Managing cattle slurry application timings to mitigate diffuse water pollution

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Around 47 million tonnes of livestock slurry supplying c.210,000 tonnes of nitrogen (N) and c.50,000 tonnes of phosphorus (P) are applied to agricultural land in the UK each year. Efficient utilisation of manure nutrients is essential to reduce diffuse water pollution. Indeed, organic manures are considered to be one of the main causes of controllable nutrient pollution in UK farming systems.
This paper summarises results from a drained clay soil study site in Oxfordshire (England) where the impact of different slurry application timings (autumn, winter and spring) on losses of agricultural pollutants to water (nitrate, ammonium and phosphorus) were quantified over four drainage seasons. The autumn slurry applications to arable land presented the greatest risk of nitrate-N loss to drainage waters ($P<0.05$), with losses in the range 8-11% of total N applied compared with 2-6% of total N applied from the winter timings. However, ammonium and P losses in drainage waters following autumn slurry applications were low. In contrast, slurry applications in winter and spring resulted in elevated ammonium and P concentrations/losses in drainage waters, reflecting the rapid connectivity between the soil surface and field drains when slurry applications are made to 'wet' soils.
The results from this drained clay soil study site show that spring slurry application timings present the lowest risk and autumn timings the highest risk of nitrate leaching loss. However, slurry applications to 'wet' soils, particularly in winter, but also in spring, are likely to result in elevated ammonium and P concentrations in drainage waters (an example of 'pollution swapping'). In order to minimise the risks of diffuse water pollution, farmers will need to ensure that they have sufficient over-winter slurry storage capacity to provide the flexibility to spread slurry when soils have dried out sufficiently in spring (i.e. ideally when the soil moisture deficit is >20mm).