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ICT Update

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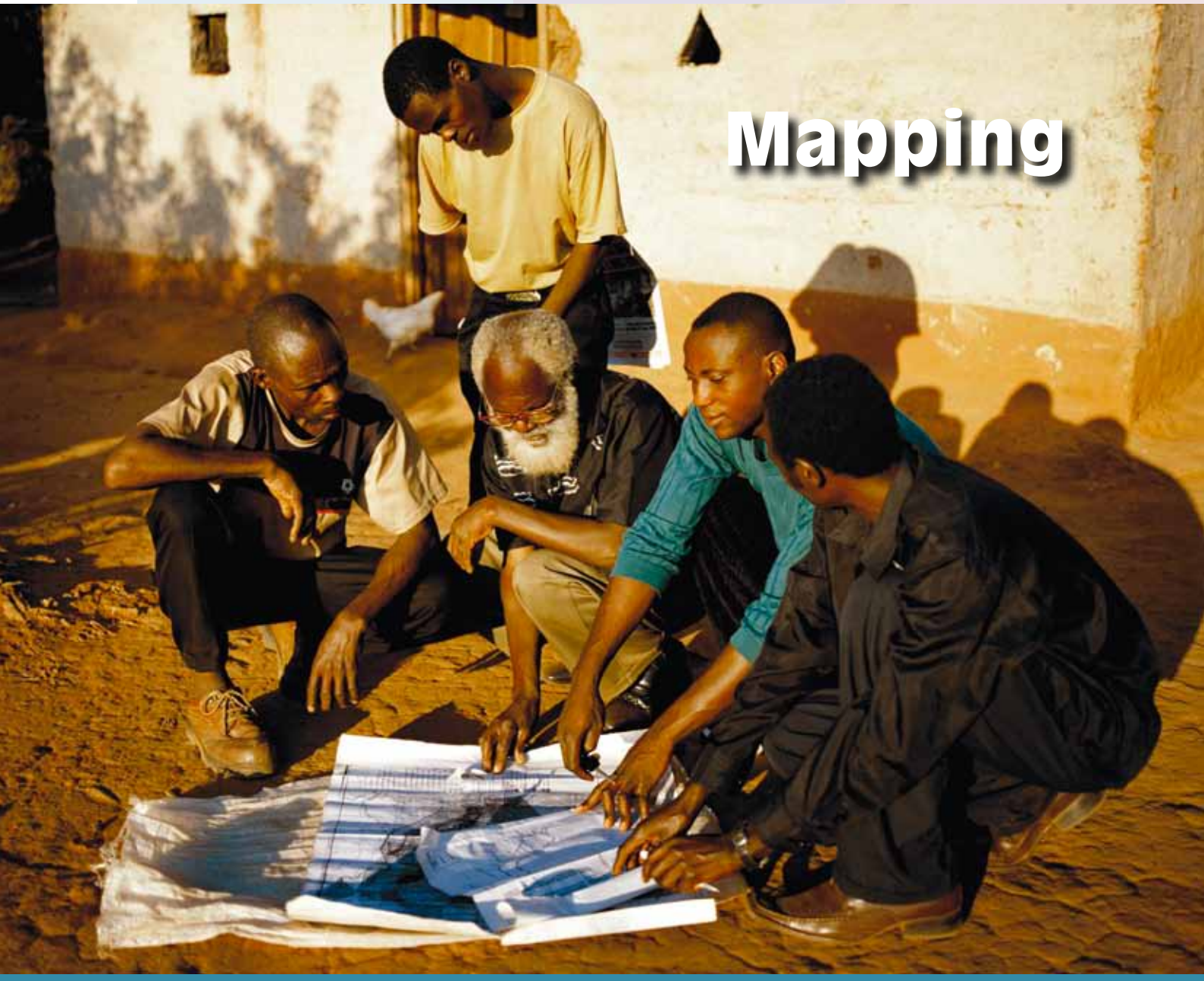
Scientists use the latest technology to produce a digital soil map of **Africa**

Participatory mapping projects support community land claims in **Cameroon**

Field workers use GPS-enabled PDAs to gather road data in **Ethiopia**



Mapping

Editorial

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ICT Update

ICT Update issue 54, April 2010.

ICT Update is a bimonthly printed bulletin with an accompanying web magazine (http://ictupdate.cta.int) and email newsletter. Each issue of ICT Update focuses on a specific theme relevant to ICTs for agricultural and rural development in African, Caribbean and Pacific (ACP) countries, and includes feature articles and annotated links to related web resources and projects. The next issue will be available in June 2010.

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Putting power on the map

Making a map has become relatively simple and inexpensive in the last few years. Anyone with access to the internet can find free high-resolution satellite images and web 2.0 applications to create and customize maps. Rural communities can document natural resources in their surroundings that are important to their livelihoods. Farmers can plot out and measure the exact size of their land. And indigenous peoples can assign the traditional names to rivers and mountains in their area. They no longer have to rely on, or accept, the maps that were previously only produced by specialists, governments and international institutions.

Maps are now also much more than two-dimensional representations of land printed on paper that is always so difficult to fold. Interactive web-based maps can contain photos, videos, data and text telling the stories of people who live in a particular location, or giving detailed information on a certain feature. But traditional maps, with their symbols and colour coding, are a still useful means of communication since they can be read by people with low literacy skills.

A recent study by the Rights and Resources Initiative showns that communities in Cameroon have been using maps to support their claims on land that had been allocated for commercial use, mining or given protected park status. The communities usually worked with NGOs who could provide GPS (global positioning system) technology, which can determine the coordinates of a location using satellite data. But many of the maps were also drawn on paper, which has the advantage of illustrating the land from the perspective of the people who live there.

These sketch maps, as they are called, show that access to the latest technology is not essential to make a map. In fact, the process of producing a map is as important as the end product. And it is often the case that rural communities are assisted through that process by external organizations. However, since map making is so easy now, it is essential that project leaders don't make the same mistakes as their predecessors in the 1980s and '90s, where communities were not fully involved in many participatory rural appraisal programmes.

To help prevent future malpractice in participatory mapping projects, a group of international experts, led by CTA, is producing a training kit with advice and guidelines for organizations to follow. The kit contains PowerPoint presentations, videos, photos, case studies and other documents which trainers can use to give a comprehensive course fitting the exact needs of their organization.

Good condition

Another international initiative that ultimately aims to help rural communities is the African Soil Information Service (AfSIS). Led by the International Center for Tropical Agriculture, AfSIS uses the latest satellite, infra-red and x-ray technology to develop a high-resolution digital map of soil conditions throughout sub-Saharan Africa. Teams of field workers collect soil samples from sites across the continent to be analyzed for their chemical and physical properties. Meanwhile, scientists use remote sensing techniques to determine other qualities of the soil and provide data for the areas which have not been sampled.

AfSIS also carries out field tests to develop techniques for improving soil fertility, with project workers carefully noting the location coordinates and soil types so that they can be matched to the digital map later. Smallholder farmers, extension services and other agricultural organizations will soon be able to access the map for free online and by mobile phone. By locating their land on the map, farmers can get specific details on how to improve the fertility of the soil in that particular area using proven methods for that soil type.

Since farming depends so much on location – with soil, weather and access to the land all playing important parts in the success or failure of a harvest – the recent developments in geographic technology will undoubtedly be an essential asset in the future of agriculture. Coupled with the spread of internet and mobile phone access, mapping is opening up a whole world of opportunities to rural communities. ■

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Using the Geoweb

Throughout history, map makers have been much sought after. They created representations of landscapes that could be used for exploration, military or trade purposes. The maps they drew, however, often only represented the ideas and perspectives of the people who paid for the maps: kings, armies and business leaders. In other words, people who already wielded substantial power.

But in the last 15 to 20 years, mapping applications and technology has developed so rapidly that map making has moved away from the realm of experts. Now, anyone with access to the internet can add locational information to web pages, photos and videos and share them on what is increasingly known as the 'Geoweb'. With little specialized knowledge, people can now make maps using Geoweb (Web 2.0) applications such as Google Maps, OpenStreetMap and Bing Maps.

The change began in part in the mid-1980s when the geographer, Brian Harley, started to talk about the subtexts in maps and thus their social implications. He encouraged map makers and ordinary people to use maps to achieve a greater sense of empowerment for the marginalized members of society.

Harley's call for action fitted well with other work being done at the same time using participatory learning and action (PLA), and participatory rural appraisal (PRA) techniques. Mapping was already being used by small communities, to determine their planning and future development needs, such as deciding where any new resources or infrastructure should be located. Using participatory methods that involved everyone within a community – and not only the most powerful – communities were creating their own maps for a variety of purposes, including as a way of recording the boundaries and the areas of land they used.

Since those early days, the range of uses for community mapping has grown exponentially, from heavily politicized land-use issues through to inner-city children plotting out areas where they feel safe at night. Maps have been used by the San communities in the Kalahari to outline their traditional hunting grounds. In Indonesia, after logging companies encroached on forest areas, the communities developed maps to show that the trees were not simply open access resources for anyone to cut down, but that they were intrinsic to the lifestyles of the people who had been living in that forest for generations.

Communication is very important too. Previously, even though the whole community could be involved in producing the map, very few people outside of the community would ever see it. But now, since it is so much easier to produce a map online, the potential audience is global in scope. People can access maps on their mobile phone. Maps are used daily on the internet, and are embedded in almost every website and on every TV news programme you see these days.

We have to ensure, however, that the process continues to involve everyone in the community, especially older people who may be reluctant to use computers. People with lower literacy levels might feel excluded too, as it still takes a certain level of education to read and interpret a map.

Prospects

Perhaps the greatest value of community mapping comes from the actual process of creating the map. My current work is with an indigenous community from the north of Vancouver Island in British Columbia, Canada. The government cut back on health and education services in the community's territory in the 1960s, and as a result the population dispersed, with many people leaving for the main urban centres. We are now using internet-based mapping as a way for dispersed community members to share their stories online.

Young people and elders contribute information to build up a better understanding of the land, resources and views that exist around Vancouver Island. The hope is that the younger people living there will get a much stronger sense of identity. But we are less concerned about whether the information provided on the map is 100% accurate; this particular project is more about building and restoring community members' understanding of traditions and lifestyles related to their particular territory.

Maps therefore have a wide variety of uses, and technology has made it possible to include other related data and information, with graphics, photos and videos. Such maps can provide a completely different view of the land, more than just buildings, roads and coastlines. They show that the landscape is far more socialized, and reflect the rich knowledge of the people who live there.

I believe the Geoweb will have great implications for the future, as maps become a bigger part of our lives. Creating, adding information and using a map are now very straightforward for many young people. Furthermore, opening mapping up to the wider population could help to realign the dynamics of power in society. People who were previously powerless, excluded from the decision-making process, might finally have a stronger voice that will be heard far away. ■

The Geoweb will have great implications for the future, as maps become a bigger part of our lives

EPA/PIERRE HOLTZ/ANP

Feature

Farming from the ground up

Agricultural researchers throughout Africa are using the latest technology to develop a digital map showing the properties of soil across the continent. Farmers will be able to get detailed information on soil fertility in their area.

The Africa Soil Information Service (AfSIS) is developing a map to show soil conditions across the continent. The service will help to identify the risk of soil degradation, how to prevent it and how to restore land where soil fertility is already depleted. AfSIS takes advantage of recent advances in digital soil mapping, remote sensing, statistics and soil fertility management to analyze the various alternatives to protect and rehabilitate soil. The project is also testing a variety of farming techniques in an effort to discover the most effective methods to suit a wide range of conditions and situations.

The rapid developments in geographic technology make this type of research more cost-effective than previously. Coupled with the spread of mobile phones and internet access, the service can easily get the information they gather to those who need it most, including small-scale farmers in remote areas.

The project, led by the International Center for Tropical Agriculture (CIAT) in Nairobi, Kenya, is collecting data that will also address issues of food security, environmental degradation, and climate change in sub-Saharan Africa.

At the launch of the service in January 2009, Kofi Annan, former UN Secretary-General and chairman of the funding organization, Alliance for a Green Revolution in Africa, said, 'The best science and technology available must be deployed immediately if Africa's soils are to be managed in a sustainable manner. AfSIS is a most welcome addition to the arsenal of tools deployed against the scourge of hunger in Africa.'

Setting standards

There is very little existing soil data for sub-Saharan Africa. Few results from previous soil surveys came with sufficient location information. Also, the testing methods varied greatly, and the interpretation of the results was not always reliable, making it difficult to compare the data from the different sources.

One objective of the AfSIS research, therefore, is to develop a baseline – an overview against which future results can be compared – using standardized tests and procedures. By applying an agreed process of sampling and analysis, the scientists will be able to build up a comprehensive picture of soil health and degradation in an area of sub-Saharan Africa covering 42 countries and more than 18 million square km.

Part of this testing procedure is to take physical samples of soil from selected sites. AfSIS has identified 60 locations, known as sentinel sites, each 100 square km in size. Three sub-regional field offices are responsible for coordinating the collection of samples. The Agricultural Research Institute in Arusha, Tanzania, is responsible for the survey sites in East Africa; the Agricultural Research Service in Lilongwe, Malawi, covers Southern Africa; samples in West Africa are handled by the Institut d'Economie Rural in Bamako, Mali. Each organization will establish a regional soil testing laboratory with the necessary equipment and an internet connection to link all the centres.

Sending field workers to remote, randomly chosen locations to scoop samples of soil is very time-consuming. AfSIS expects that, in the four-year term of the project, each regional centre will concentrate on five sentinel sites per year, spending an average of two months to collect 32 soil samples from each location. The laboratories will then analyze the samples using infra-red spectroscopy and x-ray diffraction to determine the soil composition.

The field workers use handheld PDA devices fitted with GPS receivers to document the exact location of where the soil sample was taken. The field workers can store a backup of the data on external hard drives while still at the site, and then transmit the information to the main data repositories at the World Agroforestry Centre and the Tropical Soil Biology and Fertility Institute, both in Nairobi, Kenya.

Working with local farmers, researchers also use the sentinel sites to test a variety of farming methods, such as erosion control, conservation tillage and agroforestry techniques on different types of soil and landscapes. The tests will not only prove useful when the service starts giving advice to farmers, but will also help to develop and standardize the testing procedures for future tests at more locations.

One important part of the project investigates methods farmers can use to improve the fertility of their soil. The trials compare the effectiveness of different fertilizers used on a range of soils, the rate of fertilizer application and the integration of legume crops in crop rotation systems.

Farmers in Africa typically use very little fertilizer compared with farmers in the rest of the world. Meanwhile, soil quality is rapidly decreasing due to increased pressure on the land from repeated droughts, flooding, overgrazing and demands from a growing population.

Through its wide range of studies, AfSIS is compiling information that the service can later use to advise farmers with very specific details on how to improve the fertility of their soil and the productivity of their crops. AfSIS recognizes, however, that to be truly effective they will have to deliver a complete range of information services to farmers, including advice on market data, credit management, technology

SVEN TORFINN / HOLLANDSE HOOGTE

and climate change. Team members are, therefore, also collating details on these subjects.

Broad audience

The results of the studies, coupled with their respective location coordinates, are added to the soil map. The map can then provide information on the properties of different soil types across the continent, including details on the water filtration rates and capacity of the soil to produce crops and store essential nutrients. It will show the prevalence of minerals that can limit crop productivity, such as high levels of aluminium or low carbon concentrations, and give recommendations on improving soil fertility depending on location.

Remote sensing technology and the analysis of high-resolution satellite imagery provide further details on soil moisture, nutrients and organic content. This information also gives a broader overview of soil properties in places that have not been sampled. The project team can use the extra data to predict with great accuracy the condition of soil over large areas. The map can show the properties of soil throughout the continent in blocks representing areas of land measuring 90 x 90 metres. This gives the map a resolution 100 times greater than any previous soil map.

The soil map will be available for free on the internet, and continually updated. The high resolution of the map means that farmers will have the possibility to zoom in to see the condition of the soil on their land. The project team are also looking at other ways to make the data available, via mobile phones, for example. Farmers and extension services would be able to directly access specific information for their location, and use the proven methods to develop the land and improve harvests in that area.

The AfSIS team expects that their data will also be used to develop national and international policies for improving soil quality. Governments and agricultural research centres will be able to use the information to provide targeted soil management programmes which would, for example, organize the supply and assess potential uses of fertilizers.

The main beneficiaries in the initial research stages of the AfSIS project, however, are likely to be the national soil and agricultural laboratories, and African universities. Many of these institutions have been underfunded in recent years, while admissions to soil science courses in African universities have fallen dramatically, even at the undergraduate level. AfSIS will provide many opportunities for field training at the sentinel sites and other soil management locations, and will supervise a number of postgraduate students at several African universities.

The project will fill the current gap in soil information to help farmers maximize the use of their land, and to assist agronomists and extension agents to plan and develop methods for improving soil fertility. Information gathered by AfSIS will also be used in a wider international effort to produce a digital map of the world's soil resources as part of the Global Digital Soil Properties Map initiative. Scientists from soil information and

Related links

Africa Soil Information Service
The main AfSIS website with further information on the methods used, details of the sentinel sites and field trials.
➜ **www.africasoils.net**

Global Digital Soil Properties Map
An international consortium of organizations cooperating to develop a global soil map.
➜ **www.globalsoilmap.net**

Alliance for a Green Revolution in Africa
AGRA supports small-scale farmers in Africa by improving access to markets, information, financing, storage and transport.
➜ **www.agra-alliance.org**

International Center for Tropical Agriculture (CIAT)
CIAT promotes research into efficient agricultural techniques.
➜ **www.ciat.cgiar.org**

Tropical Soil Biology and Fertility Institute
TSBF promotes the health and fertility of soil for agriculture in tropical ecosystems.
➜ **http://webapp.ciat.cgiar.org/tsbf_institute/index.htm**

ISRIC – World Soil Information
An independent organization and partner in the development of the global soil map.
➜ **www.isric.org**

Compendium of online soil survey info
A collection of soil survey resources complied by ITC.
➜ **www.itc.nl/~rossiter/research/rsrch_ss_digital.html**


JORGEN SCHYTTE / LINEAIR

AfSIS innovations

In the process of producing a soil map of Africa, the AfSIS team have introduced a number of new standards and techniques that are likely to affect the broader sector of soil science. The project will lead to the development of:

- international evaluation standards that will be consistently applied in soil collection and analyses to determine soil degradation and recovery processes, the nutrient-supplying capacity, water-holding capacity, carbon density and other functional properties of soil
- mechanisms to statistically analyze results and translate them into recommendations for soil management techniques
- a database of soil management trials in sub-Saharan Africa
- monitoring and evaluation procedures to track progress of the project allow, users to give feedback and to continue testing the recommended soil management techniques
- methods to effectively communicate the information gathered, such as websites, printed manuals and guidelines, policy briefings and a digital atlas
- a communication network to coordinate data collection and analysis.

The project is also gathering research and data from around the world to compile the first comprehensive database of soil information. AfSIS will:

- acquire and analyze data from previous soil surveys
- gather data on rainfall, vegetation and other environmental factors affecting soil in sub-Saharan Africa
- link soil management information gathered from the project research and other studies to the digital soil map to make the information easier to access
- collect information on proven soil management techniques, together with the necessary location information, from national research institutions and extension services in the countries involved
- introduce the soil health information system into the national institutions to ensure that the maintenance and updating of the service continues beyond the initial four-year term of the project in 2013
- provide training to African soil scientists in the new techniques and standards.

agricultural development institutes in Mexico, Canada and the US are cooperating with the AfSIS team to produce the global map.

The innovative use of technology and the development of standardized scientific soil sampling methods will make AfSIS a cost-effective and efficient surveillance service to map soil conditions. Its work will set a baseline for monitoring changes, and provide options for improved soil and land management.

The soil map website and systems to deliver the information to mobile phones will ensure that the data collected can reach the complete spectrum of people involved in farming in Africa. National agricultural research centres will continue to collect and add new data, public and private extension services will customize their training programmes, and national and local government departments can adopt appropriate policies to assist rural communities. All of which will combine to give small-scale farmers broad support and access to detailed advice on how to improve their crop productivity and profits. ■

On the right road

A project in Ethiopia uses GPS-enabled PDAs to map roads. Accurate road data helps NGOs, extension services and farmers to plan their transportation needs.

Case study

Accurate information on the location and trajectories of rural roads is essential to improving the livelihoods of farmers. Precise data on road positions helps small-scale producers manage transport routes, improve access to markets, and aids planning for agricultural extension officers who regularly visit remote communities.

Road information already exists for many ACP countries, but it is often difficult to know which map or source to use. One map may be more recent, while another provides more detailed information. Neither may be very reliable, as they do not show the condition of the road or whether it is only seasonably available.

In Ethiopia, the Road Data Development project has been testing methods to gather accurate and up-to-date information on rural road systems. The project is led by iMMAP, an international not-for-profit organization, and developed from work they had previously carried out in Sudan. For that project, the data was collected on paper forms which were time-consuming and laborious to process.

To make the data collection more efficient, and less prone to misinterpretation, the project team in Ethiopia is using handheld GPS-enabled PDA units, which receive location information from satellites. The PDA unit has special software installed, based on the free-to-download CyberTracker program, where the user can enter data by pressing relevant graphics on a touchscreen. The information is then stored on the PDA and can be downloaded later onto a computer for analysis.

DAVID LAURIN / AFRICANPICTURES.NET / LINEAIR

Contribution

The project works closely with staff from the World Food Programme (WFP) to gather the data. iMMAP have trained more than 100 people at WFP offices throughout the country to use the customized PDA units.

With a total of 17 PDA units, WFP staff collect road data when they travel throughout rural Ethiopia as part of their usual working day. They can record the coordinates of the roads they use, note the condition and whether it is temporarily blocked by an obstacle, such as a fallen tree or a flooded river. The field staff also document other infrastructure of importance to small-holder farmers: irrigation equipment, water reservoirs, community grain stores, fertilizer warehouses and agricultural extension offices.

Each of the WFP sub-offices has a trained ICT 'focus person' who is responsible for retrieving the information from the PDAs, uploading it onto a computer and sending the data to the WFP country office in Addis Ababa.

The data is then shared with Columbia University's Center for International Earth Science Information Network (CIESIN) to be processed further and integrated into the Global Roads Open Access Data Set (gROADS) project, which is developing a digital, public domain, global road map.

As well as contributing to these international mapping initiatives, the project team will combine their field data with information on currently available maps and satellite images to produce a single, reliable and up-to-date map of the region. Several NGOs and aid organizations have already expressed an interest in helping to gather more data, and to use the maps when they are finally available.

Small-scale farmers in the region will also directly benefit from the project's efforts. Many of them have now been identified and can be targeted in the WFP Purchase for Progress (P4P) programme, where low-income farmers can sell food to WFP's global operations for a fair price. P4P also works to develop farmers' skills and helps them to be more competitive in agricultural markets.

Better roads data will also help aid agencies and organizations that are supporting farmers to plan and improve farmers' access to local markets. WFP is already cross-referencing the raw data with their existing information to improve logistical support in the country. They can now confirm if a bridge has collapsed or a road is flooded, and start working out alternative routes.

So far, the project has proven to be a cost-effective method of mapping rural roads. iMMAP hopes to learn from, and refine, the procedures of the project in Ethiopia so that they can start collecting road data over a wider region, continue contributing to international mapping efforts, and help to make accurate, reliable maps available to organizations, farmers and extension services in many other countries. ■

Related links

CyberTracker
➜ www.cybertracker.org

Regional Center for Mapping of Resources for Development
➜ www.rcmrd.org

Center for International Earth Science Information Network
➜ www.ciesin.org

MELCA MAHIBER

A guide to good practice

As geographic information technologies become easier to use – and misuse – a group of experts has developed a training kit to improve the practice of community-based mapping.

Case study

In the last five years, geographic information technologies have become easier to use, more affordable (in many cases free) and far more widely available. Web applications such as OpenStreetMap and Google Maps offer anyone with access to the internet the possibility to customize maps and add information for, potentially, millions of other people to see.

Increased access to mapping technology can be very useful for rural communities to record the location, and the value, of traditional lands and resources. Many indigenous communities now use maps to document and archive aspects of traditional knowledge, to negotiate with commercial operators and development agencies, and to support their case in territorial disputes. Farmers can also use maps in land-use planning and natural resource management.

Although there are many advantages to increased access to mapping technologies, there are also some important risks. There are instances where, after the locations of traditional burial grounds were been mapped and published online, the graves were then vandalized. There are other ethical issues concerning where information about a community is recorded and made public without consent from the community, and where the mapping of indigenous plant and animal resources can lead to poaching and theft.

At a major conference held in Kenya in 2005, called Mapping for Change, international experts from 45 countries expressed their concerns about the possibility of malpractice by individuals or organizations using geographic technology in community-based mapping projects. Many initiatives may set out with the best of intentions to record a community's boundaries, resources and infrastructure without realizing that the information they gather could lead to local knowledge being abused or misused.

Guidance

As a consequence of the issues raised at this and subsequent events, CTA brought together a group of more than 40 specialists from a number of disciplines ranging from social anthropology and geographic information technologies, to social geography and communication, to develop a training kit on 'participatory spatial information management and communication'. The developers hope

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Elders presenting the work of their communities at the inauguration of the participatory 3 dimensional model (P3DM) of the Wechecha

the kit will give organizations a detailed set of guidelines to improve the process of their participatory mapping work, and ensure the interests and resources of the communities are protected.

The training kit is made up of 15 modules, each of which covers a specific topic, including community groundwork and processes, project structuring and initial reconnaissance, and procedures to go through to choose the appropriate participatory mapping method. The kit also covers documentation and networking processes, communication and advocacy. The modules are broken up into units, which represent a single training session.

The project team designed the kit to make it easy for trainers to adapt the course and choose which elements would best suit the needs of their trainees. Each module is made up of components: a comprehensive collection of training material for the trainer, including trainee handouts, PowerPoint presentations, video and photo archives, and sample case studies. A typical course would last from 10 days to three weeks. Some sections, however, are considered too important to be left out, such as the module on attitudes, behaviours and ethics.

'There are some key steps which have to be covered,' says Giacomo Rambaldi, a senior programme coordinator at CTA. 'One example is that before starting any community mapping process, an organization or individual should obtain prior consent from a fair representation of the community to implement a project having a mapping component.

The kit is likely to be most useful to trainers working with organizations that are already committed to using PGIS (participatory geographic information systems). Anyone applying community mapping techniques in their work would benefit from following the curriculum. The developers hope that widespread use of the kit will ensure that communities are fully involved and have control over community-based efforts to document and communicate spatial information about their area.

Procedures

'The map is not the only output,' explains Rambaldi. 'Mapping is part of a bigger process involving learning, awareness raising, and stimulating community cohesion. It has to be done carefully, looking at the long-term consequences and with respect to the people who have the knowledge. It should not be done in an extractive way, where you just get the information and walk away. Participatory mapping activities should be demand-driven, as far as possible, and not imposed or dictated by vested interests.'

When carried out with careful planning and consideration, the mapping process can help communities regain control of decisions and developments affecting their area. Community-based mapping methods have proven to be an effective aid in negotiations. There are also many cases where communities were able to settle land tenure issues based on maps produced using participatory methods. Rather than having a top-down approach where donor agencies or government offices impose their decisions, all parties have access to the same information and can, hopefully, come up with win-win solutions.

'A map always carries some bias,' says Rambaldi. 'There is no absolute truth in a map. Maps always highlight the perspective of the person who produced the map. A government could, for example, decide to build a dam. If the project engineers produce the maps of the catchment area in their offices, they will look very different from the maps produced by a community residing in the same location. The engineers might concentrate on information obtained from satellite images, government statistics, whereas the community might emphasize the traditional burial grounds, sacred areas or important forest resources upon which their livelihoods depend.

Despite the differences that can be presented on maps, they have been very successful in resolving territorial disputes by bringing together representatives from both sides of an argument. 'There are conflict management methods where two parties are encouraged to discuss their concerns using a map,' adds Rambaldi. 'The fact that they focus their attention on the map helps to dissipate energy since they are not forced to have eye contact; they are concentrating on the map. The map helps to establish the base for dialogue. It puts the parties at the same level in terms of access to information because what is on the map is viewable and readable by both parties.'

While it was the rapid spread of geographic applications that triggered the development of the training kit, cutting-edge technologies are not essential to the process of community map making. The kit is intended to help people in rural communities who do not necessarily have access to the internet or a stable electricity supply. The 15 modules contain information on a range of methodologies which can be applied to different settings and conditions, covering a range of skills and literacy.

The training kit on participatory spatial information management and communication will be available in DVD format from September 2010, initially in English and Spanish, with French and Portuguese versions being developed later. The DVD will be available via CTA's publication distribution service and its online publication catalogue. The content of the kit will be made available online as well.

'The objective is the spread of good practice in the context of development, human rights, natural resource management, spatial planning, anywhere in fact where maps are involved,' says Rambaldi. 'There is no blueprint approach to making a participatory map; it depends on the purpose of the map, on available resources and many other variables. What is important is that the process and the product meet the purpose. There are many ways to achieve that and many trajectories to get to the same result – all of which are outlined in the kit, which will then be used, hopefully, to achieve good practice in processes involving community-based map making.' ■

Related resources

ICT Update special issue on participatory GIS
➜ http://ictupdate.cta.int/en/(issue)/27

PGIS initiatives run by CTA
➜ http://pgis.cta.int

Training Kit on Participatory Spatial Information Management and Communication (from September 2010)
➜ http://pgis-tk.cta.int

PPgis.net
➜ www.ppgis.net

Integrated Approaches to Participatory Development
➜ www.iapad.org

Directing the discussion

Communities in Cameroon use participatory mapping methods to support their claim to disputed land. The maps they produce lead to informed negotiations between the parties.

Case study

Since the early 1990s, community mapping techniques have been widely used around the world to help with natural resource planning, identifying tenure rights, negotiating boundaries, resolving land use disputes, and for monitoring and evaluation purposes. The maps produced are commonly used as a communication medium between communities and other groups who have an interest in the same area of land.

In Cameroon, several organizations, mainly NGOs, have produced community maps using a broad variety of approaches and technology. To understand the methods used, their effectiveness and potential as a means of communication, the Rights and Resources Initiative carried out a comprehensive study of mapping projects in the country.

Previously, many of the country's land claim cases came about after the transfer of power from the colonial rulers. Since then, however, several other factors have highlighted the importance of mapping to secure land rights, including increased economic hardship, devaluation of the country's currency, plus the introduction of new laws and State environmental management plans.

The number and size of industrial plantations have also expanded over the last few decades, with an increased number of petroleum exploration and solid mineral mining concessions granted, as well as land set aside for the Chad-Cameroon pipeline. More recently, there has been a steady rise in the creation of wildlife protection areas, leading to disputes between conservationists and farmers.

Common sense

A number of notable cases in Cameroon have used community-based mapping to try to resolve these types of conflicts. In the area around the Kienke forest reserve, for example, a growing local population and shortage of farmland has led people to fight for their right to use more of the woodland to which they traditionally had access. The communities worked with external organizations to gather information on land use in the contested areas.

The communities used a variety of mapping techniques, including drawing simple maps on the ground (ephemeral maps) and on paper (sketch maps). These types of maps give a good indication of how the people living in the area use the land, and which resources are important to them.

The advantage of these maps is that they use the specific knowledge of the communities, and can be produced without expensive equipment or technical skills. The disadvantage is that it is difficult to add extra information later. However, the same details could be recorded using GPS receivers, and participatory GIS techniques, to get the exact coordinates of each of the resources and plot them onto a scaled map. This creates a better overview of the area involved, and is often more widely accepted.

This type of 'scale mapping' was used by organizations working with Pygmy communities in the Socapalm and Hevecam areas in the south of Cameroon. Here, the aim was to map the zones into which the communities' cultural influence extended. The types of features recorded, therefore, were hunting sites, forest resources, food collection and burial sites, and temporary settlements.

The difficulty in this case was that these areas are not always fixed, and can move as the communities migrate. Pygmy communities have a strong sense of communal ownership, so their 'sphere of influence' can overlap into areas that would be clearly demarcated on maps made by their Bantu neighbours. Identifying the sites of potential dispute on maps means both sides can access the same information and have the same starting point for any discussions.

In these types of negotiations, maps can be used to focus on finding solutions to territorial disputes, rather than allowing the opinions of only one side to be heard, which can often intensify the problems. The process has to change away from a situation where both side makes demands, and make deals by trading off portions of those demands, to one which is centred on the mutual benefits of all land users.

There have been instances in Cameroon where lands occupied by large industrial-scale agricultural corporations have been given back to the communities. Other compromise agreements mean that traditional land owners are involved in community forestry projects where the local people share the benefits and challenges of forest management with the reserve officials, or where legal enclaves have been created allowing community hunting and joint management zones.

Despite the successes, many land dispute cases can still raise many sensitive issues. Organizations or individuals who carry out community mapping projects have to be extremely careful not to be seen to be endorsing one side or the other. Objectivity is essential, therefore, and, when carried out with care and respect to all land users, participatory mapping can achieve very significant results. ■

RIPANI MASSIMO / ANP

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Add geotags to photos

It is common now to assign metadata to web pages. This data provides extra information on the content, and is often automatically generated by the software used to create the page. For example, most blogging applications add the time and date the post was published, and the name of the author. It is usually also possible to add keywords to articles, videos, podcasts and photos to give an indication of the kind of information contained on the page. Adding these tags, as they are also known, helps search engines to index the content, and makes it easier for people to find.

Increasingly, geospatial data, usually latitude and longitude coordinates, are added to web pages, which can help anyone looking for information from a specific location. This can be especially useful for photographs since geotagging can give the exact location of where the photograph was taken.

A series of geotagged photos could be used to show the state of a rural road system, or record changes to an area over several years. The photos could show, for example, if deforestation has taken place in one area, or illustrate the changes in the crops of a particular field over a single growing season. Geotagging is also a useful way to organize photos.

There are three main ways of geotagging photos:

1. GPS-enabled camera
There are several digital cameras now available that will automatically tag your photo with the GPS (global positioning system) coordinates of where the picture was taken. The cameras usually come with software that will plot the photos onto a map, showing the location of where the photo was taken. Most of these cameras are still expensive, however (over US$ 1000), but cheaper models are gradually becoming more available, such as the Nikon Coolpix P6000 and the Samsung ST1000 GPS-enabled camera (both around US$ 500). The iPhone 3GS will also geotag photos taken with the device.

2. Camera plus GPS receiver
If you have a digital camera and a separate GPS receiver you can log your location when you take a photo. If the clock on your camera is synchronized with the clock on the GPS receiver, you can easily match the data later. A simple way to do this is to use software such as Geotag. The program is written in Java and will run on most operating systems. It can be downloaded for free, or you can run it straight from the website, http://geotag.sourceforge.net. With the Geotag window open, add the photos and the log file from the GPS receiver. The program will then match the two and show the photos at their locations on a map.

3. Web
Even if you do not have a GPS receiver, there are a few websites which allow you to add location information to photos. The advantage of this method is that you can give the exact location of the subject of the photograph. For example, a photo of a distant mountain can be placed at the location of the mountain, whereas a GPS-enabled camera will only give the coordinates of where the photo was taken. It is also possible to scan old photos and set their location with these services.

Panoramio:
www.panoramio.com
Click 'upload your photos', then log in with a Google username or create an account. In the next window, click 'browse' and add the photo from your computer hard drive or memory card. When the photo has been uploaded, click 'map this photo', then type in the location of the nearest town or village in the search box provided. You will then see that location plotted on a map with a marker. Click the marker with your mouse and move it to the location of the photo. Click 'save position'. You can then give the photo a title, add other tags and a comment or description. When you click 'save' you will then see your photo on the map. By clicking the link 'in Google Earth' you can download a file that will let you view the photo on the Google Earth program.

Flickr:
www.flickr.com
Log in to Flickr, or sign up for a new account. Click on 'upload photos' and follow the instructions to upload your photos to the site (there are three ways to do this). After uploading the photos, click 'organize and create' then 'your map'. The next window will show the uploaded photos in a row below a map. Type the name of a nearby town or village in the box 'find a location', then click and drag the photo to the exact location on the map. Click 'edit photo' to add tags and a more detailed description.
Another simple way to geotag photos in Flickr is to use the loc.alize.us application. Go to the home page www.loc.alize.us and click 'create'. Click and drag 'localize bookmarklet' to the bookmark toolbar of your browser. Go to a photo page on Flickr and click the bookmarklet. A box will open where you can enter the nearest place name, address or GPS data, if available. A map then shows the location. Zoom in, if necessary, and move the cross to the exact location of the photo. Click 'save location' and then enter a title for the photo.

It is also possible to drag your photos to a location on a map using Geotag.

Privacy

Photos uploaded to Flickr, Panoramio and other photo sharing sites can be viewed by anyone with internet access unless you change your default privacy settings. Flickr also provides the possibility to change the privacy settings for individual photographs: click 'organize', 'your map' and then double-click the photo to edit the privacy settings. ■

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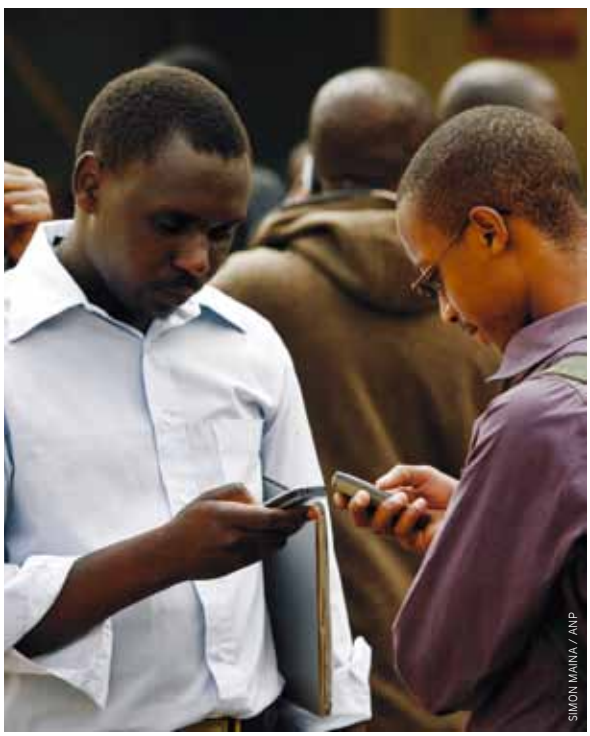
When the crowd becomes the source

What is Ushahidi, and how was it first used?
➜ Ushahidi is a platform developed in January 2008 to record and map violence in Kenya during the post-election violence. Ushahidi stands for 'testimony' in Swahili, which is exactly what people were giving to the system via SMS and reports directly on the website. This acted as a repository of near real-time information for people to see what was happening on the ground. The reports gave Kenyans and outside observers an opportunity to act on or later study the data. Today, the platform allows users to submit reports via SMS, web, email, Twitter and other social media sites which can then be mapped.



SIMON MAINA / ANP

How has Ushahidi been used since then?
➜ The software has been released, free and open source, for any organization to use for their projects. We've seen Ushahidi used for election monitoring in India, Mexico, Lebanon and others. The TV news channel, Al Jazeera used it during the Gaza War in 2008/09. A group used the software to track medicine stock-outs in five African countries from Zimbabwe to Uganda. More recently, Ushahidi was launched in Haiti and Chile only hours after their devastating earthquakes. On a lighter note, the Washington Post tracked snow cleanup and removal in the Washington DC area which was dubbed, 'Snowmageddon'. Thanks to the free and open source nature of Ushahidi, we have really seen a wide variety of uses which only proves the versatility of the platform.

How is technology changing mapping?
➜ There are different ways to look at mapping. We can draw lines and polygons on a map to delineate roads and structures. As important as it is to see how to get from point A to point B, it doesn't always tell the whole story. Platforms like Ushahidi provide a way to add human experience to the mix. In an event like a natural disaster or post-election violence, being able to see a snapshot of eye-witness events can be extremely valuable to the people involved, and to the NGO and governmental organizations that are there to support them. In Haiti, a number of organizations acted on reports to the Ushahidi system and have had confirmed reports of lives saved because of it.

How is technology helping to make mapping more accessible?
➜ Using SMS, various web mapping applications can collect reports from previously inaccessible situations. For the person submitting the report, SMS is simple, cheap and the most reliable way to get a short message across. In many developing countries, SMS is the default form of communication over voice, so it's something that people are already familiar with. In the case of Ushahidi, administrators can take these reports, extrapolate location information from the message and find the approximate location or get back to the original sender for follow up. Essentially, people in areas with limited to no internet access probably have access to a mobile phone service and would not otherwise have access to mapping or location-based services.

What other applications are there for mapping technology?
➜ There are a few utilities out there that are relevant to rural communities. The first one is OpenStreetMap. It is a 'wiki-style' map which is developed by volunteers and available under a very generous license for virtually anyone to use. They were instrumental in improving maps in and around Port-au-Prince immediately after the earthquake, as well as other places around Haiti. They have also done an amazing job mapping the Kibera slum outside of Nairobi through community engagement. In places where Google, Microsoft or Yahoo doesn't have coverage, chances are you will find that OpenStreetMap does. Another application is the Ghanaian developed Esoko. It's an application that tracks prices for commodities in villages and markets around a number of countries throughout Africa. Like Ushahidi, it can also be driven via SMS.

Why is it important that more people are able to make and contribute to maps?
➜ Crowdsourcing applications, like Ushahidi and the above mentioned tools, depend on user participation to be successful. The more reports that come into Ushahidi, the easier it is to get a clear picture of what's happening on the ground. It is certainly possible that someone will submit a false report to the system but if other people in the area are also reporting, the false report will not have much of an effect on the overall picture of the situation. ■

Related resources

Ushahidi: 2010 earthquake in Haiti
➜ http://haiti.ushahidi.com

OpenStreetMap
➜ www.openstreetmap.org

Esoko
➜ www.esoko.com

Map Kibera
➜ http://mapkibera.org