Abstract for Global Food Security

Title: Integrating Soil Quality of a Reduced Tillage System (-this would mean that the focus is on the INTEGRATING)

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Soil is the foundation of life and so contributes to food security. Improving soil quality and soil's ability to function is key to sustained food security. Reductions in soil tillage intensity have been reported to improve soil physical functions where soil biota are assumed to have played a major role in this change. Changes in soil structure and soil organic carbon and improvement in soil physical functions such as water retention and infiltration can be linked to earthworms. However, both biological and physical soil quality are seldom studied in unison at the field scale, and even less so over several years. The current study was therefore initiated to assess soil biological and physical quality of a reduced tillage system. Reduced tillage treatments were established at the Lelystad experimental station of Wageningen University in fall 2008 in both conventional and organic farming systems. Earthworm populations were monitored between 2009 and 2012. Mean total earthworm abundance was 153 m^{-2} for reduced tillage in conventional farming, 15% higher than MP over the study. However, mean total earthworm abundance for reduced tillage was 297 m^{-2} in organic farming, 45% lower than MP (Crittenden et al, 2013). Differing effects observed between conventional and organic farming were attributed to crop residue and manure application practices. In 2011 and 2012 soil physical quality was quantified by measuring soil water retention, infiltration, organic carbon, aggregate stability and penetration resistance and by using continuous soil moisture and temperate data. Infiltration varied between 0.1 and 4 $cm \cdot min^{-1}$ and soil organic carbon was 90 $Mg \cdot ha^{-1}$ in the top 50 cm (Crittenden et al, 2013b). Multivariate analysis was used to explore relations between biological and physical quality parameters within tillage and farming systems. Earthworm abundance was shown to be positively correlated with water infiltration suggesting that earthworms increase infiltration regardless of species. This study has shown that reduced tillage can increase earthworm diversity while not imposing a penalty on soil physical quality. Farming practices such as reduced tillage that have benefits for farming in terms of lessened labour costs, may encourage soil biodiversity which can replace soil functions previously performed be ploughing. Field trials of adequate length should be encouraged to encompass crop and climate effects.

REFERENCES

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