Geotechnologies for monitoring pasture degradation levels in Brazil

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Extensive livestock represents around 93% of cattle production in Brazil and pasture is its main food source. For this reason, the sector considers pasture degradation an important problem, being responsible for economic and environmental losses. Several sources indicate that more than 60% of the 160 million hectare of Brazilian pastures shows some level of degradation. The need for precise information about degraded pasture levels, localization and quantities leaded to the GEODEGRADE project. Pasture characterization under the Amazonia biome was very punctual and information was collected from about 230 checkpoints, assessed in 2011 and 2012. In Goias State, under Cerrado biome, the mapping of cultivated pasture was updated for the year 2009. In local approach, under Cerrado and Mata Atlantica biomes, three levels of pasture degradation (well maintained, under degradation and degraded) were evaluated in 7 farms, during 2011 and 2012 seasons. The characterization of pasture vegetation cover considered: percentage of exposed soil, the pasture vegetation coverage, the soil coverage with weeds, the green grass and forage height, the forage specie, the dominant weed, the pasture vigor, levels of weed infestation and information about animal handling (feeding and fallow). Also, data collected by the 2011 and 2012 Livestock Rallies were shared with the project. Currently, all this information is presently available in a Geographical Information System (GIS) containing maps of soil, topography, land use and land cover, soil losses, climatic information, low (MODIS), medium (TM/ Landsat, LIS3/Resourcesat-1, SPOT) and high (GeoEye-1, RapidEye e Worldview-2) spatial resolution orbital images. Through the GIS, the project has contributed to improving the management of the control areas (farms). Preliminary results, using Spot Vegetation (VGT-S10) NDVI products from the years 2006 to 2011, indicate degradation processes in cultivated pastures in the state of Goiás, Brazil. The results indicate that approximately 27% of the planted pasture areas show some kind of degradation process. In addition, degradation percentages higher than 30% were observed in 7 microregions of the state of Goiás. There was also a high correlation between project results and those estimated by IBGE when considering indication of degradation processes beyond the moderate level. In another type of evaluation and based on data collected during 2011 and 2012 Livestock Rallies, each sampled pasture was evaluated using time series of EVI-2/MODIS images, from the period 2000-2012, according to a protocol based on seven phenological metrics, 14 Boolean criteria and two numerical criteria. The theoretical basis of this protocol was derived from interviews with producers and livestock experts. The analysis of MODIS time series images provided valuable historical information about the type of intervention and on the biological degradation process of the sampled pastures. Out of the 782 sampled pastures, 26.6% experienced some type of intervention, 30.3% was under biological degradation, and 43.1% showed neither intervention nor trend of biomass decrease during the analyzed period. More details and results can be found at the website: http://www.geodegrade.cnpm.embrapa.br.

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