HILLSBOROUGH LONG-TERM NUTRIENT FERTILIZATION EXPERIMENT

Further Results

- A significant decrease in soil microbial biomass was found under the highest application rate of pig slurry and has been attributed partly to lower soil pH but also to accumulation of Cu and Zn in the soil (Wu *et al*., 2012). A significant decrease in arbuscular mycorrhizal colonisation with increasing application rate of both types of slurry was related to soil extractable P, but stepwise multiple regression analysis has indicated that soil Zn and pH are also important explanatory variables (Christie and Kilpatrick, 1992). Unpublished work from the LTS experiment suggests that the relationships between slurry application and silage quality are complex, but any deleterious effects (particularly of cattle slurry) can be avoided by using inexpensive and readily available bacterial silage additives.

- Using stable isotope techniques, a ^{15}N tracing study showed that long-term cattle slurry applications led to a shift toward a greater predominance of mineralisation from labile organic N forms. Increases in slurry application rates were associated with the oxidation of recalcitrant organic N and this causes a shift from predominant NH_4^+ production in the unfertilized control toward a predominant NO_3^- production (heterotrophic nitrification) in the cattle slurry treatments (Christie and Wasson, 2001; Mueller *et al*., 2015).

- Further research shows how ammonia-oxidising archaea (AOA) significantly increased under cattle N additions, whereas ammonia-oxidising bacteria (AOB) increased with the addition of inorganic N. Proportional changes of AOA, AOB and nitrite-oxidising bacteria (NOB) demonstrate that nitrifying phylotypes are influenced by chronic N additions. Also AOA/AOB ratios increased with higher application rates of cattle slurry suggesting that AOA may affect N cycling more in soils receiving animal manures, whereas AOB are functionally more important in chemically fertilized soils (Zhou *et al*., 2015).