Geophysical Research Abstracts
Vol. 16, EGU2014-16048, 2014
EGU General Assembly 2014

Soil ecology and agricultural technology; An integrated approach towards improved soil management for sustainable farming

Mirjam Pulleman (1), Guénola Pérès (2), Stephen Crittenden (1), Djilali Heddadj (3), and Wijnand Sukkel (4)

(1) Wageningen University, PO Box 47, 6700 AA Wageningen, The Netherlands (mirjam.pulleman@wur.nl), (2) University Rennes, 2 rue du Thabor, CS 46510 35065 Rennes Cedex, France (guenola.peres@univ-rennes1.fr), (3) Chambre Régionale d'Agriculture de Bretagne, avenue du Général Borgnis desbordes - BP 398, Vannes Cedex, France (djilali.heddadj@bretagne.chambagri.fr), (4) Applied Plant Research, PO Box 430, 8200 AK LELYSTAD, the Netherlands (wijnand.sukkel@wur.nl)

Intensive arable food production systems are in need of smart solutions that combine ecological knowledge and farm technology to maximize yields while protecting natural resources. The huge diversity of soil organisms and their interactions is of crucial importance for soil functions and ecosystem services, such as organic matter incorporation and break down, nutrient mineralization, soil structure formation, water regulation and disease and pest control. Soil management decisions that take into account the soil biodiversity and associated functions are thus essential to (i) maintain soil productivity in the long term, (ii) reduce the dependency on external inputs and non-renewables such as fossil fuels, and (iii) make agroecosystems more resilient against biotic and abiotic stresses. Organic farming systems and reduced tillage systems are two approaches that aim to increase soil biodiversity and general soil quality, through improved management of organic matter but differ in their emphasis on the use of chemical inputs for crop protection or soil disturbance, respectively. In North-western Europe experience with and knowledge of reduced tillage systems is still scarce, both in conventional and organic farming. Our study targeted both conventional and organic farming and aimed at 1) documenting reduced tillage practices within different agroecological contexts in NW Europe; 2) evaluating the effects of reduced tillage systems on soil biodiversity and soil ecosystem services; 3) increase understanding of agroecological factors that determine trade-offs between different ecosystem services.

Earthworm species and nematode taxa were selected as indicator organisms to be studied for their known response to soil management and effects on soil functions. Additionally, soil organic matter, physical soil parameters and processes, and crop yields have been measured across multiple sites. Data have been collected over several cropping seasons in long term field experiments and farmers field sites in France (Brittanny) and the Netherlands (Flevopolder, Hoeksche Waard). The observed diversity in earthworm communities in terms of species, abundance, and trait diversity could be related to soil quality and soil functioning. Data integration across sites allows for the evaluation of the impact of reduced tillage systems on the provision of ecosystem services via proxies such as crop yields, soil organic matter content, aggregate stability and water infiltration. We will present results of this collaborative work to shed light on some of the benefits and trade-offs associated with reduced tillage systems in NW Europe, and in particular on the role of soil organism groups for soil functioning and crop performance. Finally, scope for improvement of soil management based on novel farm technologies and farming system designs will be discussed.