Tropentag, October 7-9, 2008, Hohenheim

"Competition for Resources in a Changing World:
New Drive for Rural Development"

Gaseous Carbon and Nitrogen Emissions in Organic Agriculture in Northern Oman

Konrad Siegfried[1], Herbert Dietz[2], Eva Schlecht[3], Andreas Buerkert[1]

[1] *University of Kassel, Organic Plant Production and Agroecosystems Research in the Tropics and Subtropics, Germany*

[2] *Royal Gardens and Farms, Royal Court Affairs, Oman*

[3] *University of Kassel / University of Göttingen, Animal Husbandry in the Tropics and Subtropics, Germany*

Abstract

Information about gaseous losses of carbon (C) and nitrogen (N) in irrigated organic agriculture in northern Oman is scarce. To fill this gap of knowledge a field experiment was carried out in an experimental farm near Sohar, during which applications of two bovine manure types (a C/N ratio of 39 at high fibre content and a C/N ratio of 31 with a low fibre content) and a control treatment (mineral fertilisers with equivalent levels of N and P and K) were factorially combined with two crop rotations comprising cauliflower (*Brassica oleracea*) and carrot (*Daucus carota* subsp. *sativus*) each preceded by a crop of radish (*Raphanus sativus*). Concentrations of soil-surface emitted NH_3, N_2O, CO_2 and CH_4 were determined using an INNOVA photo-acoustic infrared multi-gas monitor within a closed chamber system and acumulative leaching losses through cartridges filled with cation/anion-exchange resins.

Cumulative gas emissions during a 90 day cropping period attained a total of 14 kg N ha^{-1} (68 % NH_3, 32 % N_2O) and 2,254 kg C ha^{-1} (98 % CO_2, 2 % CH_4) for plots treated with organic manure of high C/N and high fibre as compared to equal 14 kg N ha^{-1} and 1,889 kg C ha^{-1} for plots treated with organic manure of low C/N and low fibre content.

Emission rates declined between irrigation events, most likely due to decreasing soil moisture. The significant effect of time on gaseous emissions determined for N_2O ($p = 0.0266$), CO_2 ($p = 0.001$) and CH_4 ($p = 0.001$) was likely due to changing soil moisture and relative humidity.

Cumulative N-leaching was with a total 13 kg ha^{-1} higher on plots amended with organic manure of high C/N and high fibre in comparison to leaching losses of 6 kg N ha^{-1} on plots with organic manure of low C/N and low fibre content. Cumulative N leaching losses were higher on plots planted with cauliflower than on carrot plots. This may be due to differences in the rooting system and uptake dynamics of both crops.

Keywords: Oman, organic agriculture, vertical nutrient fluxes

Contact Address: Andreas Buerkert, University of Kassel, Organic Plant Production and Agroecosystems Research in the Tropics and Subtropics, Steinstraße 19, 37213 Witzenhausen, Germany, e-mail: tropcrops@uni-kassel.de