DROUGHT IMPACTS ON SOIL FERTILITY

Resources 2022

When excessive heat strikes, the best agronomic management is critical today and for the long-term

When drought strikes, it's effects reach beyond the current year's yields. From plant quality to end-use, to next year's crop planning, and nutrient management for years to come, dry conditions can have lasting impacts. Because nutrients move through the plant's moisture uptake, drought and soil heat impair nutrient uptake and nutrient use. These effects vary from crop to crop.

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Get to know your soil

Following a drought year, nutrient levels left in the soil will likely be higher and may mean less inputs required next year. Soil testing allows you to understand the nutrient levels while avoiding over-fertilizing, unnecessary spending, and environmental impacts.

Garth Donald, Decisive Farming's manager of agronomy and co-founder, explains. "If you fertilized expecting a 60-bushel wheat crop and in today's conditions it's likely to be a 20-bushel crop, it will only take up what it can use," he says. "In dry conditions, the need for nitrogen promotes higher protein levels that could sit as high as 16 to 18 per cent."

High protein can change end use, with drought-affected crops being cut and baled for feed, drastically reducing the price received for that crop. "There will probably be some malt barley crops where the excess nitrogen has driven protein levels up as well," says Andrea Bilodeau, Decisive Farming's senior agrologist. "When it's driven too high, that malt won't pass muster for malting contracts, and it may be sold into the feed market."

Canola fertilized for an expected 50-bushel yield that produced only 20-bushels won't use as much fertilizer, and you can expect to see much of their fertilizer go into reserve for next year. Understanding where those levels end up will be essential to making sound decisions for next year.

This includes leveraging variable rate (VR) technologies and soil sampling to understand where a crop performed well compared to where it struggled. "Soil testing allows us to understand what that crop nutrition is in those situations at the zonal basis," says Donald.

Soil samples should be taken throughout the year and tracked for use in future drought years. Based on the results, you can make more informed decisions around application rate changes for each nutrient as each will respond differently to drought conditions. For example, "In the case of extremes, potassium is essential for the plant to control its ability to open and close its cuticle during key times," Bilodeau.

What is left in your fields can make the difference

You can achieve better yields by planning and building optimal nutrient levels, as was the case last year for a Decisive Farming client. "We did attribute some of his increased yields to a strong fertility program and a cognizant look at what needed to be put down in the field," says Bilodeau. "We don't just think in terms of this year but which nutrients we can build over time, especially with potassium and phosphorous. In some years, that can certainly provide some insurance."

Another way to manage different fertility levels and rebalance the soil's health lies in adjusting the crop rotation. "One of our customers was expecting this dry weather and we talked about that," says Bilodeau. "He was very selective and opted to use more drought resilient crops."

When rebalancing for next year, soil samples will reveal where changes are required. "If a field carries over high residual nitrogen levels going into 2022, it's probably not a good idea to put a pulse into that field," says Donald. "They are not going to perform and it's a waste of the nitrogen. It may be more suitable to plant another crop that can use it. That's the value in looking at a VR program – to be able to have that data set of soil data information broken out into five-to-six sample point areas rather than just one with that data set to make these decisions."

Planning for the future

Having and saving that soil sampling information can pay off next time drought hits, showing which varieties performed best under those conditions. "Maybe we're looking at similar weather next year or four years down the road. What performed this year and what didn't? How do you make that decision without that data set?" Donald asks. "Your data needs to be in a usable form, in one platform, that's accessible."

Fertility planning and adjustments often happen at least a year ahead of time. Communication with a trusted agronomist should be ongoing to get the best results. These conversations will create nutrient plans that meet the goals of 4R nutrient stewardship: applying at the **right rate**, with the **right source**, in the **right place** and at the **right time**.

"We continue to meet the 4R expectations," says Bilodeau. "We don't fertilize to excess. Where some might put 100lbs of nitrogen right across the field, we use that as an average, with low areas in the 40-50lb range. We've met the right place in the right amount. Farmers who were going to apply top-dressing options have pulled back at the right time because the potential is not there. We'll be balancing out each nutrient source, including nitrogen, potassium and phosphorous in all we do."

Managing your nitrogen bank account in a drought year

- by Garth Donald, Manager of Agronomy

Back in 1930ish, Will Rogers said, “the farmer has to be an optimist, or he wouldn’t still be a farmer.” A lot might have changed in a hundred years of agriculture, but Will Rogers’ wisdom still holds true. Through flooding and hailstorms, August frosts and harvest snowstorms, most farmers manage to hold onto an “it’ll be better next year” attitude. In 2021, it was drought that compromised crops across much of the prairies. It’s critical that when you fertilize, you do so – yes, calculating forward with optimism – but also looking backwards at what wasn’t.

If you fertilized for a 50bu/ac canola crop this year but drought conditions mean the field only yields, say, 15bu/ac, the crop will have only used 38 of the 130lbs/ac of nitrogen applied. Going into next season, that field will already be primed with just over 90lbs/ac of nitrogen. Many, if not most, farmers under-calculate that residual, leading to over-application the next year.

When you don’t manage your fertility with an eye to what’s already in the soil, an excess of nutrients can cause problems. Too much nitrogen enormously increases the likelihood of lodging. Not only will lodging cost as much as 25 to 30% of yield, it’ll also drop possible combining speed in half or more. And, being excessively generous with nitrogen can shortchange one’s ability to invest elsewhere in a farm business.

There’s another piece too. Growing public interest in greenhouse gas emissions from fertilizer means proving our fertilizer use is responsible, informed, and based on best practices is critical.

If you’ve heard it said once; you’ve heard it a thousand times: the key to success, especially after an outlier year, is soil testing. Identifying actual nutrient levels allows you to make informed decisions about fertilizing to optimize yield and sustainability, mitigate wastage, and manage costly agronomic headaches including lodging.

Yes, I know that some agricultural farmers lack trust in soil testing. I understand that getting accurate and consistent results from soil testing used to be difficult. But that’s not the case anymore. GPS technology, better sampling techniques, and improved analysis tools allow you to accurately compare results from identical locations year to year. I can confidently and with science behind me say that your very cheapest and best investment – even in a drought year when you’re trying to save every dime – is a soil test.

Consider the math. Soil testing costs roughly $0.85/ac. Currently, urea is over $700/ton, which works out to $0.69/lb. That means a soil test is going to cost you less than 1.5lbs/ac of nitrogen. Perhaps you’ve got 30 or 50 or even 90lbs of residual nitrogen. While this might not be the year for a lot of cash flow, residual nutrients are like a savings account you may have forgotten you’ve got. Knowing what’s in that nutrient savings account allows you to make informed decisions so you can optimize next year’s returns no matter what nature throws.

This is not the year to drop potassium off your application menu

- by Garth Donald, Manager of Agronomy

With drought conditions cutting deeply into your wallets, you are justified in looking in every direction you can to trim costs. Unfortunately, I can already predict one direction many farmers will look first to save money: their potassium bill. In fact, drought is the very worst time to knock potassium off your application menu.

There are several incorrect perceptions about adequate potassium rate. First and foremost, many think potassium isn't particularly important. They're wrong. It's not accidental that agronomists and nutrient experts always preach nitrogen (N), phosphorus (P) and potassium (K). In the order of nutrient importance, potassium is second only to nitrogen depending on crop types.

If you look at a plant leaf under a microscope, you'll see thousands of tiny pores. These stomata are the openings that allow plants to take carbon dioxide (CO_2) in and move oxygen (O_2) and excess moisture out of the plant. Stomata are much more than simple chimneys, though. They open and close depending on weather and plant conditions to precisely control the optimal rate of gas and moisture movement.

I've been in a dozen, maybe a hundred, fields where a farmer has pointed to a wilting crop and complained about lack of moisture. What they sometimes don't realize is that wilting is often as much a result of potassium deficiency as water shortage. That's because potassium plays a critical role in managing the opening and closing of the stomata. If a plant is potassium deficient, it won't be able to close its stomata, leading to unnecessary moisture loss and wilting. Insufficient potassium is a problem anytime, but its impact on stomata can drastically accentuate the impact of dry conditions.

Managing the rate of moisture loss is just one of potassium's key functions. Potassium is also a key component in the creation of cell walls. As such, maintaining recommended rates of potassium directly impacts standability. It's also crucial in developing protein structures and it impacts the overall look of seeds (a key consideration for seed growers).

Many believe their fields naturally have adequate potassium. While some Canadian prairies fields are blessed by high reserves of naturally-occurring potassium, far more are deficient.

Part of the challenge is that actual soil levels and plant available levels differ significantly. A field that shows decent potassium – say 200 or even 300 ppm – may be functionally deficient if its magnesium levels are high. That's because potassium and magnesium need to be balanced for each to fulfill its role in plant nutrition. Given that many western Canadian acres have high magnesium levels, functional potassium deficiency is very common. Too, different soil types 'hold' potassium differently. Sandy soils, for example, eat potash like nobody's business, which means a farmer can put on strong rates annually and still not achieve any significant reserves.

One of the biggest roadblocks to adequate potassium application is historical use. In the early 80s, research determined that Albertan soils had adequate potassium stores. Nervous of potassium's salt toxicity and happy to save a few dollars, farmers were more than willing to skip additional potassium application. However, farming today isn't the same as farming 40 years ago. Whereas a high-performance wheat crop produced 35-40bu/ac crops in the 1980s, today we're yielding nearly double. What was adequate nutrition back then simply isn't adequate today.

Admittedly, determining the correct rate of potash application – a rate that ensures adequate potassium is available in the seed row without burning plants - is a challenge. Potassium is only 30 to 40% available in its year of application, and only moves maybe ½ to ¾ of an inch per year. So, optimizing this nutrient requires a long-range perspective.

Your cereal seeding rate matters too

24 years ago when I first started in this business, almost every farmer planted canola at exactly the same rate. No matter how sandy or loamy, high or low moisture, productive or thin-yielding the land, and no matter how plump or slim the seed, we planted 10 acres to the bag. But, because canola seed is expensive and canola companies were invested in optimal production, seeding rate practices changed. Today, 1000 kernel weight (TKW) testing is a given in canola, corn, sunflower, and beans, and variable rate seeding is intriguing more and more farmers.

In cereals, however, some still tend to plant by feel and habit. When I ask a farmer their cereal per acre seeding rate, the most common answer is, “Oh, well about a bushel. Maybe a bushel and a bit.” Rather than planting based on seedbed utilization or plants per square foot, many cereal farmers still plant based on “that’s the way my dad did it” tradition.

But here’s the thing: cereals are no different than row crops or canola. If you want to get the most from your land – and let’s face it with today’s land and input prices, that’s the only way to survive in agriculture – you need to put the right number of seeds in the ground.

Planting the right rate enables you to apply the right rate of nutrients with no wasting and no shortchanging.

It also allows proactive moisture management. In dry years, a heavy-seeded field might look more productive, but an optimally-seeded field will actually yield.

Too, seeding right promotes plant health and ground cover to best manage weeds.

Weed resistance is a big deal. Already we’re seeing the spread of Roundup-resistant kochia, group 1, 2 and 8-resistant wild oats, and more.. However, one of the simplest, first-line-of-defense tools to manage resistance is promoting a strong plant population that covers the ground quickly and adequately.

So here’s what I recommend

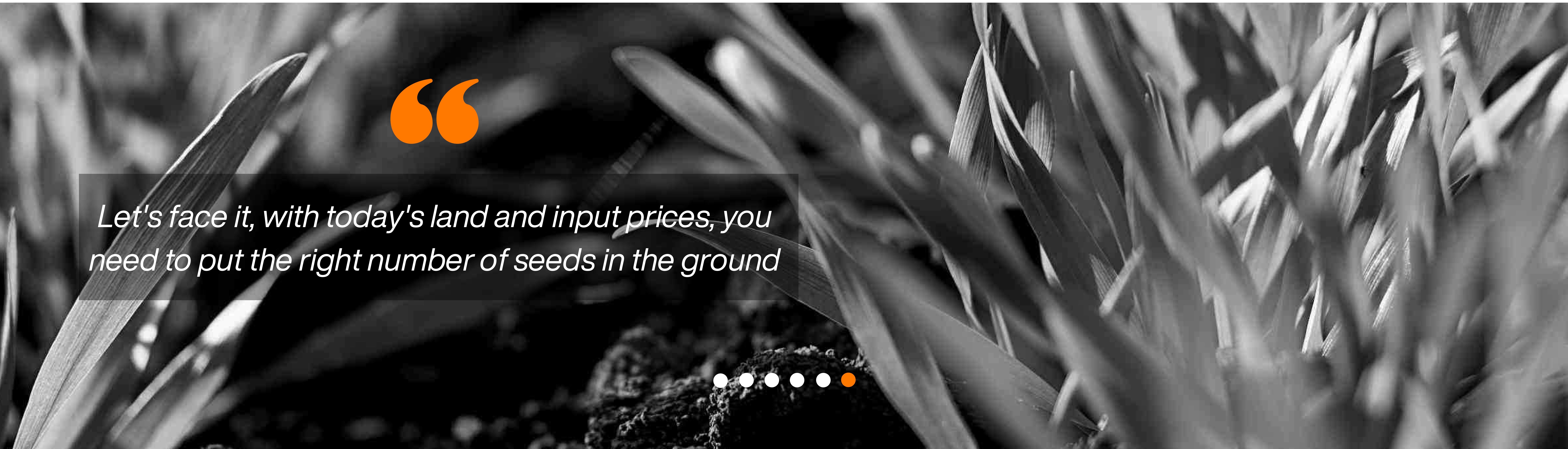
First, value your cereal seed. When farmers use their own seed, they rarely view that seed as having value beyond the $1.50 or $2.00 cost of seed treatment and cleaning. But seed – homegrown or otherwise – has inherent value. Take feed barley, for example: if you could have sold that barley for $8/bu to a mill, it’s still worth $8/bu going back into your field.

Putting a dollar figure on the seed you save for planting can make it easier to view it as a true resource worthy of precise management.

Second, invest in a thousand kernel weight (TKW) test. Yes, even in cereals. The $20 cost and small amount of effort means you have the information you need to make accurate rate decisions.

Third, start moving towards matching your seeding rates as closely as possible to what’s actually happening in your fields. For some farmers, optimizing seeding rate could mean full variable rate seeding. To them I say, fantastic: variable rate seeding is absolutely the way of the future and the way to get the very most from your land base. For other farmers, however, optimizing seeding rate may mean adjusting rates on a field by field or area by area basis. To them I also say, fantastic: small steps towards optimized seeding rates are a big improvement over a one-size-fits-the-whole-farm seeding method.

Finally, remember that you’re not on your own. Loads of great resources and advice are available today to help you make decisions that will work for your unique farm priorities.



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