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Organic Matter Application--Can You Apply Too Much?

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Fall is an excellent time to clean-up fields and plan for future crop nutrient requirements as well as increasing soil organic matter content for your farm field management program. Since most vegetable crops have already been harvested, growers should consider the broadcast application of a non-selective herbicide to 1) eliminate both perennial and difficult annual weeds in the field, 2) increase the efficiency of retrieving plastic mulch and 3) help establish a cover crop. Fall is also an excellent time to add soil amendments to increase soil organic matter. Why increase soil organic matter? High soil organic matter (greater than 3.5%) will increase the water holding capacity of soil, increase soil nutrient reserves, increase soil microbiological activity and increase soil tilth.

Organic matter has long been known to improve soil fertility and tilth, which in turn, have increased crop yields. "Organic matter composts", however, is a poorly defined term used for a wide variety of materials - all of which impact soils differently. Therefore, prior to recommending the use of a specific organic compost for a specific purpose it must be tested to determine the nutritive value of the material and the total maximum amount of material to apply per acre. Organic compost/manures can consist of a variety of materials including: chicken - beef - hog - sheep - horse manures, straw, leafs, sawdust, table scraps, treated sewage sludge, peatmoss, etc. Addition of organic composts to soil should take into account; soil type, affect on soil pH, nutrient content of compost, crops to be planted in rotation after addition of compost to soil, and rainfall or total water application through irrigation.

The recommended soil pH range for optimum plant growth, nutrient availability and best bacterial activity is 6.5 to 7.2. The soil pH affects nutrient availability and at a pH of 5.0 to 5.5, both iron and boron become more available to plants causing potential toxicity symptoms while phosphorus and potassium are less available to plants and may result in nutrient imbalances in the plant.

While liberal applications of organic composts (5 to 10+T/A) has been a rule of thumb for many growers in the last decade, it has lead to some very difficult problems in the fields where the organic compost was applied. The most serious problem has been a large release and availability of nitrogen resulting in almost all cases of very extensive vegetative growth at the expense of reproductive growth (reduced fruit production and quality). There has been an extreme build-up of phosphorus in the soil especially with the use of animal manures at rates greater than 5 T/A; resulting in soil P levels in excess of 1000 lbs./A potential for opening phosphorus mines in PA. Also the high P levels in soil probably contribute to the high P levels in the Susquehanna River and ultimately, the Chesapeake Bay. There also can develop an imbalance in the ratios of soil K-Mg-Ca availability, which will have a profound affect on the quality for fruit produced in the field (poor color, soft tissue, blossom end rot, poor shape).

Therefore, important to a good fertility program is calculating the total nitrogen availability in the soil from all potential nitrogen sources. Nitrogen sources include; graded fertilizers (10-10-10 would contain 10% nitrogen per 100 lbs. material), legume cover crops (hairy vetch produces the equivalent of 100 lbs N/A), animal manures (need to know N-P-K analysis before field application) and organic composts (peanut hulls, straw, etc). Plants generally respond to nitrogen when there is low organic matter in the soil, soil consisting of a large percentage of sand, and/or a cold, wet growing season (much like 1996). How much nitrogen should be applied for the crop to be grown?

The crop nitrogen requirement equals the recommended rate of nitrogen application minus the contribution from the previous crop (residual N), minus the contribution from cover crops (especially legumes) planted in rotation, and minus the contribution from manure. Using this method to calculate a crop's nitrogen requirement will reduce/eliminate runoff and leaching of nitrogen and other elements from the soil.

An example of organic matter application is given below in reference to a pumpkin fertility program based on the nitrogen requirement for the crop. A grower plants pumpkins on ground that was in soybeans last year; was planted to hairy vetch after the soybeans were harvested; and 3 tons/A of chicken manure (6-4-3 analysis) was broadcast and incorporated in the spring prior to seeding pumpkins. How much nitrogen should the grower apply to the pumpkin crop? Since the recommended nitrogen application for pumpkins grown on heavy soils is 60 lbs per acre, the grower needs to subtract 25 lbs residual N produced by the soybeans, 60 lbs N produced by the vetch (killed vetch in late March) and 18 lbs N from the manure application. [60 - (25+60+18) = surplus 43 lbs/A nitrogen]. The grower will not have to add any nitrogen to the pumpkin crop since he has a surplus of 43 lbs/A N over and above the required 60 lbs/A nitrogen recommended for pumpkin production.

In conclusion, a sound, well planned organic matter management program will provide; 1) optimum fertility for maximum crop yields and quality, 2) minimize runoff and leaching of water soluble elements, and 3) reduce total fertilizer costs over time.

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