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Drought and Nutrient Management Considerations for Dairy Farms

Hot and dry weather conditions often result in reduced forage yields and lower forage quality. Although forage quality and yields usually are the focus for dairy farmers during drought conditions, a drought year also impacts future nutrient management decisions.

The rules for Indiana confined feeding operations (CFOs) and concentrated animal feeding operations (CAFOs) require farmers to apply manure based on soil phosphorus levels. Because application rates and crop yields significantly impact soil phosphorus levels, changes in nutrient uptake caused by drought conditions can lead to increases in soil phosphorus.

More frequent manure sampling may be required during drought conditions. Keep in mind that drought most often is accompanied by higher temperatures and drier and windier conditions. Together,

these, along with less runoff water from lots and rainfall on manure storage surfaces, can increase the concentration of nutrients in stored manure.

Most manure and fertilizers are applied to fields either before the crop is planted or during the early growth stages of plants, to ensure adequate amounts of nutrients are available to meet the needs of the plants. Manure application rates should be based on the specific crop expected to be planted and estimated yields of that crop for the upcoming growing season. If expected yields are not met because of drought conditions, uptake and removal of nutrients from the soil will be less than what was planned for at the beginning of the growing season.

The actual amount of nutrients removed by any given crop during a growing season can be determined by multiplying the nutrient concentration of any specific

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nutrient by the yield of the crop. This likely will be lower during drought. Even though the amount of nutrients removed by crops is fairly easily calculated, nutrient losses are more difficult to determine. Some losses, such as leaching losses, are reduced in dry soil conditions. But other losses, like the volatilization of nitrogen, may be increased.

Timing of nutrient applications also will affect nutrient utilization and removal. Since moisture is needed for plants to uptake nutrients from the soil, timing applications to ensure nutrients are available when both plants are growing and soil moisture is available increases nutrient uptake. Determining the amount of nutrients removed and, thus, gaining an understanding of the amount of nutrients remaining in the soil, provides information for making adjustments to fertilizer application rates on future crops.

An example is provided (top right) using phosphorus to demonstrate impacts of drought on nutrient uptake. Phosphorus not used by crops during the growing season remains in the soil and will be available for future crops. If adjustments are not made for the additional phosphorus present in the soil during future manure or fertilizer applications, soil phosphorus will be increased. The scenario shows the effects of reduced yields on crop phosphorus removal.



Nutrient Management Example

Scenario:

Example of average yields and crop phosphorus removal

- 100-acre field of silage corn
- Expected dry matter yield of 9.1 tons/acre (26 wet tons/acre at 35% DM)
- Phosphorus content of 0.25% (DM basis)
- 4,600 lbs of P applied to the 100 acres to account for the expected phosphorus removal of 4,550 lbs of P/100 acres

Example crop yield and phosphorus removal during a drought year

- Actual DM matter yield of 6.3 tons/acre (18 wet tons/acre at 35% DM)
- Actual phosphorus removal of 3,150 lbs of P/100 acres

Summary - An extra 1,450 lbs of P were applied to the crop and still remain in the field.

In the nutrient management example, the drought conditions would result in a buildup of phosphorus in the soil because of lowered yields and reduced phosphorus removal from the field. The discrepancy in nutrient application and removal needs to be accounted for during the next growing season. Keep in mind that a reduced amount of nutrients should be applied the following season because of the additional nutrients already present in the soil. Failing to account for applied nutrients not utilized by crops can result in a buildup of soil nutrients. Taking soil samples will provide an actual measure of nutrients available in the soil to assist with planning future application rates.

Increasing soil phosphorus concentrations are a particular concern when manure application rates are based on a threshold level of soil nutrients, as they are for Indiana CFO and CAFO operations, or when there are increased risks of nutrients moving through the soil profile or into surface waters.

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