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AgriLIFE EXTENSION
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Land Application of Organic Fertilizers or Amendments

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Applying organic materials to your land can add beneficial nitrogen (N), phosphorous (P), potassium (K), micronutrients and organic matter to your soil. Organic materials can increase the soil's water-holding capacity, improve aeration, decrease erosion, and promote biological activity in the soil. Organic fertilizers can be very beneficial to pastures, crops and lawns, but they can contaminate surface and groundwater supplies if applied excessively or improperly.

Composted manure can be applied using a tractor and spreader.

Preventing Environmental Problems

When too much organic fertilizer is applied to land, plants cannot use all of the applied nutrients. Then, when rainwater runs off the land, it carries these excess nutrients into lakes and streams. N and P occur naturally in streams and lakes, but excessive concentrations can accelerate eutrophication, a process in which dissolved nutrients stimulate the growth of aquatic plants and algae and reduce the level of dissolved oxygen in the water, which can harm aquatic life.

Organic fertilizers may also contain pathogens (disease-causing bacteria or viruses) that can be carried into surface water by rainfall runoff. Pathogens degrade water quality, making it unsuitable for recreational uses and greatly increasing the cost of treating it for use as drinking water.

Selecting the Proper Application Rate

To prevent environmental problems, the most important management practice is to develop a nutrient management plan that bases application rates on annual soil tests and realistic crop yield goals. Fertilizer applications that exceed soil test recommendations waste time and money.

Annual soil tests will tell you the nutrient content of your soil. Then you will be able to determine how much fertilizer your crop needs by subtracting the available soil nutrients from the crop's total nutrient requirement. Remember to base your total nutrient requirement on a realistic yield goal.

Once you know how much supplemental N, P and K to apply, test the organic material you will use to determine its nutrient concen-

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trations. With this information you will be able to calculate the appropriate application rate.

Texas Cooperative Extension's Soil, Water and Forage Testing Laboratory will analyze soil and organic matter samples and determine the proper application rate for your crop. Instructions for using this service can be found at http://soiltesting.tamu.edu. There is a minimal fee.

Collect a sample of compost for nutrient testing.

Remember the following when determining application rates for organic fertilizers:

- Apply at rates to meet crop P requirements.
- Apply supplemental N to meet crop N requirements at realistic yield goals.
- Split organic fertilizer and supplemental N applications so that smaller amounts of nutrients are applied at any one time.

Checking Your Application Rate

Calibrate your application equipment periodically to ensure that it is applying the intended rate. Here is a simple method of verifying your application rate:

1. In an area where material can be easily applied, spread a tarp or plastic bag on the ground and distribute the organic fertilizer over the tarp or bag at your normal application rate.
2. Measure and record the length (L) and width (W) of the tarp or bag used.
3. Carefully collect all the material that was applied directly on top of your tarp or bag.
4. Weigh (M) the collected organic material.

Do this procedure at least three times.

Use a plastic bag or tarp to verify organic fertilization rate.

Apply organic fertilizer to the bag or tarp and then collect and weigh the material.

With the area and weight collected from each sample, you can calculate your actual application rate (AAR) and determine whether it corresponds to your desired application rate. Remember that if application rates are to be made on a dry-weight basis, the tons per acre (wet basis) should be divided by the percent moisture content (MC; decimal fraction) to get the correct application rate. The example below demonstrates how to determine your actual application rate.

Example: Calculating Your Application Rate

Jill needs to apply 2,000 pounds (dry basis) of composted manure per acre to achieve the proper nutrient balance for her desired crop and yield. To check her actual application rate, she has set up the test as described above. The tarp she used measured 36 inches wide (W) by 48 inches long (L). The moisture content (MC) of the organic fertilizer is 5% (0.05).

After each application, Jill weighed (M) the sample and recorded the values. The results are as follows:

Sample 1 (M_1): 0.5 pounds
Sample 2 (M_2): 0.6 pounds
Sample 3 (M_3): 0.5 pounds

Using the following four equations, Jill determined the application rate for each sample.

Sample 1

$$\frac{M_1(lb)}{L(in) \times W(in)} \times 6272640 = AAR_1(lb/acre) \text{ ..... Eq. 1}$$

$$\frac{0.5(lb)}{48(in) \times 36(in)} \times 6272640 = 1815(lb/acre)$$

Sample 2

$$\frac{M_2(lb)}{L(in) \times W(in)} \times 6272640 = AAR_2(lb/acre) \text{ ..... Eq. 2}$$

$$\frac{0.6(lb)}{48(in) \times 36(in)} \times 6272640 = 2178(lb/acre)$$

Sample 3

$$\frac{M_3(lb)}{L(in) \times W(in)} \times 6272640 = AAR_3(lb/acre) \text{ ..... Eq. 3}$$

$$\frac{0.5(lb)}{48(in) \times 36(in)} \times 6272640 = 1815(lb/acre)$$

After determining the actual application rate (AAR) for each sample, Jill then takes the average of all the samples (Equation 4).

Average Actual Application Rate

$$\frac{AAR_1 + AAR_2 + AAR_3}{3 \times (1 - MC)} = AAR(lb/acre) \text{.....} \text{Eq. 4}$$

$$\frac{1815 + 2178 + 1815}{3 \times (1 - 0.05)} = 2038(lb/acre)$$

So, Jill's actual application rate (AAR) is 2,038 pounds per acre. This value is very close to the desired application rate and verifies that Jill's equipment is properly calibrated.

Other Considerations

Location

In order to protect drinking water, fertilizer should not be applied within 150 feet of any private water well or within 500 feet of any public water well. A 100-foot buffer should be left between the application field and nearby streams, lakes or stock tanks.

Weather

Take note of current and predicted weather conditions when scheduling the application of organic materials. If heavy rain is expected within 48 hours, delay the application. Fertilizer applied to wet, frozen or sloping soils is even more likely to be carried away from the application site by runoff or erosion.

Soil

Although nearly any soil can benefit from applied organic material, soils that benefit most are those with good soil depth, no restricting layer in the root zone, a moderate rate of permeability and drainage, and a good nutrient-holding capacity.

Tillage

On cultivated sites, soil should be tilled within 24 hours of application. Tillage breaks up organic material and incorporates it into the soil, which decreases the risk of nutrient loss and places needed nutrients in the crop root zone. Incorporating freshly applied organic fertilizer into the soil also decreases odors.

Conclusion

Several studies have shown that using animal and plant by-products as organic fertilizers is a way to benefit from these resources, rather than wasting them with other disposal techniques. For the most environmentally and economically sustainable program:

- Establish a reasonable yield goal.
- Apply organic fertilizers at appropriate rates based on fertilizer composition and available soil nutrients (as determined by organic and soil sample testing).
- Apply nutrients at the time they are most needed by crops (approximately 20 days after emergence).
- Avoid making a single high-rate application (greater than the crop N requirement) because it can degrade water quality, even on sites with low soil-nutrient levels.
- Do not apply fertilizer or litter just before a heavy rain is forecast.
- To further reduce the possibility of water contamination, alternate organic fertilizers with commercial (inorganic) N.

For Further Information

Managing Crop Nutrients Through Soil, Manure and Effluent Testing (L-5175), Texas Cooperative Extension.

Using Animal Manure and Wastewater for Crops and Pastures: Know and Take Credit for Your N, P and K (E-47), Texas Cooperative Extension.

Feedyard Manure: A Farmland Fertilizer (L-5027), Texas Cooperative Extension.

United States Geological Survey (USGS). 2006. "Eutrophication." Toxic Substances Hydrology Program. Available at: http://toxins.usgs.gov/definitions/eutrophication.html

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