Do your crops need supplemental fertilizer?

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The excessive rainfall on already wet soils has led to nitrogen losses in Manitoba. A common question is "How much loss has occurred and what should be done about it?"

Estimating fertilizer N losses due to wet soils is complicated and not terribly accurate. Since losses are greatly dependent on whether N was in the nitrate or ammonia form, one must estimate the conversion processes. Furthermore, rainfall amounts have varied widely within Manitoba (from 4-12" since May 1 in S Manitoba). Decisions must be made on a field-by-field basis to account for rainfall amount, soil texture (which determines whether leaching or denitrification is the greatest threat), remaining yield potential and N management practice. For example:

a. If urea or ammonia N was applied in fall, the conversion to nitrate was probably complete by mid to late May:
    - leaching losses on sandy soils could be high, especially in low areas, with N leached out of the root zone
    - denitrification losses on clay soils may be moderate, depressed due to the cool soil temperatures. If the soil was saturated for 10 days the losses may be:
        - 2 lb nitrate-N/ac/day loss x 10 days = 20 lb N/ac.

b. If urea or ammonia N was applied early spring, perhaps 50% will have converted to nitrate form – hence losses will be only a portion of that above.

c. If urea or ammonia was banded at seeding, losses will have been minimal, regardless of soil type and rainfall amount.

Can one quantify fertilizer N losses through testing?

Soil testing in mid to late June may prove useful, but may be complicated by:

- Ammonium and urea-N are not detected by the conventional nitrate test.
- Banding creates areas of very high N concentration strips between low N areas and gathering a representative sample is very difficult. Many cores must be taken to overcome the banding challenge
- Even if the midseason soil test values are accurate, the interpretation of those values is very challenging and is not the same as interpretation of soil samples taken prior to crop establishment. The amount of soil plus fertilizer N required to feed the crop until maturity will depend greatly on the stage of crop growth and the yield potential. For example, a wheat crop takes up a large part of its nitrogen requirement between tillering and heading. Therefore, low soil test N values for an advanced crop are not as large a concern as low soil test N values for a juvenile crop.
- It is late enough that some N will be mineralizing from organic matter. This is available to the crop – but generally not accounted for when developing N recommendations from the nitrate test.
- Supplemental fertilizer N should be applied early enough to increase yield potential (e.g., prior to flagleaf emergence or bolting in cereals or canola, respectively).
- Some areas have developed a pre-side dress nitrate-N test for corn. These have been calibrated to provide a fertilizer recommendation based on the nitrogen present. For details, refer to this Ontario webpage http://www.omafra.gov.on.ca/english/crops/field/news/croppest/2010/03cpo10a2.htm

Crop scouting and tissue testing

- Scout fields carefully to note N deficiency, which is general yellowing of the young plant. Unfortunately, severe wetness and oxygen depletion of the root zone creates identical visual symptoms to N deficiency. Under waterlogged soil conditions roots will not function and many nutrients become deficient in the plant while still remaining present in the soil. To avoid such a confounding diagnosis, delay sampling until soils dry sufficiently that traffic can be done in the field.
- There are few N critical levels established for crops tissue sampled at this stage.
- Since the plant expresses N deficiency through reduced leaf greenness, these can be detected visually or with devices such as a chlorophyll meter. However, chlorophyll meters are not widely available, need to be referenced to a "high N" check area and critical levels are only developed for Manitoba crops of winter wheat and corn.

Does it pay to apply more N to the crop?

This depends on how much N was lost and what the potential yield will be. Delayed planting or stand loss and plant stunting in the wettest areas will have reduced the yield potential, and perhaps the remaining N is adequate.

Supplemental N rates should not be based on full N loss and replacement to original application levels.

For cereal and canola crops consider the following suggestions:

- Where N losses are estimated to be high and yield potential is still good – apply up to 2/3 of original targeted N rate
- Apply up to 1/3 of original targeted N rate if estimated losses are moderate but yield potential is good – or if estimated losses are high but potential yield is only fair.

Fortunately in the eastern Prairies spring rainfall is more reliable and so top-dressed N is often moved into the root zone of the growing crop. At this point, volatilization losses of topdressed urea may be high if rainfall is not received. Consider use of a urease inhibitor or other N forms, such as dribble banding UAN solution.

Sulphur

Sulphate-S (SO_4^{2-}) is moderately susceptible to leaching in sandy soils. It tends to leach less than nitrate-N owing to its combining with soil calcium and forming less soluble gypsum in many soils. Losses and S deficiency will be most likely on knolls and other well-drained areas of the field. As with nitrogen, observe fields closely for signs of S deficiency – especially in canola fields. Visual S deficiency symptoms are cupping and purpling of leaves. Tissue sampling may also prove useful. Supplemental S fertilizer in the sulphate form (ammonium sulphate or ammonium thiosulphate) can be applied until the bolting stage of canola.

Summary

In summary, excess soil wetness causes several soil fertility problems, including significant nitrate-N losses by leaching and denitrification. Estimates of N losses and possible supplementation with more nitrogen are a complicated process and must be performed on a field-by-field basis.