Tropentag, September 17-19, 2014, Prague, Czech Republic

"Bridging the gap between increasing knowledge and decreasing resources"

Improving Greenhouse Gas Emission Estimates from Livestock Production in Smallholder Farming Systems

David Pelster[1], Klaus Butterbach-Bahl[2,1], Mariana Cristina Rufino[3], Todd Rosenstock[4]

[1] *International Livestock Research Institute (ILRI), Livestock, Systems and Environment, Kenya*
[2] *Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, Atmospheric Environmental Research, Germany*
[3] *Center for International Forestry Research (CIFOR), Kenya*
[4] *World Agroforestry Centre (ICRAF), Climate Change and Land Health Decisions, Kenya*

Abstract

Agriculture in Kenya is a key economic sector, contributing 24 % to the GDP and 70 % to the creation employment. Approximately 60 % of the agriculture sector is comprised of small-scale farms that are often highly heterogenous in cropping, fertiliser, livestock, and manure management strategies. We know that management strategies alter methane, nitrous oxide and carbon dioxide (greenhouse gases — GHG) rates and patterns from large farming systems, however how these affect GHG emissions from smallholder systems is still unknown. Landscape position, soil characteristics, and general land classification may also affect soil GHG emission rates.

Here, we present our systems approach to characterise land-use and livestock production and show how different management strategies and systems affect GHG emission rates. We measured CO_2, CH_4 and N_2O flux rates from soils at 60 different farms in western Kenya using static chambers for nine months. Farms (plots) were selected based on a combination of geographical location (highlands, lowlands and mid-slopes), management strategy (low, moderate and high management effort), vegetation type (annual crops, perennial crops and grazing land) and land classification derived from remote sensing. Auxiliary data including soil inorganic N concentration (0–5 cm), crop type (including seeding and harvest date), soil C stores down to 1 m depth were also collected. The *in situ* monitoring was supplemented with incubations of intact soil cores (0–5 cm depth) at 5 different water-holding capacities to try to estimate emission potentials. Preliminary results indicate that *in situ* emissions and emission potentials differed by geographical location, management and land classification.

Keywords: Agricultural soils, manure management, nitrous oxide

Contact Address: David Pelster, International Livestock Research Institute (ILRI), Livestock, Systems and Environment, Nairobi, Kenya, e-mail: dpelster@cgiar.org