INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE RESEARCH

Land use change in the Rio de la Plata Basin: linking biophysical and human factors to predict trends, assess impacts, and support viable land use strategies for the future (CRN2031)

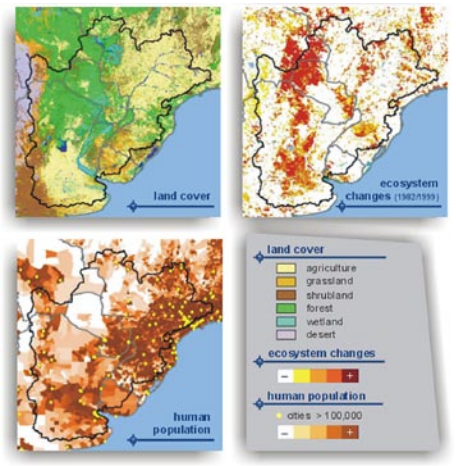
Food and biofuel production drive large-scale ecosystem conversion; in the La Plata basin alone it has resulted in the conversion of some 30 million hectares over the past 25 years. Yet, ecosystems provide fresh water, store carbon, and regulate the climate. What are the trade-offs and synergies between agriculture and ecosystem services? How can we optimize both?

Goals

Characterize patterns and drivers and assess the consequences of land use change, explore feedbacks and trade-offs. Develop tools for rational land use planning.

First results

- Expansion of crops in the La Plata basin over the last 25 years has reduced soil carbon (C) by about 30%, at loss rates of 28 million metric tons (MMT) of C per year. Intensively grazed pastures are also losing C, at rates near 1.7 MMT per year.
- Some of this conversion is now driven by a desire to substitute fossil fuels by "carbon-neutral" biofuels. However, letting the natural vegetation recover on former agricultural land is better for the carbon balance than growing biofuel crops. Carbon released from soil under corn grown for ethanol completely compensates for carbon gains from bio-alcohol for 50 years. Also, carbon was higher in soils under recovered grassland than the possible C credits from corn ethanol on the same land for 40 years, with equal or greater economic value.
- Strong human interventions in landscapes affect regional hydrology. Tree plantations in humid areas of the La Plata basin have lower albedo (reflectance to sunlight) than grasslands. Pine stands decreased (region's) albedo by 30% compared to grasslands. Afforested grasslands also decreased water yield by 50%, and caused soils to acidify. This was most marked under Eucalypt stands.
- Map of land cover changes showing regions of C sequestration and losses on the continent (http://lechusa.unsl.edu.ar/).
- This project provides insight for governments, industry and NGOs to develop sustainable strategies for land use and eventual substitution of fossil fuels.



Plata Basin territory - Whole-basin studies use existing databases and remote sensing tools

Soybean plot in the dry forest area of San Luis. Researchers are installing a groundwater observation well

Interviewing local stakeholders in a town with challenging water supply issues

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Links to other IAI projects

Collaboration with the *Small Grants Projects for the Human Dimension* **Climate change and irrigated agriculture** (SGP-HD003) and **Designing a methodology to evaluate local knowledge on global change and its role in the construction of future land use scenarios by local actors** (SGP-HD009), and with the *Collaborative Research Network* (CRN2094) **The impact of Land Cover and Land Use Changes on the Hydroclimate of the La Plata Basin.**

Project web page: http://platabasin.unsl.edu.ar

List of publications: http://iaibr1.iai.int/bs?publications/CRN2031.pdf

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