**“Economic and environmental evaluation of site-specific tillage in a maize crop in NE Italy”**

**by B. Basso et al.**

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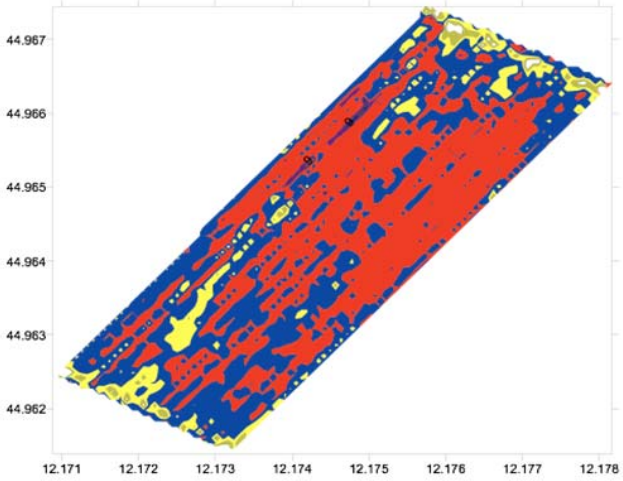
No-till management has been shown to increase soil aggregation, reduce erosion rates, and increase soil organic matter across a range of soil types, cropping systems, and climates. Few agricultural practices provide similar opportunities to deliver positive benefits for farmers, society, and the environment. The integration of site-specific management principles and conservation tillage practices is an unexploited field of research despite their significant economic and environmental benefits. The research carried out by Basso et al., 2011 (EJA 35 (2011) 83–92) illustrates a new dimension of agronomic research by integrating precision agriculture technology and conservation tillage with the goal of demonstrating the inherent advantages of linking these two innovative management approach for long term sustainability. To accurately evaluate the benefits and disadvantages of reduced tillage systems, it is important to examine the long-term impact of these systems. Modelling is a necessary tool for expanding the findings on SOC changes obtained from individual experiments spatially, to larger areas/regions, as well as temporarily to assess future changes.




a) Harvester combine with yield, moisture and protein monitor sensors;
b) Example of a maize grain yied map

The objectives of this research were to investigate the farm economic net return of three conservation tillage practices performed at spatially variable intensity within predefined management zones within a maize (Zea mays, L.) field in NE-Italy; to identify the most economically sound tillage practice for each management zone using long-term simulation results; and to assess the environmental impact of the tillage systems with regards to changes in soil organic carbon (SOC), $CO_2$ losses and nitrate leaching using the SALUS model. The zones were identified using a procedure based on spatial and temporal stability of yield maps developed by Basso et al., 2007 (EJA26 (2): 82-91)

The SALUS model was an efficient tool for analysing the temporal variability of yield and economic and environmental effects of tillage performed at variable intensity within two management zones.

The study revealed that no tillage (NT) was the most sustainable method both in terms of economic and environmental impact due to higher soil carbon sequestration and lower nitrate leaching, thus providing better ecosystems services. The simulated yields were higher for the NT treatment due to a carry-over effect of crop residues left on the surface which increased SOC and improved soil physical properties and water holding capacity. The fraction of C emitted as $CO_2$ is higher in the NT treatments because of increased soil C sequestration and the proportion of organic C fractions (labile vs. stable) at the soil surface. The higher emissions of $CO_2$ from the NT system is also due to the fact that the organic C in the top soil is primarily made of easily decomposed materials that are mineralized faster The implications of using long term simulations for environmental analyses are that NT practices results in significantly less N leaching and more C storage in the soil, thus demonstrating the reduced environmental impact of NT.

This study suggests that a management strategy should be selected through consideration of both the economic and environmental impact, in this case, the potential for increasing soil carbon content and reducing nitrate leaching to the groundwater. Agronomic challenges to no-till implementation
still exist, and identifying and overcoming these challenges should become an agricultural research
priority that emphasizes an integrated systems approach and the need to examine the long-term dynamics of soil biogeochemical processes.

**Further information:**
http://www.sciencedirect.com/science/article/pii/S116103011100041

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