Produce your own fertiliser while reducing emissions

The world needs to produce more food and reduce emissions. Farmers need solutions that improve their production and environmental footprint, combining environmental sustainability with financial sustainability. And milk processors and food industry need new ways to reduce the footprint of their supply chain to help them reach their net zero goals.

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In fact, according to UN by 2030 the world's population will have increased by 11% to 8.6 billion people resulting in an 21% increase of the demand for dairy 'milk'.

As part of the Green Deal the European Commission set up the 'From farm to fork' strategy to shift the current EU food model towards a more sustainable model. One of the strategy's goals is to reduce the use of pesticides and fertilisers by 50% until 2030.

A new approach and sustainable alternative to chemical fertilisers is now enabling farmers to reduce ammonia and methane emissions from livestock slurry locally on their farm by using air and electricity only.

The challenge of ammonia and methane losses

Liquid manure, known as slurry, can greatly contribute to a more sustainable farming, but how? Livestock slurry is a natural fertiliser providing nutrients for plants and organic matter that improves soil health and enables better growth.

However, the nitrogen content is relatively low for the optimum fertilisation of most crops, and the loss of nitrogen during slurry storage and field application can be significant. The lost nitrogen ends up as pollution in the form of ammonia, but this loss also increases the need for chemical fertiliser.

Manure management in combination with chemical fertiliser production and application is one of the major sources of greenhouse gas emissions in agriculture.

Improve global food production

To make up for the losses, chemical fertilisers are produced using fossil fuels like gas and coal to power the production and are then transported globally to provide farmers with the nutrients they need to grow crops and vegetables.

Besides high emissions related to production and transport, there are high losses of nitrogen and laughing gas (N_2O) during and after field application. The ambition is to find a way to improve global food production by increasing yield and reducing emissions.

How to solve this challenge

There is a new technology available that enables local production of fertiliser by processing slurry, using only air and electricity. The processing significantly reduces harmful emissions and produces an efficient fertiliser that improves crop yield at the same time. This solution uses so-called plasma technology.

By using electricity and air it adds nitrogen from the air directly into slurry, which increases the nitrogen content. Additionally, the processing of slurry also prevents the loss of ammonia and eliminates methane emissions, making it a real solution helping to achieve climate target commitments on an industrial scale.

The plasma technology sounds and

is innovative, but it works just like lightning where input of energy is breaking up the molecule structure of the air. By using electricity and air to produce a plasma gas, the lightning is simulated in a scalable machine. The plasma gas is subsequently absorbed into the liquid manure stream.

The end-product is a nitrogen enriched organic fertiliser (NEO), which has the same characteristics as normal slurry, but contains more nitrogen and significantly less emissions. It can still be spread using existing farm equipment, enabling farmers to improve their own food production, reduce the need for chemical fertiliser, and make farming more circular.

Better for farmers

This solution literally shifts centralised nitrogen fertiliser production in fossil-based industry to local on-farm production by using only renewable electricity and air. It enables farmers to produce fertiliser on the farm instead of buying chemical fertiliser. It supplies farmers with cost effective sustainable fertiliser, making them less dependent on the chemical fertiliser supply chain. Besides this independency of chemical fertilisers, reducing ammonia and methane emissions helps farmers to comply to regulations and to further improve their greenhouse gas (GHG) footprint.

The processing lowers the pH of slurry without adding chemicals. The acidification of slurry reduces 95% of the ammonia emissions in storage and field application and the plasma treatment in all reduces 99.9% of the methane emissions. The combined effects reduce the farm's carbon footprint up to 30%, increases crop yield by 40% and reduces air pollution by 50%.

Another positive side effect is that the new process significantly decreases the strong smell of the slurry and the odour nuisance for surrounding residents is noticeably reduced.

Treating biogas digestate

Besides treating livestock slurry, the technology is also suitable to treat biogas digestate. This works similar to treating slurry and it also results in a higher nitrogen content of the biogas digestate and reduces ammonia and methane emissions.

An important fact as digestates generally have a higher ammonia-N content and high pH and often show high ammonia and methane emissions in storage and field application. Plasma treatment can also add value to anaerobic digestion installations.

The plasma technology surely is a new step to support sustainable farming practices and help farmers to keep up food production while meeting regulatory targets. ■