

Fertilizer Application After a Drought

CONSIDERATIONS FOR THIS YEAR AND NEXT

Generally, fertilizer application is not much of an issue during a drought year. Fertilizers often have been applied before the true extent of a drought is known. If they haven't already been applied, you need to adjust rates based on lowered yield expectancy for the drought year. If little or no production is likely, it may be best to skip an application.

Fertilizer use does become a significant issue the year after a drought, however. Low crop yields during the drought year mean that significant amounts of unused nutrients could remain in the soil at the end of the growing season. Where nutrient carryover is substantial, fertilizer needs for the following year are likely to be affected. Several methods are available to help growers determine nitrogen, phosphorous and potassium carryover and current needs.

PHOSPHOROUS AND POTASSIUM CARRYOVER

If phosphorous or potassium was applied but not used because of lower than expected yields, it usually remains in the top few inches of soil. It will not be lost over the winter. Therefore, the unused portion can be credited against nutrient needs for next year's crops.

- ◆ *A formula for determining carryover.* One method for estimating unused phosphorous and potassium is based on the ratio of the actual drought-year yield and the yield goal used to determine nutrient applications that year. For example:

Drought year application = 75 lb./acre phosphate
= 300 lb./acre potash

Drought year yield goal = 6 tons/acre (alfalfa)

Actual yield = 2 tons/acre

Actual yield/yield goal = $2/6 = 1/3$

Therefore, $2/3$ of drought-year application is unused

Estimated carryover = $2/3 \times 75 \text{ lb./acre} = 50 \text{ lb./acre phosphate}$
= $2/3 \times 300 \text{ lb./acre} = 200 \text{ lb./acre potash}$

Comparison of the actual yield with the expected yield shows that the drought-year yields were $1/3$ of the goal. Under the assumption that nutrient removal is proportional to yield, approximately $2/3$ of the phosphate and potash applied in the drought year was not used and likely will be available to the next crop.

- ◆ *Soil tests.* Routine soil tests also can be used to determine the current levels of available phosphate and potash, and to obtain fertilizer recommendations. They are useful for detecting carryover where relatively large amounts of nutrients were applied in the drought year, such as in topdress maintenance fertilizer programs for alfalfa. Relatively small amounts of carryover, such as those that could occur following application in a maintenance program for corn, might not be detected. The tests may be done in spring or fall.

NITROGEN CARRYOVER

Following a drought year, most nitrogen carryover exists as nitrate in the plant root zone. However, the possibility of overwinter loss of residual nitrate makes estimation of carryover more difficult than for phosphorous

SOIL TESTING LABS

Soil testing and analysis are available from the University of Wisconsin soil testing labs in Madison and Marshfield, and other private soil testing labs. Your county Extension office can provide names and locations of commercial labs performing these tests in your area, as well as more specific sampling instructions and forms. To contact the Madison and Marshfield labs:

Soil & Plant Analysis Lab
5711 Mineral Point Road
Madison, WI 53705-4453

phone: (608) 262-4364

State Soil & Forage Lab
Marshfield Ag Research Station
8396 Yellowstone Drive
Marshfield, WI 54449

phone: (715) 387-2523

Additional resources:

Your county agricultural agent, soil testing labs, fertilizer dealers, crop consultants.

Related publications:

UW-Extension publications—

“Wisconsin’s Preplant Soil Nitrate Test,” (A3512);

“Sampling Soils for Testing,” (A2100);

“Step-by-Step Guide to Nutrient Management,” (A3568);

“Nutrient Management Practices for Wisconsin Corn Production and Water Quality Protection,” (A3557).

and potassium. The amount of residual nitrogen in the soil at the end of the growing season must be considered, as well as factors affecting overwinter loss. Specifically, nitrogen carryover is likely where:

- ◆ *The drought-year crop was corn or a non-legume.*
- ◆ *The crop received moderate to high amounts of nitrogen as fertilizer or as legume or manure nitrogen credits.*
- ◆ *Yields were below expected levels.*
- ◆ *Soils are silt loam or heavier-textured.*
- ◆ *Overwinter precipitation amounts are normal or below normal.*

TESTING FOR NITROGEN CARRYOVER

A preplant soil nitrate test should be used to determine how much nitrate has remained in the soil until the next growing season.

- ◆ *Sample in the spring.* Soil samples should be collected in the spring after the frost has left your fields and before preplant applications of nitrogen fertilizer.
- ◆ *Collection methods.*
 - a) Take at least 15 random soil cores from uniform soil areas no larger than 20 acres.
 - b) Take separate samples from areas with soil or management practice differences.
 - c) Sample in 1-foot increments to a depth of 2 feet.
 - d) Each sample should be placed in a clean container marked for the appropriate depth.
 - e) Thoroughly mix the soil from each depth and collect a 1-cup subsample. This sample should be sent to a soil testing lab for analysis.
- ◆ *Air dry or freeze samples.* Do not store or send composite samples to the lab in moist condition. If samples can't be taken to the soil testing lab within one day after collection, they should be air-dried (by spreading on clean paper for 24 to 48 hours) as soon as possible. Another option is to freeze your samples immediately after collection and then either transport them to the testing lab while still frozen or air-dry the samples before shipment.
- ◆ *Provide background information.* The soil testing lab needs to know if you applied manure to your sampled fields or if the previous crop was a legume.
- ◆ *Provide the soil name.* The name of the predominant soil and its organic matter content within the sampled area is needed.