

Agronomic Land Application of Manure

Know your limitation for application of N-P-K



Most environmental regulatory agencies limit the amount of manure that can be applied to crop lands. Each state has their rules and they vary slightly in how they are interpreted. In general, these agencies want the crop uptake between manure applications to fully utilize the fertility that you are applying.

Some states allow Nitrogen based application rates, and others base their application rates on Phosphorus. Nitrogen is the fertility that most farmers are looking for as that needs to be applied annually; where Phosphorus that is applied will remain in the soil until the crop needs it.

In most manures, if you are applying for the desired Nitrogen fertility you most likely will be overapplying Phosphorus that the crops will utilize. This phosphorus loading of the soil will remain available until utilized by crops in subsequent years. With proper crop rotation this excess Phosphorus in the soil can be managed effectively.

Step 1) - Soil Sampling

The first step is to determine what N-P-K fertility the soil already has in it. This requires either annual or semi-annual soil testing. This is generally done by your agronomist in the fall after harvest.

The simplest way is to take an average soil sample with 15 random samples in a given field. These samples need to be taken from soil 0" to 6 inches deep. These samples are put into a plastic bucket and mixed together to get an average for that field. You then send in two cups of the soil to a certified lab for analysis. You then take deep soil samples from 6" to 24 inches; this should be done at the same time and location as the 0" to 6 inch samples.

This establishes the existing fertility in the soil. This becomes the baseline which you use for the agronomic application guidelines.

https://midwestlabs.com/wp-content/uploads/2017/01/soil_sampling.pdf

<https://midwestlabs.com/wp-content/uploads/2016/11/113-Soil-Sampling-Procedures.pdf>

Step 2 - Manure or Slurry Sampling

The next step in the process is to determine the amount of N-P-K nutrients in your dry manure or liquid slurry. For the purpose of this article we will concern ourselves with the sampling of a liquid lagoon. This should be done by your custom manure pumper; they can provide you with certified lab reports.

You need to sample both the top water and the solids to get a true picture of what will be land applied. Lagoon Pumping & Dredging will provide 3 sample results for each lagoon to

be pumped: 1) Lagoon Top Water analysis, 2) Manure sludge analysis, and 3) an analysis of a 1:1 slurry comprised of 1 part top water and 1 part sludge.

Typically, the 1:1 analysis (*this amounts to approximately 12% solid content*) will closely resemble the manure slurry product that will be land applied. But that can vary depending upon the amount of top water that is available. If there is more sludge than top water; then a mathematical determination can be made by combining the top water and sludge ratio.

The actual manure slurry N-P-K fertility applied should be provided to you by your pumper from the samples taken as they were land applying on every 30-40 acres of land. This will be certified lab results available within 10 days after pumping. You can use this information to determine if you want to side dress the fields with additional Nitrogen or other fertilizers.

Step 3 - Crop Uptake

The next step in the process is to determine the amount of N-P-K nutrients that will be utilized by the crop you intend to plant for the expected yield goal. This information is readily available on-line at the following web addresses:

<https://www.ipni.net/app/calculator/home>

<https://plants.usda.gov/npk/main>

https://www.cropnutrition.com/nutrient-knowledge?qclid=Cj0KCQjw2v7mBRC1ARIsAAiw349mq7At-2Sqlp718OK5ZnwXWDF9EV1P1Vsv26s-0Mu3WVcm2L8saAgKnEALw_wcB#NutrientRemovalCalculator

Some states will allow you to use the total crop uptake between fertilizer applications; other states will only allow the first-year crop uptake.

Other limitations are the soil limitations of Phosphorus that are allowed by your state. This is generally 200 ppm. If you are only figuring the top 6" of soil or the root zone of most plants, then the total P limit is 400 pounds per acre. If you are figuring a full foot of soil, then you can double the total P limit to 800 pounds per acre. Since Phosphorus does not volatilize or leave the land other than by crop uptake, leaching or runoff you can plan on the residual P being available for future crops.

For the determination of your lagoons' manure slurry application, Lagoon Pumping & Dredging defers to wishes of the farmer as they know their crop and soil situation the best. Each farmer may wish to consult with their agronomist or crop advisor to determine their recommendations based upon your state's requirements and the history of your manure application.

Step 4 - Determine how many gallons per acre you can apply

Once you know how much nutrients are in your soil, the N-P-K available from your manure slurry, and the N-P-K requirements for the yield goal of your crop you now can determine the number of gallons per acre that should be applied.

Some farmers may wish to add a few more gallons per acre to assure that their crops get all the Nitrogen it needs. You as the producer and farmer are responsible to your states environmental regulatory agency so you will need to make the final determination of how many gallons per acre you wish to apply on each field.