Effect of the incorporation of cowpea residues on the yield and greenhouse gas emissions of a following cereal crop

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The inclusion of legume crops in rotations can contribute to the sustainability of agricultural systems due to the ability of these plants to fix atmospheric nitrogen (N) directly to the soil-plant system via symbiotic association with bacteria of the genus *Rhizobium*. The legume post-harvest residue is high in N and C, having the potential to increase the soil fertility if incorporated into the soil and thus to improve the yield of the following crop. A decrease in the use of mineral N based fertilizers can therefore be achieved. Conversely, these residues can greatly stimulate soil microbial activity, which may result in the loss of N by nitrate (NO_3^-) leaching and nitrous oxide (N_2O) emissions, a potent greenhouse gas.

A field experiment with cowpea crop from May to September followed by triticale for forage from October to June was conducted during two years (May 2014 – May 2016). The effects of the removal vs. incorporation into the soil of the legume straw immediately after pulse harvest were evaluated in terms of transfer of fixed N to the triticale crop and in terms of N_2O emissions.

Nitrogen present in the cowpea straw reached 65.9 kg N ha^{-1} in the first year. In this first crop rotation, triticale grown after cowpea achieved the production of 7420 kg DM ha^{-1} when the legume straw was incorporated, a value that, albeit higher, was not significantly different from that obtained when the straw was removed (6928 kg DM ha^{-1}). Total N loss via N_2O emissions was 0.28 kg N-N_2O ha^{-1} when straw was removed and 0.52 kg N-N_2O ha^{-1} when incorporated into the soil. The 2nd year of rotations will end in the end of May 2016 and the results will be presented at the poster.

It is expected that the differences in yield between the two treatments will increase in the 2nd year of rotation due to the cumulative effect of that year's incorporated residue and the

mineralization of the slowly degradable fraction of the first year's residue. When straw was incorporated into the soil, N_2O emissions were almost double comparing to when it was removed. However, both treatments showed low N losses via this gaseous compound.