

Development of a system for fertilization with sulfur, reduction of ammonia emission and leaching of nitrate from slurry application and experiences with 5 years use in Denmark

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Initiated by BioCover A/S, a group of companies were assembled (Aarhus University, SEGES, Grundfos) and committed to a joint development project – SyreN - with support from the Danish ministry for development and innovation to develop a system for fertilization with sulfur, reduction of ammonia emission and leaching of nitrate from slurry during application to fields. The group defined and created a demand specification for using sulfuric acid together with a slurry tanker during application with the purpose of being able to adjust the sulfur and ammonium nutrient values in the slurry. Following a successful research evaluation, the system was jointly developed to a pilot scale system for tests and following used in commercial slurry application. The system was tested according to the VERA protocol for ammonia emission. The extensive emission tests concluded an effectiveness of up to 70% reduction of ammonia emissions using sulfuric acid for acidification of slurry during application. Average reduction at pH 6.4 of 49%. App. 60% of all commercial applications results in following the recommended sulfur fertilization rates from the Danish extension services together with application of slurry at pH 6.4. 5 years of certified yield tests in winter wheat have concluded an average increase in yield of 1.7 hkg/ha. A total of 20 % of all slurry in Denmark is now being treated with acidification prior- or during application, with 120 SyreN systems operative in Denmark, using 16.000 m³ of sulfuric acid, without any reports of accidents over 5 years. Yield tests have shown up to 1.9 ton increased yield where sulfur deficiencies could be identified. Denmark is now committed to 24% ammonia emission reduction by 2020, compared to average 6% in EU. From 2016, an EU Interreg project – Baltic sea acidification project, are establishing 7 pilot projects in all Baltic sea states. Software has been developed to allow the user to quantify amounts of sulfuric acid to be used and the nutrient values in the combined application. It also identifies the economy in using the system to optimize the effectiveness of organic fertilizers. A successful demonstration of commercial scale system to reduce both ammonia emission through acidification and reduction in leaching of nitrate through converting ammonia into ammonium. In addition, Sulfur fertilization through slurry application eliminates necessity of using NS fertilizers in certain crops, reducing traffic in fields.

Fangueiro, D., Hjorth M. and Fabrizio G. (2015) Acidification of animal slurry – a review. *J. Environ. Manage.* 149: 46-56.