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Conservation and Precision Agriculture for optimizing Corn (Zea mays) sustainability in Veneto Region

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Introduction

Conservation Agriculture (CA) and Precision Agriculture (AP) are virtuous model as a sustainable production system that includes a set of agronomic practices and the adoption of precision technologies (Pierce et al, 1999), cultivation and land management. These models allow to protect land from the phenomena of erosion and degradation, simultaneously improving the sustainability of the system, giving more value to the upstream part of the chain (production), respecting natural resources, including water and the air we breathe (Pisante et al, 2014;). Regarding the technological advances in AP, yield maps became economically accessible to farmers because they can be generated easily after harvesting with the yield monitor of GNNS Harvesting-Machine (Schellberga et al, 2008) which allow to process with high definition the corn grain yield (Kg h^{-1}). In this study the processing of Yield maps wants to evaluate as spatial variables in corn grain production obtained with precision harvesting.

Keywords: *Precision Harvesting, GIS, Interpolation, Conservation Agriculture*

Materials and Methods

The field experiment is carried out at the Agripolis, in the Farm of the University. The Experimental Design is a Split plot. Two blocks 1 and 2 (260 m long x 38 m wide) are split into three plots (260 m long x 12 m wide); plots are separated by a 1 m wide strips; two cover crop (horseradish and wheat) and bare soil are distributed in 9 subplots, 87 m long x 12 m wide.

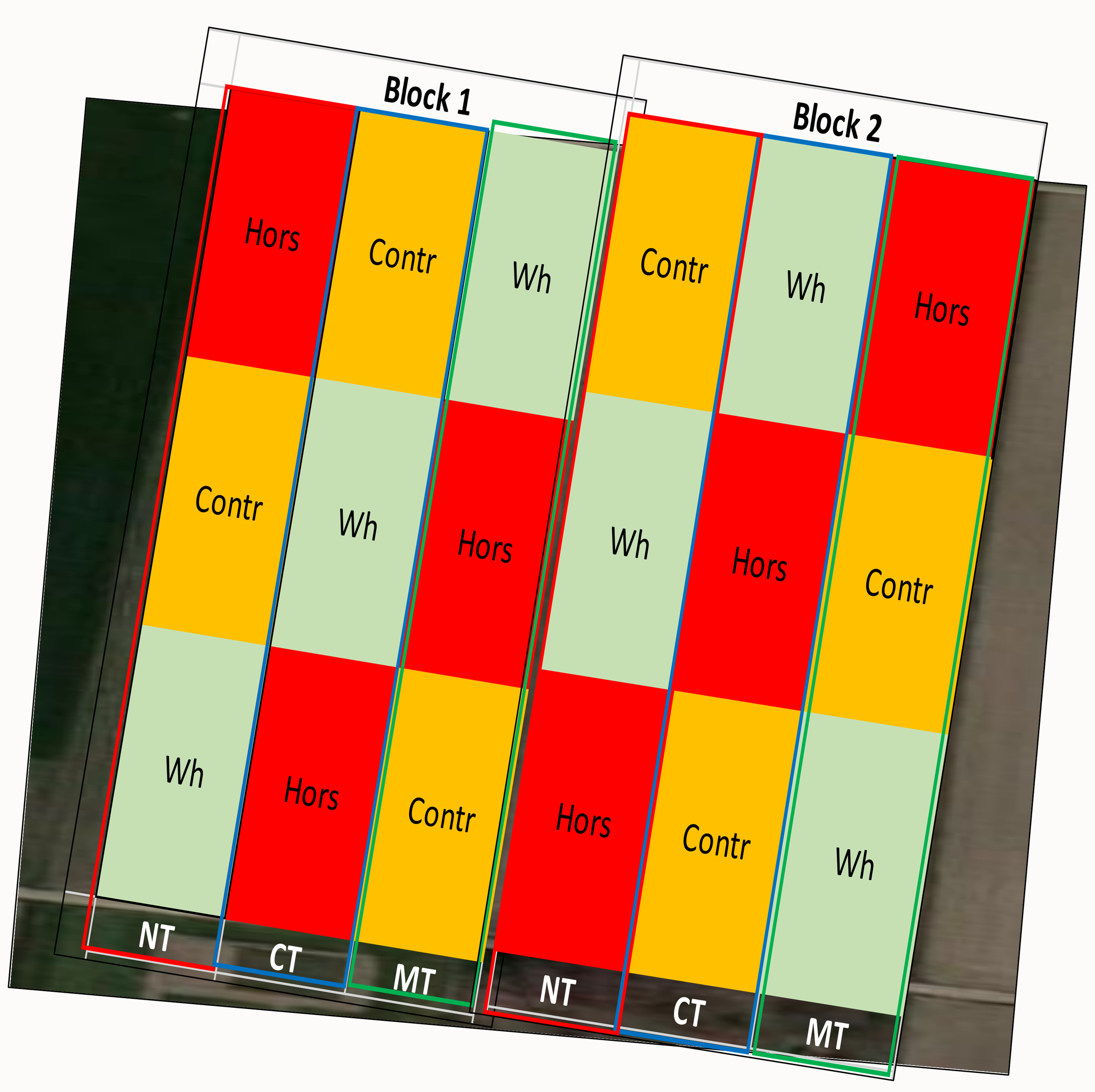

Figure1. Experimental Field with 2 block; tillage factor as plot (NT=No-tillage; CT=Conventional tillage; MT=Minimum tillage); crop coverage factor in randomized subplots (Wh=Wheat; Hors= Horseradish; Contr= Bare Soil).

In this study we acquired the spatial-temporal variability at harvest (06/09/2018) using a GNNS Harvesting-Machine with global navigation satellite system and moisture sensor for the assessment of corn grain yield (Kg h^{-1}) harvested. The yield data was cleaned by eliminating yield data points that presented very high or very low yield values. A Geographic Information System (GIS), generated the yield map using the Inverse distance Weighting interpolation methods (Souza et al; 2016) on data calibrated with ones of essay areas.

Results

Georeferenced yield data collected, using Differential Global Positioning System (DGPS) equipped yield monitor, were calibrated in combination with data coming from essay area by truck balance (81 square meter), fig 2. **NT** grain produced is 12,6 tonns ha^{-1}, **MT** production is 13,6 tonns ha^{-1} while the production in Conventional Tillage soil's management is bigger (15,2 tonns ha^{-1}).

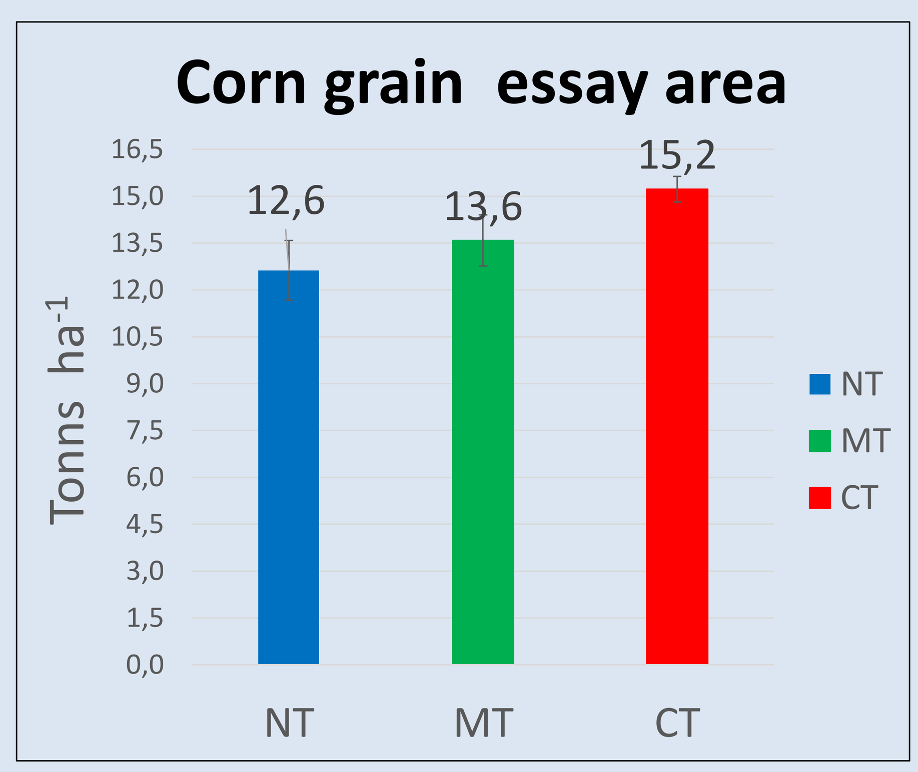

Figure2. There are not great differences between means values of NO tillage (NT) and Minimum tillage (MT) factors compared with Conventional Tillage which is larger.

The grain yield map, fig. 3, showed a lower production of grain in area of the field border and near the drains. Considering that this activity was carried out at the first year of the project, this results were expected.

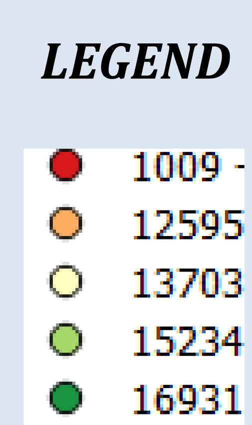

Figure3. The interpolated maps of production (expressed in Kg ha^{-1}) showed a great variability, classified in 5 classes (from less of 1,7 tonns to 15 tonns).

Conclusions. The potential of this prototype allowed testing the effectiveness of the Precision Harvesting application to maximize yield while lowering management costs.

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