Applying geotechnologies for grain yield intensification and diversification In Uruguay

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Introduction

The lowlands of the Mirim lagoon hydrographic basin, both on the Brazilian and the Uruguayan side, are predominantly flat and feature relatively shallow topsoil with high bulk densities (Lima et al. 2009), low hydraulic conductivities, and impermeable subsurface soils. The poor natural drainage is a key characteristic of this lowland agroecosystem (Parfitt et al. 2017) that has made it favorable for rice production for more than a century (Theisen 2017). Thus, this environment has favored the cultivation of irrigated rice in rotation with pasture as an agricultural activity, but in recent years soy has been introduced as an alternative for crop rotation, income generation and also a way of intensifying agricultural crops in this productive system.

Land-leveling is used to correct soil surface irregularities to improve surface drainage and irrigation and make the area more manageable for an array of agricultural activities. Recently, technology using the Global Navigation Satellite System (GNSS) has been used to carry out projects with varying slope, called land-forming. Land forming for irrigation (LFI) model can improve water management in rice and also allows the furrow irrigation in soybeans. The apparent electrical conductivity of the soil (Eca), moisture and penetration resistance can be used to determine management zones in the fields, with the intention of reducing the number of samples, without compromising the quality of the data.

Objective

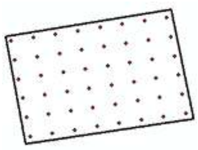
The main goal of this work was develop a sustainable intensification of two fields of the Laguna Merin basin through the crop rotation, using geotechnology tools for water management.

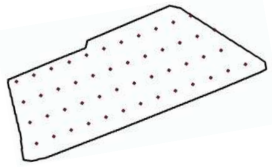
Specific objectives:

- Evaluate crop productivity in areas with and without LFI model.
- Evaluate crop productivity in cut/fill areas.
- Evaluate water consumption in irrigated rice and soybean crops.
- Determine the spatial variability of the chemical and physical attributes of the soil, in both areas, with and without LFI model.
- Make a statistical analyses to correlate apparent electrical conductivity of the soil, moisture and penetration resistance and productivity in both areas before and after the LFI model.
- Make a partial economic analysis of the use of precision agriculture and LFI model.

Material and Methods

To achieve the proposed objective, an experiment is carried out at the Paso de la Laguna Experimental Unit (33 ° 16 ’S 54 ° 10’ W), belonging to the National Agricultural Research Institute (INIA-Uruguay). Two fields located in Treinta y Tres – Uruguay, a field of 12.6 hectares cultivated with rice and another of 11.8 hectares with soybean.



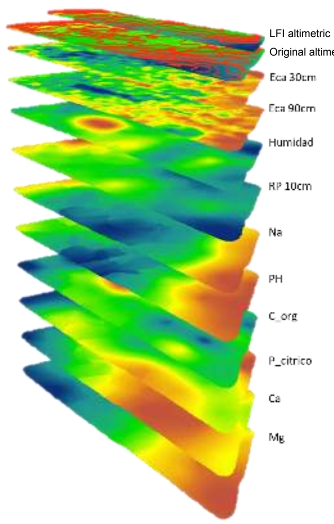


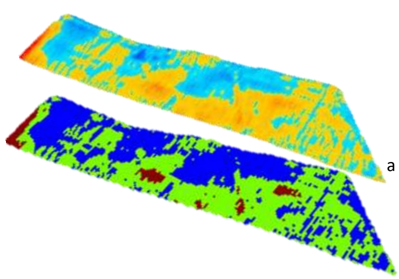
Each field was divided in half, comparing LFI with traditional management. In half of the area where soybean will be grown, the furrow Irrigation system was implemented, and flowmeters where installed to measure water consumption. In both areas soil samples were taken before and after the land forming, in order to verify the changes that occurred in the cutting and fill areas after the LFI model has been executed.

Other parameters being measured are apparent electrical conductivity of the soil, moisture and penetration resistance in both areas before and after the LFI model. To measure productivity a combine harvester equipped with a grain yield sensor will be used. Statistical analyses will be used to correlate the dependent and independent variables.

Results

As preliminary results, the altimetric maps with surface contours before and after the LFI model be applied, maps of Eca, humidity, penetration resistance (RP), and chemical soil attributes are showing (right). And the cut an fill map (a), and cutting area above 5 cm are showing below (b).





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