- Final sampling – Braszowice – 2014.10.01, Puste Jakartice – 2014.09.24

Braszowice – final sampling – 2014.10.01

Puste Jakartice – final sampling – 2014.09.24

Pot experiment

- The greenhouse experiment was continued and concluded at IUNG, Puławy, Poland from May to August 2014
  Plant: Spring wheat
  Design: randomized blocks
  Treatments (doses incl. control): 3
  Replicates: 4
  Tested EOMs: 3 (digestate from the biogas plant using pulp from sugar factory as a substrate; digestate from the biogas plant using corn ensilage as a substrate; industrial compost made of separated biodegradable wastes from households such as kitchen and garden wastes, and other biodegradable wastes such as wood and sewage sludge from municipal wastewater treatment plant.
  Tested soils: 3
  - Setting up of the pot experiment – 2014.05.12
  - First sampling – 2014.06.11 – 12
  - Second sampling and harvest – August 2014

Setting up of the pot experiment – 2014.05.12

Pots during experiment

irst sampling – 2014.06.11 - 12

Forthcoming events

1. Preparation of analytical manual – 2015.05.31
2. Preparation of methodical guideline for EOM application on soil 2015.05.31
3. Final seminar with end users – Jelenia Góra, Poland – 26 May 2015
4. Final seminar with end users – Ostrava, Czech Republic – 28 May 2015

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Risks and benefits of application of exogenous organic matter into soil

NEWSLETTER No.3

Background

Soil organic matter (SOM) decline was defined by the EU Strategy for Soil Protection as the major threat to soil quality. Regional assessments indicate that SOM levels might be decreasing. SOM is essential to many soil functions: production potential, retention, biodiversity provision, buffering and filtering contaminants. Simplification of crop rotations and specialisation in agriculture (crop production without animal sector) have led to limited input of organic matter to soil.

Project aims at evaluation of the effects of exogenous organic matter (EOM) on a wide range of soil properties and preparation of guidelines for their safe and efficient use in agriculture.

The project focuses on safe application of EOM into soil with respect to the local conditions in the Czech-Polish borderland.

All obtained data will be evaluated together which will enable a complex picture of changes in soil properties and processes following application of EOM. Literature and experimental data will be used for preparation of the guideline for the sustainable application of EOM to soil along with a detailed manual for performance of required laboratory testing. Information on the project progress is being disseminated through seminars and the newsletters. The project outputs will be delivered to authorities in soil protection, waste management, farmers and biowaste producers.

Location of Project partners and the field experiments

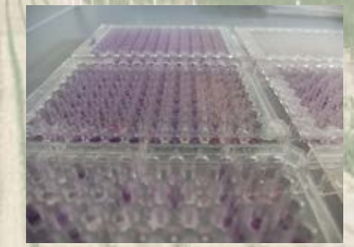
What has been done since May 2014?

Meetings

- Expert Meeting was organized in Pulawy on 20th January 2015 – the progress of the project was discussed. Project partners reported the advancement of laboratory analyses, the status of the preparation of the analytical manual. Partners also agreed on harmonization of statistical methods.

Data analysis

All analyses of the samples taken in 2013 (two samplings in pot experiment and two samplings in both field experiments) have been completed. Most of the 2014 samples have also been analyzed. Performed analyses included chemical (exchangeable cations, electric conductivity, hydrolitic acidity, pH_{H2O}, pH_{KCl}, salinity, extractable metals (1M HCl), total carbon, total nitrogen, labile fractions of OM, stable fractions of OM, nutrients, organic pollutants), microbiological (acid phosphomonoesterase activity, alkaline phosphomonoesterase activity, basal respiration, CM-cellulase activity, denitrifying enzyme activity, C biomass, N biomass, N_2O production, N_2 production, time to the maximal respiration rate after the addition of substrate (glucose), specific growth rate (using glc), relative N_2O production, substrate-induced respiration, short-term nitrification, urease activity) and physical (hydrophobicity - water repellency, water retention curve, pore size distribution including pores retaining plant available water, strength parameters, water infiltration, particle size distribution of soils – texture) properties. Ecotoxicological analyses were also performed.



Analysis of soil microbial functional and genetic diversity

The EOMs used in experiments were analyzed for chemical properties and ecotoxicological effect (microbial analyses, tests with plants and soil invertebrates) .

The figures below show some of the results of the laboratory analyses.

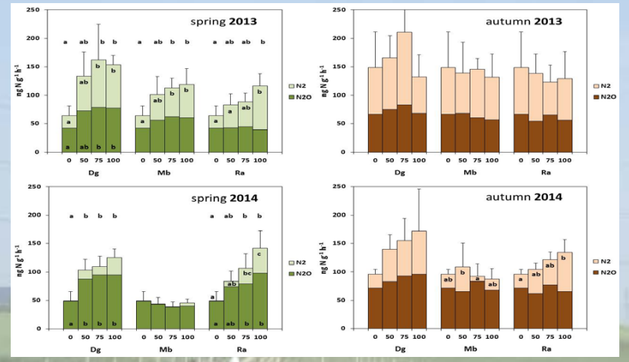
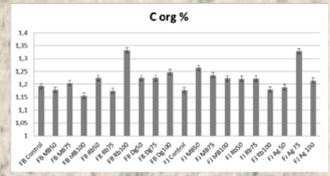
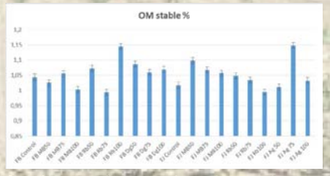


Fig. Denitrifying enzyme activity (DEA) expressed as N_2O and N_2 production from soils sampled at field experiment in Braszowice (PL) in spring and autumn 2013 and 2014. Soils were treated with the EOMs digestate (Dg), meat bone meal (Mb) and compost Rabio (Ra), at different doses: control (0), 50, 75 and 100% of total added nitrogen as fertilizer. The different letters placed in the bars indicate significant differences between the doses, separately for N_2O and N_2 production. The different letters above the bars indicate significant differences between the doses for DEA.

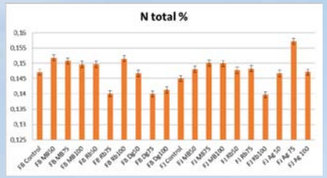
DEA represents a laboratory measure of denitrification in soil. Denitrification is a microbial process responsible for most of N_2O emissions from soil into the atmosphere. N_2O is a potent greenhouse gas (contributing to global warming) and its emissions into the atmosphere was controlled under the Kyoto Protocol of the United Nations Framework Convention on Climate Change. Application of EOM into soil may lead to higher denitrification rate and consequentially also to higher N_2O emissions. Therefore also testing of such material for denitrification activity should be conducted prior producing guidelines for their application into soil.



Organic carbon of lab. analysis – spring sampling



Organic matter of lab. analysis – spring sampling



Nitrogen total of lab. analysis – spring sampling

pH results of lab. analysis - spring sampling

Legend: FB – field experiment in Braszowice (Poland), FJ – field experiment i Puste Jakartice (Czech Rep.); EOMs doses (50, 75, 100 [%]): Ag – agrohum, Dg – digestate, Mb – meat bone, Ra – rabio ; soil properties: Corg – organic carbon content [%], OM stab – content of stable fractions of organic matter [%], N total – nitrogen total content [%], soil pH in H2O

The results of the analyzes presented in the graphs indicate that the EOM added to soils have very different impact on the some soil parameters. Noteworthy is a very positive effect of EOM added to increase the pH of the soils.

Field experiments

- Both field experiments have been concluded – work performed in the fields included:
  - Spring sampling (3rd since EOM application in 2013)– Braszowice – 2014.05.06, Puste Jakartice – 2014.05.06

Braszowice – third sampling – 2014.05.06

Braszowice – third sampling – 2014.05.06

  - Harvest – Braszowice – 2014.09.29, Puste Jakartice – 2014.09.24

Braszowice – harvest – 2014.09.29

Puste Jakartice – harvest – 2014.09.24