



Tropentag, October 11-13, 2006, Bonn

“Prosperity and Poverty in a Globalised World—  
Challenges for Agricultural Research”

## Satellite Based Biomass Estimation on Rangeland in Empedrado, Corrientes - Argentina

DITMAR BERNARDO KURTZ<sup>1,2</sup>, JÜRGEN SCHELLBERG<sup>1</sup>, MATHIAS BRAUN<sup>2</sup>

<sup>1</sup>University of Bonn, Institute of Crop Science and Resource Conservation - Crop Production, Germany

<sup>2</sup>University of Bonn, Center for Remote Sensing (ZFL),

### Abstract

The Empedrado department is located in the Northwest of the Corrientes province in Argentina. About 96,692 hectares of the total land area (123,148 hectares) is covered with rangelands usually utilised by continuous grazing. As the stocking rates are visually estimated, resource utilisation is inefficient and produces either overrested or overgrazed areas.

Alternatively, estimation of vegetation cover based on remote sensing data could provide valuable spatial information in support of management decisions as was recently shown in Australia. Since the normalised difference vegetation index (NDVI) derived from satellite imagery is positively related to the standing green biomass, this relationship has been tested for rangelands. The aim of the project was to provide an impartial biomass estimation allowing to support adequate grazing management.

In the present project, five co-registered Landsat 5 TM images (path 226, row 079) from the period 2000 to 2003 were used to calculate NDVI. The imagery had been radiometrically normalised using multivariate alteration detection transformation technique. The historical total dry matter yield (DMY) data, starting in 2000, was checked for completeness and accuracy. Only DMY data coincident with the passing dates of the satellite were used. DMY from three different paddocks and two different vegetation types were analyzed.

Joint analysis of both vegetation types shows a positive relation between NDVI and biomass ( $n = 10 / r^2 = 0.50$ ). If compared separately, the relationship was found far better for the highlands than for the lowlands ( $n = 6 / r^2 = 0.76$ ;  $n = 4 / r^2 = 0.18$  respectively). The variation coefficients were between 6 % to 22 % for NDVI and 38 % - 84 % for DMY values. The strong variation is attributed to the fact that historical measurement included not only green biomass but also standing senesced plant material. Furthermore, the lack of sufficient matching dates between DMY and satellite overpasses added to the strong variation among the range of biomass data.

Although the limited repetition rates of the satellite cause considerable restrictions in order to establish accurate pixel-by-pixel biomass estimation, the preliminary results indicate that the general spatial patterns can be captured and incorporated into management scenarios.

**Keywords:** Dry matter yield, Landsat images, normalised difference vegetation index, rangeland, remote sensing

---

**Contact Address:** Ditmar Bernardo Kurtz, University of Bonn, Institute of Crop Science and Resource Conservation - Crop Production, Nussallee 1, 53115 Bonn, Germany, e-mail: dkurtz@uni-bonn.de