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### HOW MUCH FERTILIZER DOES IT TAKE TO RAISE SOIL TEST LEVELS?

**Many farmers, crop consultants, and fertilizer dealers are asking how much fertilizer it takes to raise soil test phosphorus and potassium levels.** Some farmers have been making excellent yields and are concerned that crop removal of nutrients may exceed phosphorus and potassium application rates. For the last several years, many other farmers have been purposely drawing down soil test levels. A continued “draw-down” approach can reduce farm profit potential, increase the risk of yield loss associated with limited soil moisture or surplus moisture, lead to nutritional imbalances with nitrogen and other nutrients, increase environmental risk associated with reduced nitrogen-use efficiency, and make it more difficult to restore phosphorus and potassium fertility to the optimum levels.

**Inattention to optimum fertilization is not a sustainable farming practice.** A frequent site-specific soil sampling and testing program should be used to identify phosphorus and potassium needs...at least every three years, and preferably every two years. Soil testing should be used to *monitor* soil test levels, not just to see what the levels are in a given field area. Considered with crop nutrient removal, soil testing can help nutrient management planners use appropriate site-specific rates for the best short-term economic benefits as well as the long-term gain.

**Consider the removal of  $P_2O_5$  and  $K_2O$  in a corn and soybean (1:1) rotation over seven years, where corn yields average 160 bushels per acre and soybean yields average 45 bushels per acre.** An estimated 211 pounds of  $P_2O_5$  per acre are removed by corn, 108 pounds of  $P_2O_5$  per acre by soybeans; 139 pounds of  $K_2O$  per acre are removed by corn and 189 pounds of  $K_2O$  per acre by soybeans. This amounts to a total removal of 319 pounds of  $P_2O_5$  per acre and 328 pounds of  $K_2O$  per acre over seven years. Without replacement fertilization in this time period, soil test phosphorus levels could potentially decrease by as much as 10 to 15 parts per million or 20 to 30 pounds per acre (one part per million is equal to about 2 pounds per acre, based on a soil depth of approximately 6 inches). Soil test potassium levels could decrease by as much as 20 to 40 parts per million (40 to 80 pounds per acre). Obviously, significant damage to soil phosphorus and potassium fertility can occur if fertilizer needs are neglected. The same is true for soybean-wheat rotations, rice-soybean rotations, sorghum and cotton production systems, forage systems, and other cropping scenarios.

**Soil test levels can be raised if the rate of  $P_2O_5$  and  $K_2O$  application exceeds the rate of removal by the harvested crop(s).** A general rule of thumb is: 12 to 28 pounds of  $P_2O_5$  above crop removal are required to raise the soil test phosphorus level one part per million. It takes about 8 to 16 pounds of  $K_2O$  above crop removal to raise soil test potassium one part per million. The amounts of  $P_2O_5$  and  $K_2O$  required will depend on the initial soil test level, the rate of crop removal, the soil texture, clay minerals present, organic matter level, and tillage system. Knowledge of these relationships gives farmers greater flexibility to manage soil fertility and to negotiate with landlords and lenders.

**Many agronomists believe that farmers should consider a 4 to 8-year approach in raising soil test phosphorus and potassium to optimum levels.** It is possible to raise levels more quickly, but the economics are often less attractive and the risk of possible runoff losses of phosphorus during intense rainstorms should be considered.

**Farmers need to evaluate their phosphorus and potassium fertility program to determine if they have been mining, maintaining, or building soil phosphorus and potassium levels.** Planning for optimum fertility now will, 1) raise profit potential, 2) ensure that soil phosphorus and potassium levels do not limit the return on other crop production inputs, 3) reduce the risk of crop damage in years with moisture and temperature extremes, and 4) enhance sustainability and land stewardship.

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