

How satellite data save lives

Satellite data can contribute in many ways to the relief of human need, both in the context of emergency aid and in longer-term development cooperation. Examples of its use are the International Charter “Space and Major Disasters”, which was called on after the major earthquake in Haiti, ILRI’s index-based livestock insurance scheme and Amnesty International’s Eyes on Darfur project.

Satellite data is used in many ways to tackle poverty and secure peace. For example, since 2007 Amnesty International has been using satellite data to monitor the Darfur region of Sudan. The images are available to the public on the website www.eyesondarfur.org. A special watch is kept on villages under threat of attack, and there are “before and after” pictures of destroyed villages. Amnesty International hopes that the campaign will put renewed pressure on the Sudanese government to send peacekeepers to Darfur. The satellite images are obtained from Digital Global, GeoEye, and ImageSat International N.V., companies which provide commercial, high-resolution satellite imagery.

■ Emergency aid: Haiti earthquake

The International Charter “Space and Major Disasters” uses satellite data to provide relief workers with important information on access and conditions in the wake of natural disasters. The initiative, which is supported by international space organisations, became operational in 2000. There are currently ten members, all of whom have committed to provide free and unrestricted access to their space assets to support relief efforts in the immediate aftermath of a major disaster.

Such a powerful earthquake as in Haiti, 12 January 2010, can make current maps suddenly out of date, causing additional challenges to rescue workers on the ground. Earth observation satellite images can help rescue

efforts by providing updated views of how the landscape and the infrastructure have been affected.

Following the event, the French Civil Protection authorities, the Public Safety of Canada, the American Earthquake Hazards Programme of USGS and the UN Stabilisation Mission in Haiti requested satellite data of the area from the International Charter on “Space and Major Disasters”. The initiative, referred to as “The Charter”, is aimed at providing satellite data free of charge to those affected by disasters anywhere in the world.

To meet the requirements of the rescue teams in Haiti, very high resolution imagery is needed from both optical and radar sensors. Through the Charter, the international space community is acquiring satellite imagery as quickly as possible. Currently, data are being collected by various satellites including Japan’s ALOS, CNES’s Spot-5, the U.S.’s WorldView and QuickBird, Canada’s RADARSAT-2 and ESA’s ERS-2 and Envisat.

Satellite imagery acquired immediately after the event is used to generate emergency maps to provide rescue services with an overview of the current state of the area. These can be compared with situation maps generated from

archived satellite data to identify major changes on the ground caused by the disaster.

Comparison of the maps from before and after the event allows areas that have been hit hardest to be distinguished and makes it possible to identify passable routes for relief and rescue workers. Additionally, they can help to identify areas which are suitable for setting up aid camps where medical support and shelter can be provided to people. Radar satellites are able to peer through clouds, which is an asset when weather conditions prevent the use of optical satellite instruments. Radar imagery can be used to identify hazards such as landslides that may be triggered by earthquakes. In the long term, radar data can also be processed to map surface deformations caused by earthquakes to help scientists improve their understanding of seismic events.

■ Risk reduction: Index-based livestock insurance

The new index-based livestock insurance scheme of the International

Data from the earth observation satellite Envisat were also used in the rescue operations following the earthquake in Haiti.

Photo: ESA



Livestock Research Institute (ILRI) was launched on 22 January 2010. Based on satellite data, the scheme is being piloted in the Marsabit district of Kenya for an initial period of four years.

This livestock insurance scheme utilises the Normalized Difference Vegetation Index (NDVI). Healthy plants reflect relatively little radiation in the visible portion of the spectrum but a relatively large amount in the adjacent infrared region. This clear difference in reflection in the two areas of the

spectrum does not occur for other surfaces such as soil, water, rock or dead vegetation. The insurance agency can therefore use reflection levels to establish whether there has been a loss of vegetation – and hence inevitably of livestock – in a particular district. If loss has occurred, the insurance sum is paid.

The data for the NDVI is provided by National Oceanic and Atmospheric Administration (NOAA) and processed by the National Aeronautical and Space

Administration (NASA). The data are freely available to the public.

Experts at ILRI expect about 1,000 pastoralists to take out index-based livestock insurance in the first year. Depending on the region, they will pay either 5.5 percent or 3.25 percent of the insurance value. The insurance is more expensive in the north of the district than in the south, since there is a higher risk of livestock mortality in the north. Cattle, goats, sheep and camels can all be covered by the insurance.

The insurance is made available through the Equity Insurance Agency, a subsidiary of Equity Bank Limited, with UAP Insurance Company underwriting the product and Swiss-Re re-insuring it. *(disastercharter/ib)*

More information:

Eyes on Darfur: www.eyesondarfur.org
 International Charter Space and Major Disasters: www.disasterscharter.org
 Index-based Livestock Insurance:
www.ilri.org/research/Content.asp?CCID=41&SID=299

In brief

■ Bacteria reveal landmines

Students from the University of Edinburgh/Scotland have created a custom-made bacteria that glows green when it comes into contact with chemicals leaked by buried explosives, reported the University in late 2009. This is claimed to provide a simple, cheap and accurate test to find undetected landmines. The bacteria can be mixed into a colourless solution that, when sprayed on to the ground, forms green patches to indicate the presence of landmines. Researchers say that the organism, which is cheap to produce, could be delivered from the air onto areas thought to contain landmines, with results available within a few hours. The bacteria is not dangerous to people or animals. Between 15,000 and 20,000 casualties are caused each year by landmines and unexploded ordnance, according to the charity Handicap International. Some 87 countries contain minefields. Scientists and engineers were able to create their bespoke bacteria with an emerging technique known as BioBricking. The

tool enables bacteria molecules to be assembled from a range of tiny parts called BioBricks, like a very small-scale machine. Researchers involved in the project say that although as yet they have no plans to make their product commercial, they believe it could form a cheap, accessible and easy-to-use alternative to existing landmine sensors. A further novel method to detect landmines is to plant genetically modified tobacco plants, the foliage of which changes from green to red near mines. Rural 21 reported on this technique in issue 5/2008, page 38. *(University of Edinburgh/ib)*

■ Global Research Alliance on Agricultural Greenhouse Gases launched

Delegates from 22 countries meeting at the Copenhagen Climate Conference in December 2009 formed a Global Research Alliance (GRA) on Agricultural Greenhouse Gases, an international research collaborative to combat climate change. The GRA will focus on research, development and

extension of technologies and practices to grow more food (and more climate-resilient food systems) without increasing greenhouse gas emissions. This will be accomplished through partnerships among researchers in participating countries with the purpose of developing new knowledge and technologies that can be transferred to farmers and other land and resource managers around the globe. Anticipated products of the worldwide scientific collaboration include cost-effective and accurate ways of measuring greenhouse gas emissions and carbon stored in soil; new farming practices that reduce emissions and increase carbon storage in farmland in different countries; and farming methods that sustain yields while helping to mitigate climate change. The countries which have agreed to participate in the GRA thus far include Australia, Canada, Columbia, Chile, Denmark, France, Germany, Ghana, India, Ireland, Japan, Malaysia, Netherlands, New Zealand, Spain, Sweden, Switzerland, UK, Uruguay, USA and Vietnam. *(USDA/ib)*

Salt-resistant maize hybrids

Researchers at the Institute of Plant Nutrition at the Justus-Liebig University in Giessen, Germany have succeeded in developing salt-resistant maize plants using conventional plant breeding methods. A fundamental prerequisite for growing crops on saline cropland has thus been fulfilled, according to reports from the Justus-Liebig University in mid-December 2009.

Maize plants pursue various physiological strategies for surviving high salt concentrations in the soil. In addition to the mechanism for preventing toxic

ion buildups in plant tissue, some plants also possess a more pronounced ability to survive water deficiencies under saline soil conditions. The researchers set out to combine different resistance strategies in one plant type by crossing suitable parent lines. Homozygous plants exhibiting good growth and low sodium concentrations in leaf tissue under saline conditions were selected for further breeding. Ultimately the researchers were able to produce salt-resistant hybrid plants, and thus succeeded where others had failed using molecular genetics and conventional methods. *(JLU Gießen/ib)*

Almost half a million seed samples in safe storage

The Svalbard Global Seed Vault, the seed bank on the Norwegian island of Spitzbergen, is celebrating its two-year anniversary with a noteworthy achievement: the quantity of seed samples in storage has nearly doubled since the opening date – from approx. 268,000 seed samples in February 2008 to exactly 491,526 samples on 14 January 2010. And 120,000 more seed samples are expected to be added this year.

The mission of the Svalbard Global Seed Vault is to safeguard the world's genetic diversity. It houses seed samples from around the world. Its extraordinarily massive and unique architecture attracted quite a bit of attention over the past years. The Norwegian construction company Leonhard Nilsen & Sønner, which built the Svalbard Global Seed Vault, received the 2008 prize for best construction, and the Norwegian Lighting Prize was awarded in 2009 for the artistic outside lighting. *(ib)*



Photo: Mari Tefre/Svalbard Global Seed Vault

The Svalbard Global Seed Vault contains almost half a million seed samples from all over the world (January 2010).

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