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PRESSEMITTEILUNG

Innovative fertilization methods: Fewer emissions from slurry fertilization in growing field crops

A collaborative project with the participation of the University of Hohenheim is investigating how to minimize greenhouse gas and ammonia emissions that form when fertilizing with slurry and digestate.

Up to 55 percent less ammonia emissions thanks to innovative methods: Commercial fertilizers such as slurry or digestate from biogas plants could be spread on fields and meadows in a much more environmentally friendly way. This was demonstrated by the initial results of a collaborative project involving the University of Hohenheim in Stuttgart. The project has set its sights on a problem that the 2017 Fertilizer Ordinance and its 2020 amendment have exacerbated by increasing fertilization of already overgrown fields where the fertilizer cannot be incorporated into the soil. Dr. Reiner Ruser from the University's Department of Fertilization and Soil Chemistry received funding amounting to just over EUR 360,000 for the collaborative project, which is financed by the German Federal Ministry of Food and Agriculture (BMEL) to the tune of around EUR 1.7 million. This makes it a heavily funded research area.

"Commercial fertilizers not only release large amounts of ammonia that can harm human health. The plants also lose nitrogen, an important nutrient, as a consequence," explained Dr. Ruser. "For example, under the Clean Air for Europe (CAFE) Directive, ammonia emissions in Germany must be reduced by 29 percent by 2030 compared to the 2005 levels."

In addition, due in part to the intensive use of nitrogen fertilizers in Germany, agriculture accounts for around seven percent of total greenhouse gas emissions. Around half of this is released from agricultural soils in the form of nitrous oxide (N2O), which possesses far greater greenhouse gas potential than carbon dioxide.

In addition to the amount of fertilizer, the techniques used to apply the fertilizer to the fields and green areas play a major role in the release of these gases. Researchers in the collaborative project "Reduction of ammonia and greenhouse gas emissions and optimization of nitrogen productivity through innovative techniques for slurry and digestate application in growing field crops" – GülleBest – are investigating what innovative, low-emission spreading techniques might look like.

Acidification reduces the release of ammonia

Initial results show significant differences in ammonia release. The acidification of slurry and digestate in particular is proving to be especially effective: "If we achieve a pH of about 6.0, which is usually what the soil has, we can reduce ammonia emissions by up to 55 percent," said Dr. Ruser, who works with Prof. Dr. Torsten Müller in the Department of Fertilization and Soil Chemistry.

The concern that this could lead to the increased release of nitrous oxide has not been confirmed either. This makes him and his doctoral candidate Christoph Essich, whose work focuses on recording nitrous oxide emissions, particularly happy.

However, the acidifying technique is not yet widely used in Germany and further studies on the optimization of acidification, such as pH value, occupational safety when handling concentrated sulfuric acid and possible alternative methods would be useful in the opinion of the scientists.

Innovative application techniques can reduce emissions

Especially in combination with what is known as the trailing shoe technique, acidification is very effective on grassland soils. This trailing shoe pushes the grass aside so that the slurry can be spread directly onto the soil. In addition, the GülleBest project is investigating the slot technique on arable land and grassland as well as application via a trailing hose on arable land. The slot technique involves cutting open the turf before slurry is subsequently injected, and trailing hoses allow application very close to the ground between the rows of wheat.

Together with the project partners, Dr. Ruser and Christoph Essich are testing different approaches in growing field crops, such as fields where winter wheat or grass is growing, in a network of coordinated field trials. In addition, the researchers record nitrogen uptake by the plants and assess the economic and operational advantages and disadvantages.

So far, all the tested techniques resulted in comparable yields, both in winter wheat grain yield and grassland biomass production, but differed in their ammonia emissions. For growing crops in particular, innovative, low-emission technologies could help to optimally meet the nutrient requirements of the crops and cut back on nitrogen fertilizers. By reducing emissions in crop production that are harmful to the climate and the environment, they also make an important contribution to environmental and climate protection.

Goal: Derive fertilizer recommendations for as many sites as possible

The overall objective of GülleBest is to derive fertilizer recommendations for organic fertilizers for different soil conditions and site properties for winter wheat and grassland from the data obtained. "Due to the requirements of the Fertilizer Ordinance, which entered into force in 2017, application is increasingly shifting to spring and to fields already covered with crops, such as winter cereals," said Dr. Ruser. "This prevents slurry from being incorporated into the soil and increases the risk of higher ammonia emissions."

Further details:

- Project website
- Expert List Precision Farming / Smart Farming / Farming 4.0 / Agriculture 4.0
- Expert list climate change

BACKGROUND: "Reduction of ammonia and greenhouse gas emissions and optimization of nitrogen productivity through innovative techniques of slurry and digestate application in growing field crops" – GülleBest

The aim of the GülleBest joint project is to investigate innovative and low-emission application techniques in order to make fertilizer recommendations for different soil conditions, crops, and organic fertilizers.

In addition to the Hohenheim researchers, the Christian-Albrecht University of Kiel, the Osnabrück University of Applied Sciences and Samson Agro A/S are involved in the project. The Thünen Institute in Braunschweig is responsible for the overall coordination. The project started on 1 September 2018 and is scheduled to end on 31 March 2022.

The University of Hohenheim has received around EUR 360,000 funding for the collaborative project, which is supported by the Federal Ministry of Food and Agriculture (BMEL) via the Federal Agency for Agriculture and Food (BLE) with around EUR 1.7 million.

BACKGROUND: Heavily funded research areas

In 2020, scientists at the University of Hohenheim raised EUR 33.8 million of third-party funding for research and teaching. In no set order, the series "Heavily funded research areas" presents outstanding research projects with a financial volume of at least EUR 350,000 for technical research or EUR 150,000 for non-technical research.

More heavily funded research areas

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