Remote sensing survey updates forest-loss estimates

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A new study has improved our knowledge of changes in tree cover and forest land use over time.

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FAO led remote sensing studies focused on tropical forests for Global Forest Resources Assessment (FRA) reports for 1980, 1990 and 2000. A new study, carried out as part of FRA 2010, was more comprehensive, with satellite images collected globally. The objective was to improve our knowledge of changes in tree cover and forest land use over time. A key driver of the study was the increasing importance of climate change, which has heightened the need for better information because forest and related land-use changes are estimated to be responsible for approximately 17 percent of human-induced carbon emissions.[1]

Satellite data enable consistent information to be collected globally, information that can, in turn, be analysed in the same way for different points in time to derive better estimates of change. Remote sensing does not replace the need for good field data, but combining both methods provides better results than does either method alone.

The outcomes of the FRA 2010 Remote Sensing Survey were:

- improved knowledge on land cover and land-use changes related to forests, especially deforestation, afforestation and natural expansion of forests;
- information on the rate of change between 1990 and 2005 at global, biome and regional levels;
- a global framework and method for monitoring forest change;
- easy access to satellite imagery through an Internet-based data portal; and
- enhanced capacity in many countries for monitoring, assessing and reporting on forest area and forest-area change.

A scientific sampling design

The survey used a sampling grid design with imagery taken at each longitude and latitude intersection (approximately 100 km apart), reduced to two-degree spacing above 60 degrees North (Figure 1). There were approximately 13 500 samples, of which about 9 000 were outside deserts and permanent ice (Antarctica was excluded). Each sample site was 10 km by 10 km, giving a total sampling area equivalent to about 1 percent of the Earth's land surface. This grid was compatible with that used for many national forest assessments, including those supported by FAO.

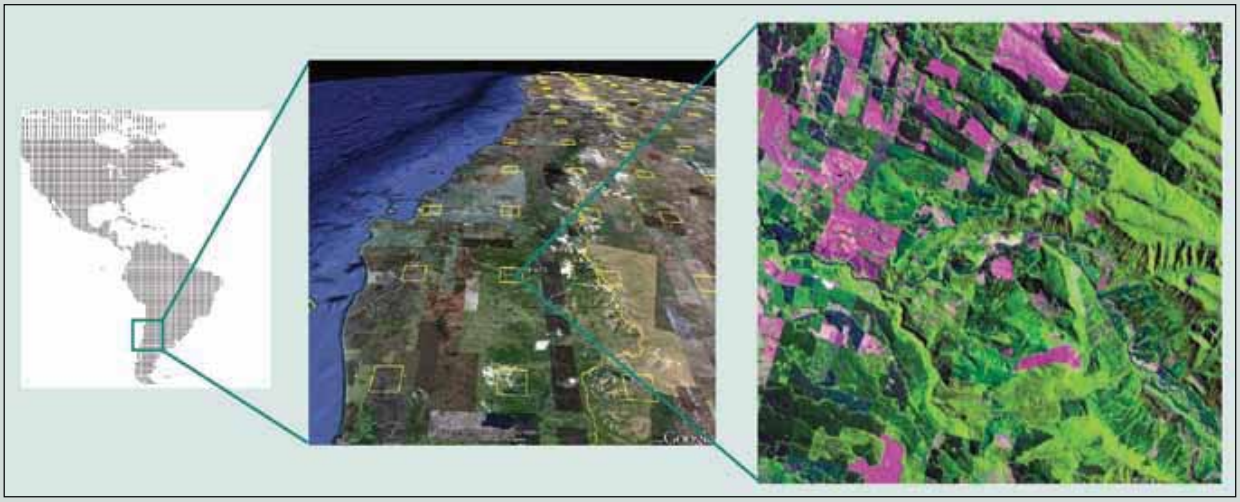
Easy access to tools and satellite images

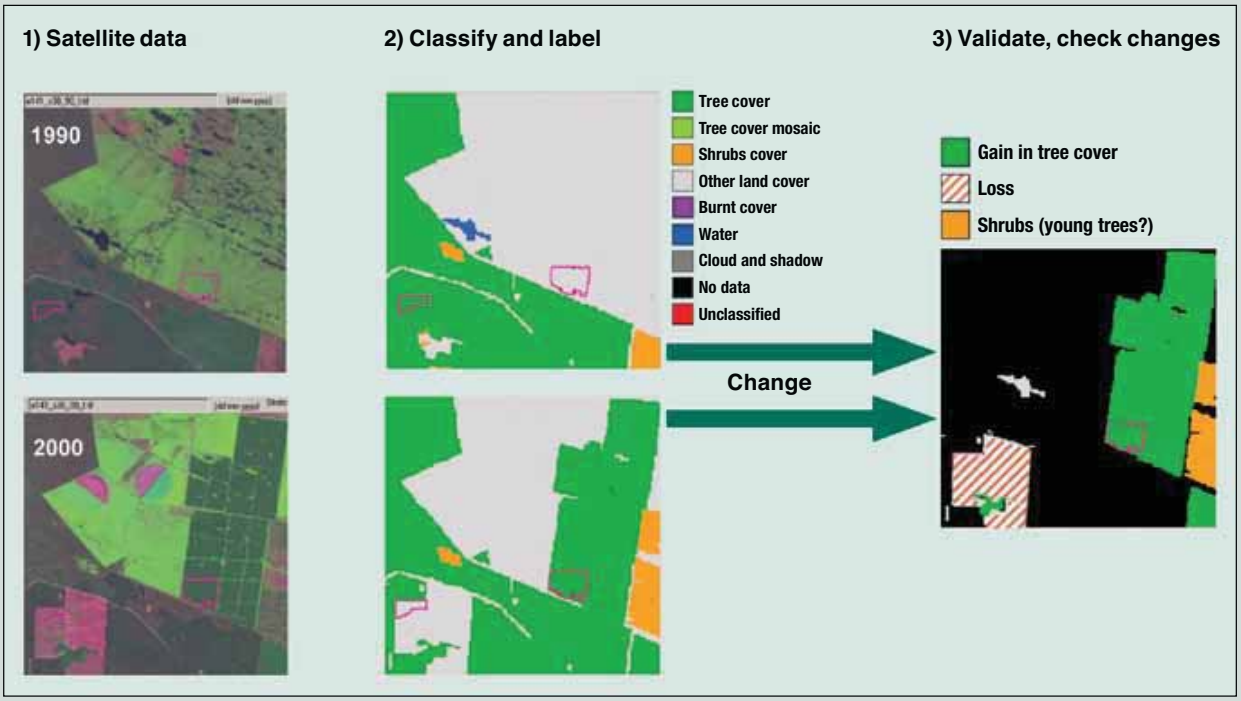
FAO and its partner organizations made pre-processed imagery for the sample areas easily available through the Internet.[2] Access to free remote sensing data and specialized

[1] IPCC. 2007. *Climate change 2007. The physical science basis: Contribution of Working Group I to the Fourth Assessment Report of the IPCC*. Cambridge, UK, Cambridge University Press.

[2] See www.fao.org/forestry/fra/remotesensing/portal.

1
The systematic sampling grid





2
Example of steps used in processing Landsat data to classified land cover map and resulting land cover change, 1990–2000

software has particularly benefited developing countries with limited forest-monitoring data or capacity. Authorized national experts can log in and download draft labelled polygons for checking and then upload the validated data.

Improved globally consistent estimates of forest extent and change over time

For each sample, three Landsat images – from around 1990, 2000 and 2005 – were extracted by South Dakota State University and further processed by FAO or the European Commission Joint Research Centre (JRC) to a consistent standard using an automated image-classification process. Draft land-cover labels were then prepared, and the changes in land cover over time were highlighted. National experts validated the preliminary results and then helped undertake the transformation from land-cover classes to land-use classes (Figure 2).

Strong technical partnerships and engagement with countries

The project combined the technical forest and land-cover experience in FAO, in partnership with external agencies, with funding support from the European Commission and technical expertise from their JRC. The results from this work have been reviewed and validated by over 200 national experts in 102 countries. This input has made the results some of the most detailed and widely checked global statistics on forest-cover change from satellite data.

Key findings

The findings of the survey show that the world's total forest area in 2005 was 3.69 billion hectares (ha), which is approximately 30 percent of the global land area. The findings suggest that the rate of world deforestation averaged 14.5 million ha per year between 1990 and 2005, a figure that is consistent with previous estimates. Deforestation was highest in the tropics, likely attributable to the conversion of tropical forests to agricultural land.

The survey shows that, worldwide, the net loss in forest area between 1990 and 2005 was not as great as had previously been reported, as gains in forest areas are larger than had previously been estimated.

Net loss – in which losses of forest cover are partially offset by afforestation or natural expansion – was 72.9 million ha between 1990 and 2005. The planet lost an average of 4.9 million ha of forest per year, or nearly 10 ha of forest per minute, over the 15-year period.

The new data also show that the net loss of forests increased from 4.1 million ha per year between 1990 and 2000 to 6.4 million ha between 2000 and 2005.

Although the data and analysis have not yet been applied to forest degradation, they could be reprocessed later for that purpose.

Detailed results of the survey, including information on regional losses and gains, are planned for release in early 2012. Initial results from the survey, and further information, are available at:

www.fao.org/forestry/fra/remotesensingsurvey/en.

This discussion has been adapted from the FRA 2010 report to reflect key findings of the survey.