

Green manures as winter cover crops enhance soil improvement and weed regulation in crop rotation

Liina Talgre, Viacheslav Eremeev, Diego Sanches de Cima, Berit Tein, Endla Reintam, Darja Matt, Anne Luik
Estonian University of Life Sciences (EULS), Tartu, Estonia. Contact e-mail: anne.luik@emu.ee

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Description

5-years crop rotation (winter wheat, pea, potato, barley us. red clover, red clover) experiment in 3 cropping systems (started in 2008, modified in 2011). Block scheme.

- **Org. 0** → follows crop rotation (CR);
- **Org. I** → CR+ green manure (GM) winter cover crops;
- **Org. II** CR+GM+composted cattle manure – winter wheat 10 t ha⁻¹, potato 20 t ha⁻¹, barley 10 t ha⁻¹ (in spring).

Green manures: ryegrass* (2012) or winter oilseed rape+winter rye (2013) after winter wheat, winter oilseed rape after pea, winter rye after potato, red clover

Each system in 4 replications = 60 plots. Each plot = 60 m²

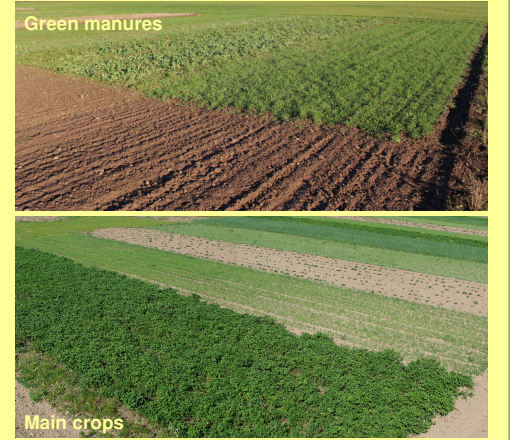
Site: Eerika experimental field (58°22'N, 26°40'E) near to Tartu, Estonia

Climate: Precipitation 591 mm y⁻¹

Mean annual temperature 4.4 (+30...-30) °C

Soil: sandy loam *Albic Stagnic Luvisol*

Experimental place and design

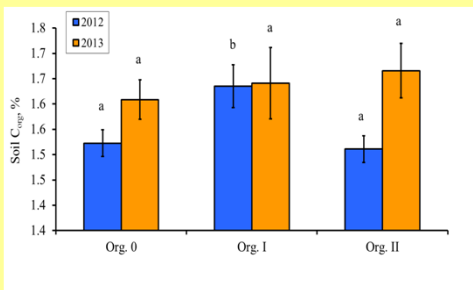


Study aims:

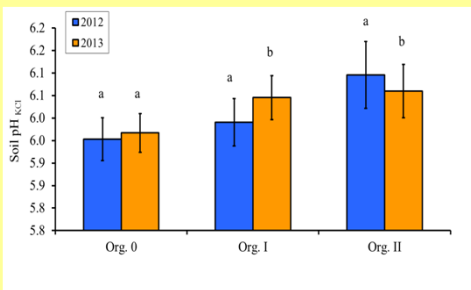
The aim of this research was to explain the effect of different green manures as winter cover crops and their combination with cattle manure on soil properties, weeds and crop yields in five-field crop rotation experiment of three different organic cropping systems.

Results of 2012-2013

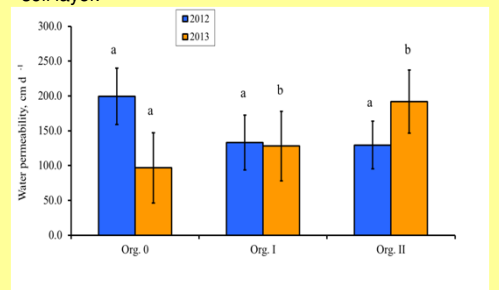
Green manures enhanced soil organic carbon content increases.



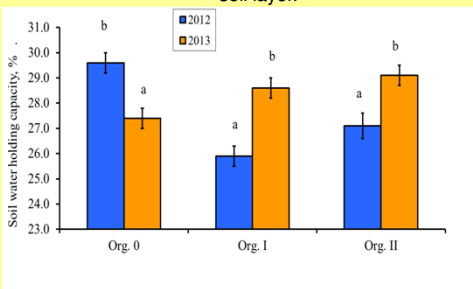
Green manures and their combination with cattle manure increased soil pH significantly in 2013.



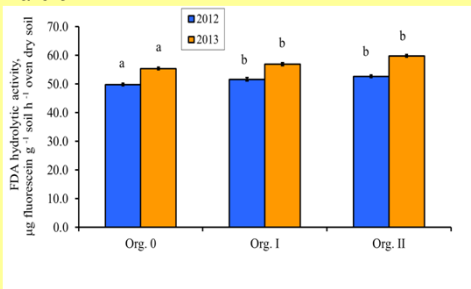
Green manures and their combination with cattle manure increased the soil water permeability in 0-5 cm soil layer.



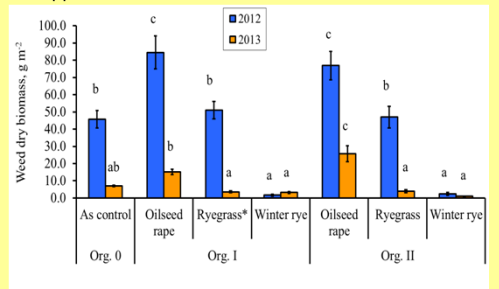
Green manures and their combination with cattle manure increased soil water holding capacity in 0-5 cm soil layer.



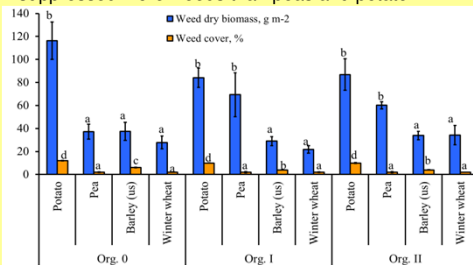
Soil microbial activity was significantly increased by green manures and by their combination with cattle manure.



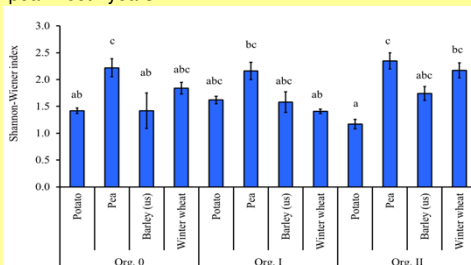
From green manures winter rye was the best weed suppressor.



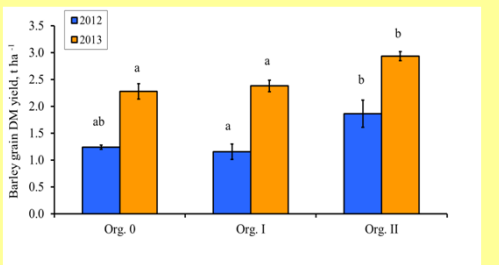
Cereal crops in co-influence with red clover suppressed more weeds than peas and potato.



Before crop harvest S-W index was highest in the pea due to weak suppression of winter cover crop as well as pea in both years.



There were tendencies that green manures increased yields in all rotation crops and significantly in barley.



NB! Different letters indicate significant differences (Tukey HSD test ($P < 0.05$)). Vertical bars denote +/- standard errors.

Conclusions

The use of green manures and their combination with cattle manure brought tendencies to improve soil quality: increased content of organic carbon, pH, soil water permeability, soil water holding capacity and soil microbial activity.

Green manures were influencing on weed density, biomass and species composition depending on crop, cropping system and growing year. Winter rye as winter cover crop was the best suppressor. Cereal crops in co-influence with green manures (red clover) suppressed more weeds than peas and potato.

Yield level of all main crops has increased due to improved soil properties caused by green manures