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GIS Congress 2019- Remote Sensing and Cloud GIS optimizes Field Work for Data Collection during Flood Events- Javier Gustavo Villegas- Grupo Ganadero Estancias Espíritu

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Abstract

Rapid urbanization, population pressure and the governmental, shelter, infrastructural, industrial and commercial needs of a fast growing city have stretched the land delivery system in different parts of the country. Agricultural lands, which serves as the main source of livelihood, has been encroached by the process. This paper seeks to assess the impact of rapid urbanization on agricultural lands and its impact on the livelihood of the peri-urban farmers the case of Gelan and Dukem towns. The research used a mixture of qualitative and quantitative methods including interviews and questionnaires to collect and analyze data from stakeholders in selected peri urban areas in the study area. Contrary to the mainstream view that the polygamous nature of these two towns are the main source of increment in the population and thus urbanization in the area, stakeholders' perception was different as a result of increased commercial activities and its strategic location In the floodplains of the Yacuma River watershed, the events of extreme inundations are occurring with an increasing frequency. Yacuma River is a navigable water course that is part of the Amazon basin. In February 2014 a major flooding event in the Beni provinces, caused by unprecedented rains and river flow levels, devastated this beef cattle producing area. In less magnitude but also harmful for the farmers, flooding's occurred in the following years.. It is required to map the areas covered by water during the rainy season and compare them with the area of water bodies during the dry season, to distinguish between permanent water bodies, flooded areas and non-flooded areas. The study of the levels of magnitude of water during the rainy period allows taking preventive measures for the management of livestock during this critical stage, and thus reduce or mitigate damage and economic losses.

This is achieved by combining observations obtained on the site with information provided by remote sensors, both sources are important and complement each other. The data required are mainly the levels of water depth, daily and monthly precipitation, perimeter of water bodies, flows and others.

Field work for water cover geo-registration was assisted with the use of two technology tools: satellite image processing and data collection using digital forms with geo-locating capabilities. The extension of the surface of the property studied is equivalent to 30.000 hectares. Flood events occur in the rainy season, between December and March with more intensity, water remains in the soil surface for a long time, caused by the heavy and compacted soils and also by the flat slope.

Keywords: Rapid urbanization, floods,geo-location.

Background of the Research

Mapping of flooded areas was done using Sentinel-1 synthetic aperture radar (SAR) imagery provided by the Copernicus Program of the European Space Agency (ESA). Radar signal is not affected by clouds, it works under almost any weather condition. The signal can penetrate through the canopy depending on the wavelength providing information about the presence of water. Sentinel 1 Toolbox software was used because it has specific tools for processing radar bands, such as calibration, multi looking, speckle filtering, classification, terrain correction and others.

Validation of the flooding assessment was done by registering and sampling sites in field and filling data into a database using GIS Cloud customized forms on a mobile device connected to an external GPS to increase location accuracy. The combination of radar image processing and field data collection gives a more consistent, validated and precise flood mapping.

Two Sentinel 1 images were used, one of the disaster event known as the crisis image and a image of a previous time referred as the archive, acquired on the 11th of February 2019, and on the 25th of October 2018 respectively. Processes of calibration, speckle filtering, terraing correction and contrast stretching were taken for each image.

A RGB composite was created from archive and crisis processed images, flooded areas appear in red because of the

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high response in the red channel but a low response in the green and blue channels, in the surrounding areas we see tones of gray, and a dark color in the permanent water bodies. Vegetation intercepts the satellite signal, so it disables to identify water under the forest cover. About a 85% of the total surface was flooded, cattle were herded to refuges in islands and embankments, where also wild animals looked for shelter and food.

Digital Elevation Model (DEM) has relative importance in this case, the very uniform and low slope present difficult to model the floods, however, some trends can be observed. The water level reached 102 cm over the soil level of the grasslands in February 2019, the precipitation during the period was 1963 mm, about 20% more than the average of the last 20 years.
Flood mapping has proved to be an essential tool for planning and disaster prevention, and radar images are a valuable input for creating the maps. Automation of the processing flow will lead to timely and consistent results.

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