

Phd Project: Karin Andersson

Increased nitrogen efficiency from cattle slurry – effects of slurry characteristics, slurry treatments and application techniques

The overall focus of my PhD project is to look at techniques to increase the nitrogen efficiency from cattle slurry, through increased availability of nitrogen and reduced ammonia emissions. With more of the manure nitrogen taken up by crops, the need for chemical fertilizers is reduced, as are the negative impacts from nitrogen lost to the environment.

The project includes untreated cattle slurry as well as the liquid fraction from solid-liquid separated slurry and anaerobically digested slurry, techniques which both result in a lower C/N ratio and thereby an increased nitrogen availability. Techniques for reducing the ammonia emissions from slurry spreading include slurry acidification and the use of trailing shoes, which are compared to the more commonly used trailing hoses.

Field trials are used to study the effects of different combinations of slurry treatments and application techniques on crop yield and nitrogen recovery. The study includes in total six fertilization field trials during two years, 4 in grass ley and 2 in winter wheat. The same slurry treatments and application techniques as in the field trials are also used in ammonia emission experiments, using wind tunnels in combination with a Picarro ammonia analyzer, an instrument that continuously measures ammonia concentration in air from the wind tunnels.

The field trials provide information on how different combinations of slurry treatments and ammonia abatement techniques work under Swedish conditions and on different soil types. The evaluation of differences between clay soils and lighter soils is especially interesting, since a majority of field experiments within this area has been conducted on lighter soils. The ammonia emission experiments using wind tunnels also add valuable information on how the emissions are affected by slurry treatment and application technique, with an extra focus on the clay soil.

In addition to the field scale experiments, soil incubations and pot experiments are used to further investigate the effects of slurry C/N ratio, carbon source (i.e. type of bedding material) and degree of separation on nitrogen availability and crop N uptake.