

SOIL TEST INFORMATION SHEET NO. C-110

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Field Corn

1. In field corn production, applying agricultural limestone is recommended when the soil pH falls below 5.8. To ensure optimal nutrient availability, a soil pH of 6.0-7.0 should be maintained.
2. The effectiveness of limestone depends on the particle size of the liming material (fineness factor) and its Calcium Carbonate Equivalent (CCE). Lime recommendations typically assume a CCE of 100. Agricultural lime (Ag lime), primarily Calcite Lime (CaCO_3), is the most common liming material. If the soil's magnesium content is medium or low, dolomitic limestone [$\text{CaMg}(\text{CO}_3)_2$] should be applied. Ideally, incorporate liming materials into the soil 3 to 6 months before planting. It's also important to consider the soil's buffer pH and avoid overliming, as this can induce deficiencies in micronutrients and phosphorus.
3. For consistent results, soil samples should be collected every two to three years, ideally at the same time of year and submitted to the same laboratory. Collecting multiple soil samples per field or grid using a soil probe is the preferred method. In Louisiana, it is common practice to take 0–6 inch core samples and send them to a lab that utilizes the Mehlich-3 extraction method. The LSU AgCenter fertilizer recommendations are specifically based on analyses of 0–6 inch core samples using the Mehlich-3 extraction method.
4. Generally, a yield response to fertilizer application is anticipated when soil-test nutrient concentrations fall below critical levels. The likelihood and extent of yield increase from fertilization are inversely related to how far the soil-test nutrient concentration is below this critical threshold. Research has established reliable critical concentrations for soil test levels of nitrogen (N), phosphorus (P), potassium (K), sulfur (S), and zinc (Zn). It's important to note that these critical nutrient concentrations and the corresponding application rate recommendations may be slightly adjusted based on ongoing research and should be considered approximate. Recommended application rates may vary depending on the nutrient concentration: medium, low, very low. For nitrogen (N), the critical level is 1.25lbs N/bushel on in fine textured soils, and 1 lbs N/bushel in coarse textured soils. For phosphorus (P), the critical level is 35 ppm. When soil test results fall below this threshold, a recommended application rate of 60 to 100 lbs of P_2O_5 per acre is advised. For potassium (K), the critical level is 150 ppm K. When soil test results fall below this threshold, a recommended application rate of 60 to 120 lbs K_2O per acre is advised. The critical level for sulfur (S) is 12 ppm S. When soil test results fall below this threshold, a recommended application rate of 20 lbs S per acre is advised.

5. Other macronutrient and micronutrient application recommendations are generally highly dependent on soil pH. Soils with high pH (above 7.0 – 7.5) may require applications of most micronutrients, except for molybdenum. Molybdenum application is recommended for soils with a pH below 6.0-6.2. Recommended critical concentrations for some micronutrients include 0.01 lb/ac for Molybdenum and Nickel, 0.1 lb/ac for Copper, 0.2 lb/ac Boron, 0.4 lb/ac Manganese and Zinc, and 2.4 lb/ac of Iron.
6. Corn plants require macronutrients nitrogen (N), phosphorus (P), and potassium (K) in substantial amounts. Typically, nitrogen fertilizer is applied as a split of two or three applications. In general, 225-bushel corn removes up to 1.6 lbs of nitrogen per bushel each growing season. The total phosphorus uptake (as P_2O_5) is approximately 0.76 lbs per bushel. For potassium (as K_2O), the total uptake is about 0.84 lbs per bushel. To at least maintain soil nutrient levels, fertilizer should be applied annually at the rate of nutrient removal. Nitrogen applications in corn are based on yield goals, whereas other nutrient applications are based on soil testing and assessment of nutrient critical levels.
7. Field corn plants utilize and remove the secondary macronutrients, magnesium and calcium per bushel, at lower rates compared to nitrogen, phosphorus, and potassium. In general, these secondary macro-nutrients 0.1-5% of the dry weight of corn plant tissue.
8. Field corn plants utilize and remove significantly smaller amounts of micronutrients. Louisiana soils often already contain enough micronutrient concentration for corn production. In comparison to secondary macronutrients, micronutrients usually only comprise 0.025% of dry corn material. Due to the relatively small quantities required, plant deficiencies in micronutrients can often be corrected more readily than deficiencies in macro and secondary macronutrients. In addition to nitrogen, phosphorus, and potassium deficiencies, zinc deficiency is another frequently observed nutrient deficiency. Zinc availability is heavily influenced by the pH of the soil. As pH increases zinc availability is reduced. Therefore, it is important to remember that some soil deficiencies in certain micronutrients can frequently be prevented by adjusting the pH to the optimal range when making lime applications.
9. Prior research suggests that spring applications of phosphorus and potassium, when incorporated and followed by rehipping, can enhance yield potential compared to fall applications. This is particularly true for soils susceptible to nutrient losses through runoff, leaching, erosion, and fixation. However, research has shown no significant yield difference between spring and fall applications when spring applications are not incorporated and rehipped. In soils with chloride toxicity issues, it is advisable to apply potassium fertilizer (which may contain chloride) in the fall. This allows winter rainfall to leach and reduce the chloride concentration in the soil.
10. Contact your county agent for additional information and help in your fertilization program. The agent also receives a copy of this report for the parish office files.