Geophysical Research Abstracts
Vol. 14, EGU2012-11628, 2012
EGU General Assembly 2012

Nitrogen dynamics in organic and conventional cotton production systems in India

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Ongoing population growth still represents a challenge to agricultural production (food, fiber and fuel material supply). In spite of the undeniable achievements reached with the "green revolution" technologies, there is a growing awareness among scientists and policy makers that diverse and integrated approaches which are both productive and sustainable are now necessary to meet the agricultural challenges. Integrated and organic agriculture are such alternatives which need to be better investigated and implemented. While long-term experiments in temperate regions have assessed the effect of organic agriculture on different crops and soil quality, there is currently a lack of reliable data from tropical regions, such as findings arising from long-term systems comparison trials.

This has necessitated a long-term system comparison trials in Kenya, Bolivia and India by the Research Institute of Organic Agriculture (FiBL) and its partners (icipe, BioRe, Ecotop and Institute of Ecology) (www.systems-comparison.fibl.org). In India the project is based in Madhya Pradesh, in which organic and conventional production systems are being compared in a 2-yr crop rotation - cotton (yr 1) and soybean-wheat (yr 2). The field trial is planned for a time span of 10-20 years, in order to investigate long-term effects of those production systems on yields, soil characteristics, or economic return.

A PhD study is incorporated into this project to investigate the effect of the production systems on soil characteristics. The main focus will be on nitrogen cycling under the different production systems. Particular attention will be given to nitrogen use efficiencies and the synchrony of nitrogen availability (e.g. nitrogen mineralization with the polyethylene bag technique, monitoring of soil mineral N) with plant nitrogen uptake, for which allometric equations will be calibrated in order to circumvent destructive sampling on the plots of the long-term experiment. Nitrogen losses - leaching and gaseous emissions - will also be investigated with methods such as buried ion exchange resin cores and gas sampling in the field. Furthermore, the project will test management solutions to improve nitrogen use efficiencies in both, organic and conventional systems, such as the introduction of leguminous intercrops in cotton, which is the main cash crop in the system and which also has the highest requirements for fertilization. This poster thus mainly discusses methodic issues relating to the planned study.