SOIL TESTING AFTER A GROWING SEASON OF DROUGHT

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Precipitation across Alberta in the 2021 growing season ranged from somewhat drier than normal to extreme drought. Most areas of southern Alberta were the driest in the province with less than 50% of normal growing season precipitation. South central to north central Alberta generally ranged from 60 to 90% of normal precipitation and much Peace Region was in the 60 to 70% range of normal. A few examples are shown in Table 1.

Generally, yields of most crops were lower than average across Alberta. Crop yield deficits were correlated with moisture deficit. But the other complicating factor affecting yield was the number of very hot days in June and throughout July. Almost all crops grown in Alberta are cool season crops which do not tolerate long periods of excessive heat. For example, pea may terminate flowering after four to five days of very hot temperatures of greater than 30°C. For many crops in 2021, yield deficient was a function of both a lack of moisture and excessive heat.

When crop yields are lower than typical, it stands to reason soil nutrient uptake is often reduced resulting in higher soil nutrient carryover than typical. At the end of the 2021 growing season, the question for most farmers is "how much higher will soil nutrient carryover be, going into 2022?" The only way to accurately assess this is to very carefully soil test each field. Nitrate-nitrogen (NO3-N) and sulphate-sulphur (SO4-S) are the two nutrients that are more likely to be higher than typical.

A complicating factor in accessing nutrient carryover is that in very dry areas there wasn't enough moisture for banded fertilizer to dissipate and move out of the band for plant uptake. In drier regions of Alberta, a fair amount of fertilizer may remain in the fertilizer band where it was originally placed.

Normally, at least 20 or more soil sampling sites are necessary in a uniform field or soil/crop management zone in a field, to accurately assess residual soil nutrient levels. However, fields with intact fertilizer bands will have greater "micro-scale" variability. This requires even more careful soil sampling and a greater number of samples per field or soil/crop management zone to account for nutrient variability and to ensure each soil sample is representative of the field.

Table 1. Examples of normal versus actual growing season precipitation at selected sites across Alberta. (Data source: Alberta Agriculture Climate Information Service)

LOCATION	LONG-TERM AVERAGE PRECIPITATION MAY 1 TO AUG 31	ACTUAL PRECIPITATION MAY 1 TO AUG 31, 2021	% OF NORMAL
LETHBRIDGE	205	90	44
BROOKS	185	85	46
STRATHMORE	235	195	83
DRUMHELLER	215	185	86
OLDS	290	205	71
LACOMBE	280	250	89
DAPP	280	195	70
FAIRVIEW	225	130	57
PEACE RIVER	210	125	60

Ross McKenzie, using soil cores, explained at an Alberta Agriculture field day near Vegreville how soil properties change within a field and the resulting variability in soil nutrient profiles.

To ensure fields are properly sampled, farmers need to seek out a reputable, well educated, trained and experienced agronomist to conduct accurate soil sampling. When your fields are being soil sampled, ride along with the agronomist taking the samples. It can be a great learning experience to see how the soil samples are taken, how many samples are taken and where they are taken. It gives you the opportunity to see first-hand how variable your soils are in your fields.

After soil sampling, the agronomist must ensure samples are sent to a reputable lab. Be sure you know which lab is doing the soil analysis. Ask your agronomist why they use this lab! If it is not an Alberta soil testing lab, ask if the lab uses the soil test methods recommended for Alberta, such as the modified Kelowna method for plant available phosphorus. If the lab does not use this method, you won't be getting the best phosphorus recommendations! All phosphorus fertilizer research in Alberta for the past 30 years has been based on this method, which has proven to be the best method for Alberta soils. Ask if soil tests such as cation exchange capacity (CEC) or base saturation percent (BS%) are done on your samples. These soil characteristics do not change from year to year, so it is not necessary to test every year and is a waste of money.

The next step is the agronomist and farmer together, should carefully review each soil test report for each field. What is the crop to be grown in each field next year? What is the target yield? Is the target yield reasonable based on soil moisture reserves going into next spring? What is the long-range weather forecast for next spring and summer? What are the nutrient requirements based on the target yield of the crop? The soil nutrient levels for each field or the management zones for each field, should be jointly reviewed by the agronomist and farmer. Which nutrients have higher carryover than normal? Decide which nutrients are adequate, marginal, or deficient based on Alberta fertilizer research, coupled with the experiences of both the farmer and the agronomist. Taking all factors into consideration for each field, decide which nutrients need to be applied as fertilizer and at what rates, keeping economic and agronomic factors in mind.

With the substantially higher cost of most fertilizers, it is important to only apply the fertilizers that have a reasonable probability of economically increasing crop yield. If probability of yield increase of a particular type or rate of fertilizer is low, it may not be justifiable.

When reviewing soil test reports, take the time to monitor and evaluate any soil changes resulting from longer term crop and fertilizer management practices. Review soil analysis to identify and diagnose any problem soil issues that may be slowly developing.

SOIL SAMPLING TIPS

- Microbial activity will affect soil test Nitrogen (N) levels. There is minimal N mineralization when soils are 5-7°C or less, so delay fall sampling until soils have cooled to these temperatures. In spring, sample as early as possible when soils are thawed but still within this 5-7°C or less temperature range, even for late-seeded crops like dry beans or soybeans.
- Some sampling equipment can auger or core through frozen soils. Frozen soil sampling can produce reliable results if samples are handled properly and the lab receives representative material.
- Refrigerate soil soon after it is taken from the field. Deliver samples directly to a local lab or ship with "Next Day" or "Overnight" delivery to minimize the potential for samples sitting in warm conditions.
- Sulphur (S) and N are both soluble and move in soil as water moves. After growing seasons with above average or well above average growing season rainfall, both N and S may have moved from the nutrient-rich surface soil to sub-surface horizons. Sample deep enough to capture these nutrients at depth.

Check out https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/epw11920/$file/3-3.pdf for more information.