

# The Great Rate Debate!

Dann Bolinger and Natalie Rector, Michigan State University Extension Educators

With heightened concern for all aspects of manure management, the basic practice of land application is front and center calling for significant advances in technology and management. The reason is two fold: environmental protection and crop performance. Both too high and too low of an application rate can be problematic. Rates need to be based on a combination of the agronomic need of the next crop and the soils ability to capture the total volume.

A recent field comparison of what farmers reported as their application rate and their measured rate revealed a need for improvement. Only six (25%) of the 24 applications measured in the MSU Extension study were within +/- 20% of the reported rate. The most unexpected result was that under application was equally as common as over-application.

## Too Low

While lower than intended rates are non-offensive to the environment, under-application can have a negative effect on crop yields and subsequent profitability if the nutrients were calibrated for crop need. It also creates the expense of driving across more acres and creates unnecessary soil compaction.

## Too High

A manure application rate can be too high for several reasons; it can be too high for the nutrient needs of the crop or too high based on the soil's ability to capture and hold the manure in the root zone. The latter is a contributing factor of discharges to surface waters and is unacceptable. Excessive nutrients are a lost opportunity for the producer who could have captured their value on another field.

**Calibration**

$$\text{Rate per Acre} = C \div W \div T \div S \times 29,700$$

An accurate tractor speedometer (within 0.1 mph accuracy, such as radar) can be substituted into the following equation to calculate rate per acre of manure:

$$\text{Rate/Acre} = C \div W \div T \div S \times 29,700$$

**C** = capacity of spreader (tons or gallons - consider unused volume)\*  
**W** = width of a pass with applicator (feet - consider overlap)  
**T** = time required to empty spreader at the selected pto rpm (seconds)\*  
**S** = ground speed of equipment at a particular gear and the selected pto rpm (mph)

\* If using a drag hose, enter gallons per minute pumped for C, and enter 60 for T.

## Just Right

The key to managing application rates is simply to have calibrated equipment capable of uniformly and accurately applying manure at the desired rate. This may require upgrading equipment that includes flow meters or other rate control abilities.

Among the most practical approaches to calibration is to check the rate currently being applied by simply dividing the volume of manure applied in a load by the acreage covered.

Liquid tanker volumes are readily known and acreage covered is as simple as length times width (in feet) divided by 43,560 square feet per acre. The resulting value is how much of an acre has been covered. Solid spreaders may need to be weighed.

Developing a chart for equipment operators is extremely helpful in

providing guidance as to what gear, rpm, and amount of overlap is necessary to achieve the desired application rates. Training employees to understand and follow calibration charts is equally important. Double-checking these rates from records will maintain consistency in the operation, protect the environment, and ensure yield potential.

For more details on calibrating various land application equipment visit [www.rootzone.msu.edu](http://www.rootzone.msu.edu). 🌱