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## **EFFICIENT TECHNOLOGIES FOR SPREADING OF LIQUID MANURE**

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*Abstract:* The article describes the innovations for spreading technologies of liquid manure. It highlights the advantages of Vogelsang spreading technology and NIR sensors.

*Keywords:* manure spreaders, liquid manure, calibration, soil, distribute, Vogelsang spreading technology, NIR technology, apply.

### **Introduction**

Manure spreaders are used to apply manure uniformly, effectively and consistently from load to load. Having the right selection and calibration of the manure spreader ensures the optimal use and functionality of the manure.

### **Main body**

There are a variety of spreader systems available with different calibration methods. However, manure application systems usually fall into one of the three categories:

1. Solid manure systems that store, move and spread manure on soil;

2. Liquid manure systems that apply manure to soil's surface;
3. Liquid manure systems that inject manure into your soil, below the surface.

Part of manure management is knowing how much manure is being spread. Knowing the amount of manure spread at a planned rate helps plants nutrients and allows to adjust the amount of fertiliser needed.

It is important to remember to spread the manure as evenly as possible. This avoids the field getting excessive nutrients while other parts may not be getting enough. This also prevents any accumulation of excess nutrients in the fields.

Liquid manure systems are for manure that contains less than 10% solids. A tank wagon with splash plates is used to surface the manure. Often, this type of method leads to a non-uniform spreading with a lot of odour. But there are several types of attachments you can use to improve the uniformity and tanker performance.

Brooms can be added to the dispenser with nozzles and drop hoses to help distribute a more uniform and odourless layer.

Other types of applications include direct injection or immediate incorporation of manure into the soil. These spreaders achieve greater manure use and reduce nutrient loss from volatilisation, runoff and odour. Depending on what type of manure spreader system are used, different calibration methods need to apply to guarantee the system is operating to its fullest potential. Calibration is important for the correct amount of nutrients being delivered to the crops.

Wherever liquid manure is used in agriculture, it is essential to distribute this organic fertilizer precisely and with minimal loss and emissions. It is therefore best to distribute the liquid manure close to the ground or to incorporate it directly into the soil.

Vogelsang technology is now gaining popularity. Vogelsang spreading technology is divided into several categories:

1. Dribble bar systems: There are various dribble hose systems for low-level, low-emission liquid manure spreading from a tanker (SwingUp, SwingMax, UniSpread) and for self-propelled vehicles (Compax).

2. Trailing shoe systems: The trailing shoe on the BlackBird, SwingUp Slide and SwingMax Slide linkage divides growing plants during the spreading process and deposits the liquid manure on the soil for an efficient use of nutrients.

3. Umbilical systems: With BackPac liquid manure spreading via an umbilical system opens up a whole new dimension, presenting a high-efficiency alternative especially for farms with rolling hills.

4. Precision distributors: The precise DosiMat and ExaCut precision distributors enable highly specific distribution for various spreading technologies.

5. Soil cultivation: Whether used as an equipment kit for tillage devices (SynCult) or as a stand-alone machine (XTill), these spreading variants provide major advantages for larger agricultural operations, thanks to their combination of two work processes [1].

NIR technology makes liquid manures true value visible. Since NIR sensors have become widely available, the nutrient content can be measured and the uncertainty around their application is much lower. As a result, we no longer speak of the mass of liquid manure in cubic metres, but of the amount of nutrients in kilograms.

Liquid manure is a nutrient-rich organic fertiliser. But until now, natural variance and rapid settling left the success nutrient application to chance. With NIR sensors, such as the John Deere HarvestLab, liquid manure can be applied as needed based on nutrient targets and limits for N, P and K in kg/ha [2].

The sensor provides statistically secure data in real time. Errors that usually occur during manual sample collection (such as, for example, oxygen or heat exposure before the sample arrives at the laboratory) are eliminated. In addition, all data is displayed in real time and documented site-specifically. This allows the operator to adjust machine settings and optimises automated machine operations in the field. The accuracy of an NIR sensor measurement compared to a laboratory sample does not play the decisive role here. What is much more important is the new way the NIR sensor makes it possible to work. With the NIR sensor it is possible to get a value for every second when applying. The NIR sensor enables farmers and contractors to determine the three important nutrient levels in the slurry continuously and in real time [3].

### **Conclusion**

Mentioned technologies help reduce fertilizer costs. The wide range of spreading technologies ensures optimized work processes with minimum time. Combined with soil cultivation, highly efficient units for

directly incorporating the liquid manure ensure exceptionally low-emission and economic spreading of this resource.

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### MICRONUTRIENTS IN RAPESEED CROPS

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*Abstract:* Trace elements are involved in almost all processes of plant life, despite the fact that they need very small amounts. The lack of trace elements in the soil does not lead to the death of plants, but is the cause of a decrease in the rate of their development. In the end, the plants do not realize their capabilities and give a low and low-quality crop. To solve this problem quickly, you can use foliar fertilizing with microfertilizers. The purpose of this study was to assess the impact of foliar fertilizing at different times with new types of complex microfertilizers on the productivity of spring rapeseed and the quality of its oilseeds. The experiments were carried out in the Lipetsk Region in Russia in 2019 and 2020 on Rif spring oilseed rape variety. The research results showed that processing foliar fertilization in the rosette stage with further feeding in the bud-formation phase were most effective. Because of