

SOILS AND CROPS



If someone comes knocking on your door to propose a variable rate prescription, be sure you're ready to ask some hard questions before you sign up.

Precision ag may not work on your farm

In the field, precision ag does not yet live up to the hype that has surrounded it



Les Henry

If we go into a farm meeting and ask how many are using auto steer almost all hands go up. If you ask how many are using variable rate only a few respond. The uptake has been slow and many techies think that farmers are slow adopters. Guess what folks: if it works farmers are all over it like a dirty shirt. The hype around precision agriculture has not been followed up with results.

In essence, precision ag is really about farming individual soils rather than the entire field. I am a firm believer in the concept.

THE SCIENCE

The scientific journal entitled *Precision Agriculture* started in 1999 and is now up to Volume 18. In today's world it is all available at the click of a mouse. In early issues many of the papers dealt with the fancy technology that could be used to make pretty maps but with little agronomy attached to it. A review of recent issues shows a shift in emphasis – not to agronomy but to complex mathematics.

In recent issues we see such titillating titles and phrases as “An experimental simulation of moisture distribution and its uniformity within the soil profile under laboratory conditions.” What does a lab have to do with field variability?

“Multi-variate adaptive regression splines” and “classification and regression trees analysis (CART)” leaves one wondering what application is possible.

“Assessing the potential of an algorithm based on mean climatic

data to predict wheat yield” was an interesting title but within the article the authors admitted that “unknown future weather remains the main obstacle to reliable yield prediction.” Really, who would have thought it!

Some years ago I had someone ask me what algorithm I used to make my annual Soil Moisture Map. My answer? “The one between my ears.”

PRECISION AG: THE STARTING POINT

The first thing to realize is that one size does not fit all. What works on nearly level thick, black Elleslie clay loam at Edmonton is not likely to provide much useful information on dark brown Weyburn loam at Saskatoon with sharp eroded knolls and numerous sloughs intermixed with “normal” soils on midslopes.

In almost all the scientific papers I have read or heard regarding precision agriculture, the land or soil type is seldom if ever mentioned. Basic information about the soils, topography, agronomic history and area climate should be the starting point.

Yield maps from combine data can be useful but a single year of data does not cut it. In a dry year much of the yield might come from lower areas that tend to gather more runoff. In a very wet year those same low areas may be drowned out and much of the yield comes from midslopes and hills. If the yield varies within a field we must know why it varies to plan a precision ag strategy.

Pretty coloured maps based on satellite imagery from various years may highlight differences based on averages over a number of years but average is exactly

what we are trying to get away from with precision ag.

EC MAPPING TO FIND MANAGEMENT ZONES

Many believe electrical conductivity (EC) mapping can aid in the delineation of management zones.

In past years there have been a wide array of fancy instruments that promise to make a map based on several indirect methods. EC mapping seems now to be the most common and the EM38 is the unit I see used most often.

This old scribe likes to think he has tromped over more acres with an EM38 in hand than most. I am a huge fan of that instrument. It was my great pleasure to take an EM38 to the field with the person who invented it: Duncan MacNeil of Geonics Ltd. – a Canadian Company with headquarters in Mississauga. I would not even think of doing any soil investigation without an EM38 and I personally own one.

The theory is simple. The EM38 uses an ordinary nine-volt battery to induce an electromagnetic field and then measure the earth's response to that field. In the vertical position it “sees” to about four feet and in the horizontal position to about two feet – just right for agriculture.

But it is a measurement of EC, which is affected by temperature and moisture. Clay soils hold more water than sand so clays will give a higher reading if both are moist to depth. The main application of EM38 is the mapping of saline soils. If salts are high, moisture will be high by definition and high readings will be obtained. The main application of EM38 has been as a salt meter for various parts of a field.

A no-brainer for variable rate is to map the very saline areas and make the fertilizer application = 0 in those areas, and perhaps up the seeding rate as well. Even better, if there is a large enough area, plant it down to salt-tolerant forage and quit annual cropping.

In non-saline environments an EM38 can make a soil texture map if all soils are at field capacity moisture and moisture is not present. The point is: the EM38 always gives the right answer, but it is up to the user to interpret what that answer means.

The modern EM38 used in precision ag is a single instrument that does vertical and horizontal readings in one pass and can be hooked up to give a map of a piece of land.

At the same time as EC is mapped a topographic map can also be made. This is where technique comes in. Various mappers may use various spacings to do a grid map of a quarter section. Grids are for folks that do not understand the landscape. It is all about water. That little slough that holds water in spring needs to be mapped by dedicated passes.

CropPro Consulting of Naicam, Sask., uses such an approach in their patented SWAT (Soil Water and Topography) method. I have no financial interest or have done no consulting with CropPro but have had many fruitful discussions with principal Cory Willness and have learned a lot from him.

NITROGEN

I recently found a piece of work done in the Peace River contry by SARDA (Smoky Applied Research and Demonstration Association) that found that both EM38 and Veris instruments worked well to

map soil texture (and moisture) but the zones did nothing to provide variable rates for nitrogen.

Nitrogen is still the big cost and still the big return. For years I have been begging for some research entity to look at the simple matter of leaving a fall soil sample that is at field capacity moisture sit in the soil bag for a month and then send it in. I think that the N mineralized during the growing season offers more potential profit than most variable rate schemes in present use.

CONCLUSION

If someone comes knocking on your door to propose a variable rate “prescription” some questions you should ask are:

1. Have you done your homework; do you know the soils and landscapes of this area?
2. What plan do you have to accommodate what we have on this farm?
3. What nutrient, pesticide or other input or management practice do you intend to vary?
4. If you think perhaps our soil/landscape may be a poor candidate for precision ag will you admit it?

With some of the very big farms today it may even be necessary to have more than one approach on different parts of the same farm. *en*

LL (Les) Henry is a former professor and extension specialist at the University of Saskatchewan. He farms at Dundurn, Sask. His book, “Henry's Handbook of Soil and Water,” mixes the basics and practical aspects of soil, fertilizer and farming. To order a signed copy, send a cheque for \$50 (includes shipping and GST) to Henry Perspectives, 143 Tucker Cres, Saskatoon, Sask., S7H 3H2.