



## Reducing Manure Application Rates: It Can Be Done

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After working with Dennis Weidman, Huron County Conservation District Groundwater Technician, to complete their farm's comprehensive nutrient management plan (CNMP), brothers Paul and Ralph Swartzendurber of Bay Port, MI were faced with a dilemma: how to spread hog finishing manure at rates low enough to meet the nitrogen needs of edible beans?

They like to apply manure from their swine finishing operation in mid- to late May before planting edible beans in early June. Paul and Ralph knew that by applying manure in May their fields would be dry enough to minimize soil compaction. Past yields showed that edible beans respond favorably to manure application.

The lowest rate they could achieve when injecting manure with their tank spreader was 4,500 gallons per acre. A dilemma arose when the farm CNMP showed a need to reduce manure application rates to 2,500 gallons per acre on edible bean ground to meet Generally Acceptable Agriculture Management Practice (GAAMP) standards for nitrogen and phosphorus. Edible beans have a lower crop removal value than most other crops. Applying at lower rates allowed for applying manure across more acres, thereby reducing phosphorus build-up.

Because the Swartzendurber's seek to be good neighbors and minimize odor emissions from their livestock operation, they are avid believers in rapid manure incorporation when soil conditions allow. To achieve both lower rates and odor control, the brothers decided on surface application to increase travel speed and application width, and immediate, shallow incorporation. The challenge sent the brothers to the farm shop with their design ingenuity and mechanical ability to develop an implement that would meet field and crop fertility needs.

### **Retrofitting manure spreaders to lower application rates**

Paul and Ralph started with a 6,000 gallon tank spreader and removed the injection system that came with the machine when it was purchased. They purchased a used 18-foot field cultivator to pull behind the spreader for immediate incorporation. They attached a sturdy



draw bar to pull the field cultivator on fields requiring a lower application rate, or a chisel plow for higher application rates. The drawbar frame was built with 4 X 2 X 1/4" tubing and attached to the spreader chassis using the brackets from the discarded injectors.

To provide a spreading pattern for both incorporation tools they developed an interchangeable system. Low application rates require a wide spread pattern and a field cultivator for incorporation. The spread pattern is formed with two 6-inch pipes that tee from a manifold attached to the discharge valve. Each 6-inch line extends 32 inches from the center of the manifold. At the end of each pipe is a standard discharge elbow set to angle down and discharges the manure approximately 24 inches from the soil surface. This provides for an even spray pattern in front of the field cultivator and prevents drift onto the cultivator itself. The spray pattern is formed by splash plates welded together from flat steel. The clamp that attaches the splash plate to the elbow can be rotated to adjust the spray pattern to fit the width of the cultivator. Rotating the elbow forward or backward from the spreader adjusts the angle of the splash plate, thus adjusting the width of the spray pattern.



For higher application rates the chisel plow is used. The manifold is removed from the discharge valve and two elbows are connected to the valve in place of the manifold. Connecting two elbows together brings manure up and over the chisel plow's tongue where it is discharged down onto a splash plate directly in front of the chisel plow. The drawbar and chisel plow tongue get covered with manure, but outside of that inconvenience the system is satisfactory.

Fine-tuning of application rates is done with a rubber cone attached to the end of the discharge elbow. By using cones with different size openings they can adjust rates to meet the needs of specific crops on a field-by-field basis.

After two years of use there is no indication of additional wear and stress on the spreader's frame or undercarriage. When comparing the factory installed injection system with the spreader and field cultivator the brothers report that the spreader/field cultivator combination pulls easier, causes less compaction, and maneuvers just as easy as it did before



Paul points out the rubber cone that may be trimmed to adjust application rates.



The rubber cone on the right has been slightly trimmed to increase flow.

the injection system was replaced.

Since developing their current system the brothers have discovered two additional challenges. First, they would like to find a durable but affordable flow sensor to determine the manure flow through the spreader's discharge valve. That sensor would provide input to the same monitor used with the farm's crop sprayer. Once calibrated the monitor would provide a continuous readout and record of manure application rate.

Second, pre-side dress nitrogen testing (PSNT) indicates more nitrogen available from manure incorporated with the field cultivator than when using the chisel plow. Visual appraisal of growing crops and yields shows that the PSNT's are correct. Paul reasons that the chisel plow may be incorporating too deeply, or possibly, the manure is not incorporated as well and volatile nitrogen is lost to the atmosphere.

Second, pre-side dress nitrogen testing (PSNT) indicates more

The brother's next goal is to change the spreading pattern to release manure behind the last set of teeth on the chisel plow and in front of a shallow incorporation tool drawn behind the plow.



The basket attached to the side of the spreader provides easy access to the hose used to transfer manure from the farm's 6,000 gallon nurse tanks.

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