environmental covariates for Africa, such as MODIS imagery, the SRTM DEM and land cover products. A multi-scale regression kriging algorithm was developed and applied to Malawi, as a test case. Jointly with a visiting scientist from the University of Sydney, Australia, maps of soil properties for Nigeria were made using Classification and Regression Trees algorithms. ISRIC has also engaged in joint projects with the Chinese Academy of Agricultural Sciences (China) and the USDA National Soil Survey Center (USA) to jointly apply DSM methods and uncertainty quantification techniques to case studies.

### Carbon benefits

Since 2009, the *Carbon Benefits Project* (CBP) has been 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. Partners of the Global Environment Facility (GEF) co-financed project presented and discussed a prototype of the web-based CBP tool during an Open Forum at the World Bank (Washington, October 2011). ISRIC contributed a global 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 type inventory assessments using the CBP system in data poor regions. The final CBP system will be delivered in 2012 when the project ends (<http://www.unep.org/climatechange/carbon-benefits/>)

### Green Water Credits

The Green Water Credits (GWC) project aims for the development of a funding mechanism between downstream beneficiaries from upstream interventions based on soil and water conservation measures. In December 2011, the IFAD-funded GWC project in Kenya (Detailed Project Design) and in Morocco (Proof

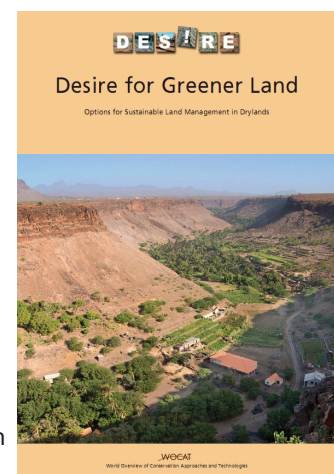
of Concept) came to an end. Results were presented in Nairobi to higher-level policy makers followed by a meeting in Nyeri that involved field-level stakeholders. Participants committed to the implementation of the approach, including the IFAD pledge of some US\$ 30M to GWC activities within the framework of the Upper Tana Natural Resources Management Project through the Water Services Trust Fund. Also the Kenya Hydropower company (KenGen) and Nairobi Water Company expressed their intention to make required investments. The GWC Report series on the multiple aspects of the GWC approach is available through the renewed GWC Website (<http://greenwatercredits.net/>).

A meeting for local stakeholders in Fes, Morocco, was followed by a meeting in Rabat with the key institutions involved. Results of the impact of soil and water conservation in the Sebou basin on downstream conditions have been reported based on biophysical modelling, possible economic impacts, and required financial and institutional mechanisms. Parties agreed to detail the institutional arrangements in a next “detailed project design” phase.

The GWC concept sparks the interest of many donors and interested parties when presented at international meetings. At the request of the Yangtze River Commission and Huazhong Agricultural University in China, the GWC tools will be turned into a toolkit for a sub-catchment area of the Danjiangkou Reservoir (a major tributary to the Yangtze river). The toolkit will facilitate location-specific outscaling of the approach. A GWC pilot project for Algeria in collaboration with a broader Dutch Water Consortium and coordinated by the Netherlands African Business Council (NABC) is under construction.

### DESIRE

The EU-FP6 funded DESIRE project for *Desertification Mitigation and Remediation of Land Degradation* drew to a close. DESIRE was well received by the EU, also receiving much broader appreciation by the Committee for the Review of the Implementation of the Convention of the UNCCD. ISRIC provided the contextual overview through coordinating study site descriptions, mapping of degradation and conservation, describing drivers and policies, and providing an

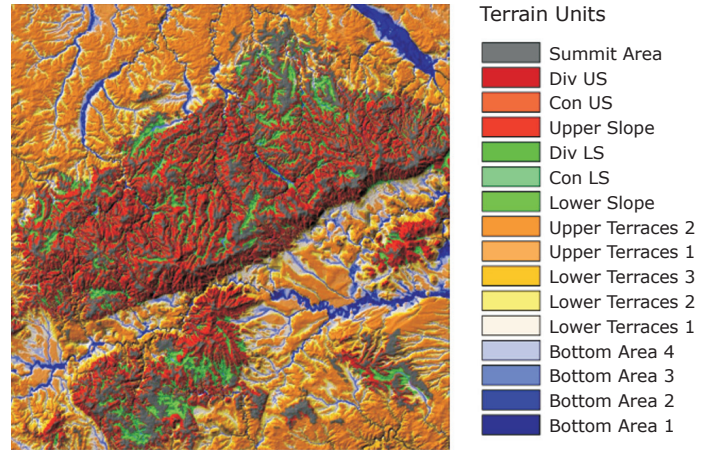


overview of various stakeholders involved at different levels. Reports are available through the DESIRE Website (<http://www.desire-project.eu/>). Contributions were also made to the book "DESIRE for greener land" (to be published mid-2012) following the format of the WOCAT book "Where the land is greener".

**e-SOTER**

During the e-SOTER project (2008-2012), development of a *Regional pilot platform as EU contribution to a Global Soil Observing System*, various technical barriers had to be overcome which include quantitative mapping of landforms; soil parent material and soil attribute characterization and pattern recognition by remote sensing; standardization of methods and measures of soil attributes to convert legacy data. The two major research thrusts involved: a) improvement of the current SOTER methodology at scale 1:1 million in four windows in Europe, China and Morocco. This included, for example, combining moderate-resolution optical remote sensing with existing parent material/geology and soil

information by applying advanced statistical procedures; b) within 1:250.000 scale pilot areas, advanced remote sensing applications have been developed including geomorphic landscape analysis, geological re-classified remote sensing, and remote sensing of soil attributes.

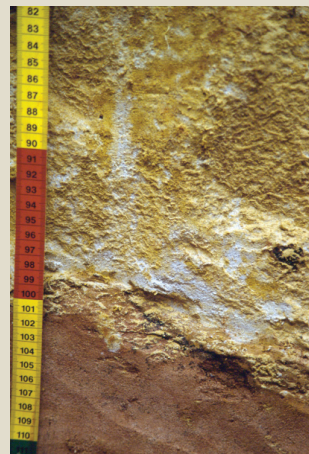
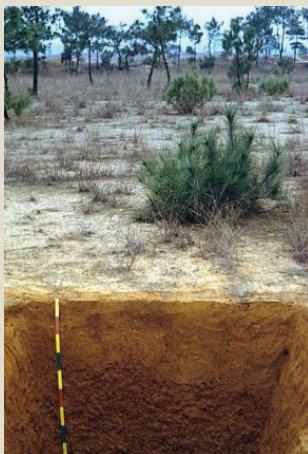


*e-SOTER terrain units for the Chemnitz test area delineating 16 different landforms*

## Soil exploration and sampling for science and education

ISRIC has designed a global sampling scheme to improve the scientific quality and enhance the educational value of the World Soil Reference Collection. Samples and monoliths are described and analysed in relation to global thematic issues and will be prepared for display in the ISRIC-World Soil Museum. The SOil EXploration and Sampling for Science and Education (SOLEX) project (2010-2013) is funded by the Netherlands Ministry of Economic Affairs, Agriculture and Innovation (EL&I), Wageningen University, and ISRIC. Activities include improving access to our current collections, and full

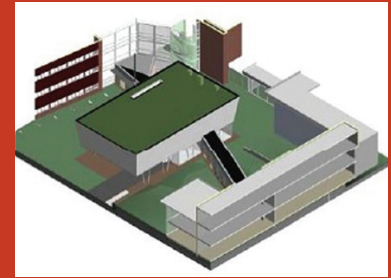
profile sampling, site and soil description, lab and spectral analysis as well as collection of supporting information, such as high resolution photographs, for newly selected sites. Collaboration with partner institutes worldwide involves joint research on collected soils, training in soil monolith collection, description, sampling and soil classification. Samples and monoliths have already been collected from sites along a North-South transect stretching from Moscow to Volgograd, and from sites in Morocco and Chile.



*Sampling of soil monoliths*

# Towards a new World Soil Museum

During 2011, architects and construction engineers detailed the construction plans for the new museum. ISRIC aims to be officially registered as a Dutch museum to guarantee professionalism and ensure high quality standards for the long-term. In the meantime, our temporary World Soil Museum is open. It has been visited by groups of students from Universities and colleges from various countries as well as other groups and individuals. Typically, such visits include an introduction to the world of soils.



Birds eye view of the new ISRIC World Soil Museum

## New software packages

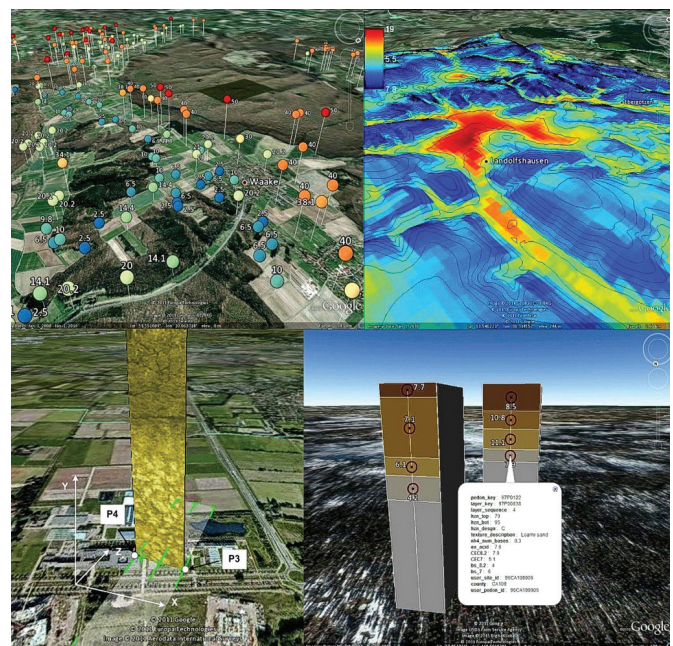
ISRIC is tuning its activities to better fulfil its mission of world soil data centre through active development of software solutions for global soil mapping. The focus is on open source solutions that can be used to import, harmonize, reformat and analyse soil data in an automated or semi-automated manner. Contributing to the Free and Open Source Software initiatives is largely in the spirit of ISRIC's mandate – to promote the use of publicly available standards and data sets, in accord with data provider supplied information on data-access rights.

### Global Soil Information Facilities

Within the *Global Soil Information Facilities (GSIF)* project different packages are being developed for processing global soil data: (1) The R plotKML package for visualization of spatio-temporal soil and environmental data in Google Earth, and (2) the GSIF package with a suite of functions for global soil mapping and analysis. Both packages are developed under the General Public licences. The plotKML package is already available for use via the Comprehensive R Archive Network (CRAN), while components of the GSIF package will gradually be released in 2012. In addition to this, A GSIF toolbox for ArcGIS has been developed by ISRIC; it can be downloaded through the *Globalsoilmap.net* website.

### Metadata harvester

ISRIC's MetaData Service became operational in 2011. It provides metadata from ISRIC and other organisations from around the world as part of our service to the international scientific and other user communities, with a focus on soil-related data. The multilingual catalogue application allows users to easily search and retrieve metadata records, which provide links to the associated datasets or services. The system now harvests meta-databases maintained by the FAO, CGIAR data centre, GS-SOIL portal, and Pangea – it currently includes over 500,000 records (<http://meta2.isric.org/geonetwork/>).



Visualization of soil data in Google Earth with the plotKML package: point and gridded data (top), soil profile photographs and soil profile description data (bottom)

### Soil Data Model

ISRIC's Data Base Group developed and submitted the database design document, "Global Soil Information Facility: Database Component (WOSIS)", for a centralized and user-focused database to a group of external reviewers. Comments received have been incorporated in the WOSIS design; the resulting prototype was setup for initial production. It 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 has been implemented in PostgreSQL and the database already contains data for some 14,000 soil profiles. A fully operational system will be available in mid 2012 and it will be queryable through different web-services.

## Training courses offered

ISRIC provides several training courses, especially about the soils of the world and on software solutions to managing and processing soil data. In conjunction with the ongoing development of international soil data sets, methods and case studies, ISRIC initiated a new Training and Education Programme that offers a number of intensive training courses. Courses are given on request and can be tailored to specific user needs. They can be given in Wageningen or with the local host. ISRIC's

block training courses are intended for project teams, ministry departments, research groups, and groups of PhD students. Their general objective is to promote use of international standards and open source tools for processing soil data. The typical duration of a course is from one half day to one week. Details, including costs, may be found at <http://www.isric.org/services/training-and-education>.

## Co-organization of international events

ISRIC co-organized several workshops and international events in 2011, including the *GlobalSoilMap.net* workshop. In its capacity of coordinator of the *GlobalSoilMap.net* project in 2011, ISRIC co-organized the workshop at the Joint Research Centre (Ispra, Italy, June 2011 <http://www.gsm2011.org/>). Over 60 participated presented and deliberated about their ideas and progress towards reaching the main *GlobalSoilMap.net* aim, i.e. to produce high-resolution three-dimensional maps of key soil properties for the entire land surface of the Earth

(<http://www.globalsoilmap.net>). ISRIC also co-organized the *Third biannual meeting of the International Society for Geomorphometry*, held at the ESRI Campus (Redlands, California, September 2011). The conference series is now widely recognized as the meeting place for scientific research on DEM data processing. ISRIC staff members co-organized two post-conference workshops on a) automated analysis and visualization of elevation data using the open source tools R+OSGeo, and b) creating an open database of DEM-derived parameters of the World.

## International Scientific Advisory Council

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 council to represent the research community, UN organizations, private enterprises, policymaker and representatives from Civil Society Organizations. ISAC's role is to help set out

the overall strategy for ISRIC and to provide advice about, and actively support actions to implement ISRIC's strategic plan. Specific areas for recommendation and actions are: 1) International institutional strategy, 2) Science policy and funding strategy, and 3) support for operational activities, primarily fund-raising opportunities.

## Library and publications

ISRIC's library collection includes 7,850 maps, of which 6,160 have been digitized so far, and 15,500 reports of which 4,263 are scanned and available online. The holdings are freely accessible through <http://library.isric.org/>. In 2011, they were consulted by some 36,000 users. Special attention was paid to digitizing soil maps and reports of Africa, in support of the project 'A Globally Integrated African Soil Information Service' (AfSIS).

Scientific output for 2011 includes papers in primary Journals (13), book chapters (2), and technical reports (12). Details may be found on our website. Two ISRIC staff are members of the Editorial Board of scientific journals.

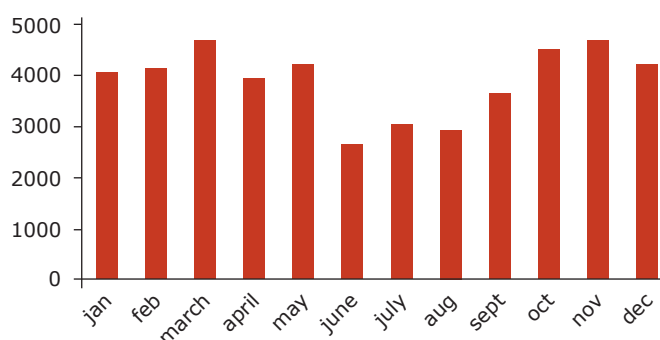
## Staff and visiting scientists

ISRIC – World Soil Information carried out its activities as a team of 24 people, including visiting scholars and guest researchers. Support on financial, legal, human resource affairs was provided by Wageningen UR. ISRIC staff comprises seven senior scientists, five scientists, and six support staff for collections, database and website management and project administration. Two new colleagues (Senior Researcher Pedometrics and

Digital Soil Mapping; and museum specialist) were recruited and five have left the institute (international project manager, soil science coordinator GlobalSoiMap.net; fund raising officer AFSIS project; soil scientist; head soil museum). Over the year, ISRIC hosted guest researchers from India, Australia, Russia, Iran, Brazil, Indonesia and had temporary staff for reorganizing the sample collection.

## Website

In June 2011, ISRIC launched its renewed website. The website was re-designed so that different user groups may be better served from the homepage. New pages that show ISRIC activities and web-services that give on-line access to ISRIC's data holdings have been added. The importance of the website is apparent from the almost 50,000 visitors in 2011, and over 15,000 downloads of the various datasets. Especially university staff and students use the datasets.



Unique visitors of ISRIC website per month for 2011

## Accounts and results for 2011

### Balance sheet

#### Assets

fixed assets	€	0
current assets	€	402,250
liquid assets	€	857,317

**Total assets** € **1,259,567**

#### Liabilities

capital	€	424,345
provisions	€	291,972
current liabilities	€	543,250

**Total liabilities** € **1,259,567**

### Profit & loss account

#### Turnover

base funding	€	1,264,524
research projects	€	1,009,441

**Total income** € **2,273,965**

#### Expenses

Personnel costs	€	1,339,968
General costs	€	459,785
Material expenses on research	€	431,207

Total expenditure € 2,230,960

**Net result** € **43,006**



Photo by J.H. Kauffman



## 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.

ISRIC coordinates a number of global soil programs through grants from major institutions and donors. It 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](http://www.isric.org).

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