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The contribution of agricultural practices in semi-arid Africa to soil emissions of N_2O, CH_4 and CO_2

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We measured greenhouse gas emissions from a four cultivation systems in semi-arid regions of Mali in order to determine the relative contribution of different practices to global warming. The flux of soil emitted greenhouse gases (N_2O, CO_2 and CH_4) were monitored over one year (Jan – Dec 2004) from a total of eight cropping systems selected from a larger experiment coordinated by the African Soil Fertility Net Work (Afnet).. The plots (10 m x 10m) were established on three farmers fields in parklands in the village of Siribougou, approximately 35 km from Ségou and 250 km northeast of Bamako, Mali. Three cropping system (continuous cereal, legumes/cereals and cereal/legume in rotation) were selected with and without added organic manure (8000 kg ha^{-1}) in the previous season. In additional continuous cereal production with added inorganic manure (50 kg ha^{-1}) was included. The treatments were selected as they represented the current common practise as recommended by researchers for the region. For the flux measurements a total of 24 (3 farmers x 8 treatments) stainless steel circular chambers (40 cm depth and 40 cm diameter) were dug into the ground at the start of the experiment. Air samples were collected from the head space, transported to the UK and N_2O, $CO_2$and CH_4 analysed by gas chromatography. The influence of organic manure, rainfall and ploughing wereinvestigated. There was a significant difference in N_2O emission (p=0.046) between cultivation treatments with the continuous cereal crop treated with 50 kg ha^{-1} inorganic fertilizer (NH_4NO_3 or urea???) emitting significantly more N_2O annually (197 μg$Nm^{-2}h^{-1}$) compared with the other cultivation treatments (130 -139 μug $Nm^{-2}h^{-1}$). The interaction between the addition of organic and inorganic fertilizer was significant (P = ..), but requires further investigation (What kind of investigation – should you leave this out if you can not go into detail by April?). The addition of organic manure significantly increased (p=002) the

annual emission by 65% (from 101 to 167 μug $Nm^{-2}h^{-1}$) (Is this the average flux for all treatments??). The different management practices did not significantly influence the CH_4 flux and soil respiration. Fluxes ranged between +/- 200 μg $CH_4m^{-2}h^{-1}$ and 0-35,000 μg $CO_2m^{-2}h^{-1}$. These results are important as they support earlier laboratory work indicating that nitrogen fixing crops in Africa do not always result in an increased rates of N_2O emission. I would stop here contrary to the expectations of IPCC methodology (if you continue you better check the IPCC methodology in detail before you write this : there may be some differences in methodology if you apply mineral N to crops –we know that N fixation is turned off when external mineral N is in ample supply . This may have significant impact on the global budgets estimated from this region.