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PRESSEMITTEILUNG

Wastewater recycling: Agriculture open to design fertilizers in principle

Study by the University of Hohenheim shows: Farmers accept mineral fertilizers produced from biowaste and residential wastewater – provided they meet certain conditions.

Farmers would use novel types of fertilizer made from biowaste and household wastewater – provided they are guaranteed to be pollutant-free. This is because the concern about contamination is the most important obstacle. For some of the respondents, a price reduction would increase their willingness to buy these products. Researchers at the University of Hohenheim in Stuttgart identified this multi-layered snapshot of mood. Under the direction of agricultural economist Prof. Dr. Christian Lippert, they asked 206 farmers about the conditions under which they would be willing to use recycling fertilizers. The study is part of the collaborative project "Agricultural Systems of the Future: RUN - Nutrient partnerships for sustainable agriculture". Its goal is to close regional nutrient cycles and use resources sustainably.

Given the growing energy and resource scarcity, in the future agriculture will have to make greater use of fertilizers whose production does not require fossil resources. The production of mineral recycling fertilizers from domestic wastewater and kitchen waste is a promising approach in this context. This is because elementary plant nutrients such as nitrogen and phosphorus can be recovered from them.

How this approach could be implemented in practice is currently being investigated by scientists in the collaborative project "Agricultural systems of the future: RUN - Nutrient partnerships for sustainable agriculture" under the aegis of the University of Stuttgart. The acronym RUN stands for Rural Urban Nutrient Partnership.

An online survey records the stance of agriculture on design fertilizers

From a technical and ecological point of view, nutrient recycling from domestic wastewater together with biowaste from the kitchen is deemed to be a promising approach to obtaining sustainably produced mineral fertilizers. Because these fertilizers could be adapted to the specific needs of each farm, project participants refer to them as "design fertilizers."

But what properties should such fertilizers possess in order to be widely accepted and purchased by farmers? Researchers at the University of Hohenheim from the Department of Production

Theory and Resource Economics in Agriculture have looked into this and ascertained the attitude of German farmers to these new types of mineral fertilizers in an online survey.

In what is known as a choice experiment, the 206 respondents had to opt several times over in each case for one of three described mineral fertilizers with different properties. This enabled the researchers to estimate their willingness to pay for corresponding fertilizers for the first time on a broad scientific basis.

Very different levels of acceptance affect willingness to pay

"It was revealed that attitudes vary considerably. This can be explained in part by the respective on-farm circumstances," said Prof. Dr. Lippert. For example, the researchers observed significantly greater reservations about design fertilizers, especially among farms that market their products directly in farm stores, for example. The problem is the origin of the nutrients from residential wastewater.

Farmers who sell their products without such direct marketing also had, on average, minor reservations about these new types of fertilizers. But they would accept them with a price discount of around ten percent.

However, not all farmers expected to benefit from a discount when buying design fertilizers: Farms that also grow crops for feed or energy production would purchase such fertilizers at prevailing market prices, too. For them, the origin of the nutrients had no significant impact on their willingness to pay. The customizable nutrient composition of the design fertilizers and constant deliverability also had a sales-promoting effect.

Design fertilizers tended to be less contaminated with heavy metals than conventional fertilizers

"Some farmers even seem to be willing to pay more than for correspondingly contaminated conventional fertilizers if the heavy metal contents of the design fertilizers were well below the statutory limits for fertilizers," said the expert. A plus for phosphate fertilizers derived from wastewater: They tend to be less contaminated with heavy metals than conventional mineral fertilizers based on rock phosphate from fossil deposits.

"On the other hand, the average willingness to pay for fertilizers drops considerably if they were likely to contain residues of medicinal products or other organic pollutants," continued Prof. Dr. Lippert.

Concern about contamination constitutes an obstacle

"Overall, our results suggest that a negative attitude of German farmers toward design fertilizers mainly stems from their concern that recycled nutrients could compromise the product safety of their food crops through contamination, especially with organic pollutants," he concluded.

Guaranteed freedom from pollutants is therefore crucial for the acceptance and willingness of the agricultural sector to use fertilizers derived from wastewater and kitchen waste on a large scale in the future. Researchers at the University of Stuttgart's Institute for Sanitary Engineering, Water

Quality and Waste Management (ISWA), together with their Hohenheim colleagues from the Center for Organic Farming, are therefore undertaking intensive investigations of the safety (low pollutant levels) of the design fertilizers.

"Currently, there is sufficient scope for the introduction of customized recycling fertilizers if the associated technical and hygienic challenges can be overcome," Prof. Dr. Lippert added.

Political circles need to be involved in the market launch

Cost-covering decentralized phosphorus recycling from wastewater scarcely seems possible at the present time without additional financial support. The price reduction that farmers expected for design fertilizers also highlights the need for subsidies if recycling fertilizers are to be widely introduced in practice.

On the other hand, supply shortages and skyrocketing energy prices, especially after the Russian invasion of Ukraine, have raised serious concerns about the security of supply in the European Union. This could create incentives for recycling fertilizers in the future.

In addition, these fertilizers could also be promoted by setting quality standards and creating a trustworthy label. "In this way, policymakers would increase farmers' confidence in a recycling product that has the potential to contribute to a sustainable and circular farming system," recommended Prof. Dr. Lippert.

Further details

Publication: Utai, K., Narjes, M., Krimly, T., and C. Lippert (2022): Farmers' Preferences for Fertilizers derived from Domestic Sewage and Kitchen Waste – A Discrete Choice Experiment in Germany. German Journal of Agricultural Economics (GJAE) 71 (4); DOI: 10.30430/gjae.2022.0235

- Bioeconomy expert list

BACKGROUND: Agricultural systems of the future: RUN - Nutrient partnerships for sustainable agriculture

RUN is one of eight projects of the research project "Agricultural systems of the future" within the framework of the "National Research Strategy BioEconomy 2030". It is funded by the German Federal Ministry of Education and Research (BMBF) to the tune of EUR 5.95 million in total, including more than EUR 680,000 for the University of Hohenheim. The project start date was 1 April 2019. The project was initially scheduled to run for three years and was extended for a further two years up to August 2024.

The project is coordinated by Dr.-Ing. Anna Fritzsche from the Institute for Sanitary Engineering, Water Quality and Waste Management at the University of Stuttgart (ISWA). Other project partners are the Technical University of Kaiserslautern, the University of Heidelberg, the Karlsruhe Institute of Technology (KIT), the Birkenfeld Environmental Campus of Trier University of Applied Sciences, iat Ingenieurberatung für Abwassertechnik GmbH as a practice partner, and the Thünen Institute in Braunschweig as an associated partner.

- Project website with explanatory videos and comic
- Press release on RUN

BACKGROUND: Research Center for Global Food Security and Ecosystems

The Center pursues the goal of helping to improve global food security. It supports scientists in developing and implementing innovative and effective research initiatives on ensuring food security and combatting hunger, with a particular focus on development-oriented research.

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.

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