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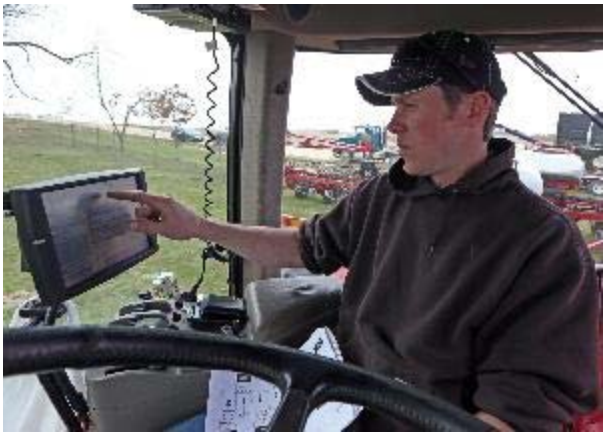

Farmer Craig Breuer programmed the GPS control unit on a Case STX 325 tractor before planting corn on fields.

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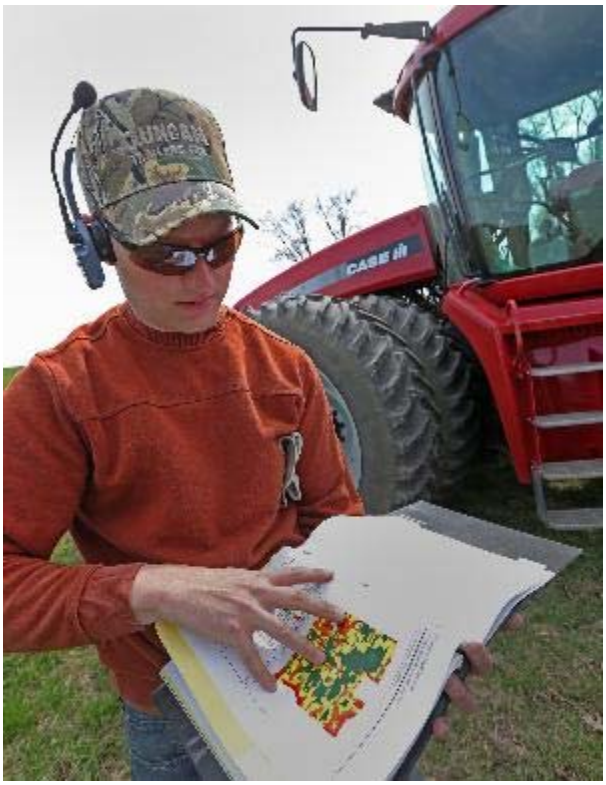

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Farmer Marty Amundson showed how fields are programed into the control units, telling where to put different amounts of seed, depending on the soil's quality.

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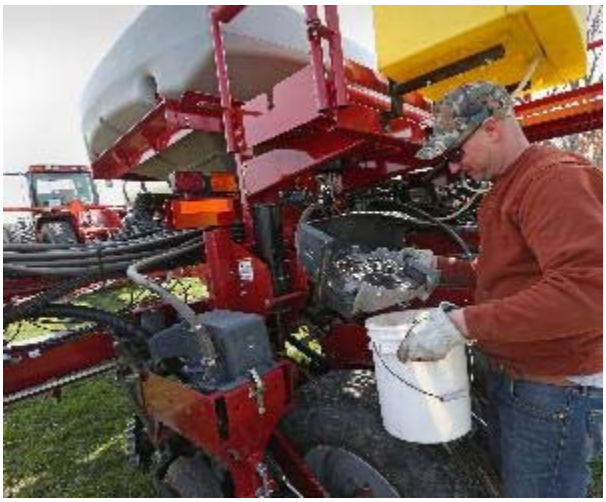

Farmer Marty Amundsen cleaned out seed from throw units on a huge planter attached to a Case STX 325 tractor before planting corn on fields.

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Precision agriculture: GPS, robots, drones are new Minn. farmhands

- Article by: TOM MEERSMAN
- Star Tribune
- May 15, 2014 - 5:14 AM

ZUMBROTA, MINN.

For Marty Amundson, farming is measured in inches, not just acres.

As he and hundreds of other corn farmers began tilling, fertilizing and planting last week, an increasing number is turning to technology to optimize their crop.

The techniques, known as precision agriculture, incorporate global positioning systems and digital mapping software linked to machines that apply just the right number of seeds and just the right concentrations of fertilizers and herbicide to get the most out of the fields.

"The technology's been figured out, and now the guys are saving money doing it," Amundson said. "Ninety percent of the guys I know are using it."

Precision agriculture has gone from largely experimental to mainstream since the mid-1990s, and more technology is on the horizon: narrow robots that chug down corn rows to zap weeds or squirt fertilizer and drones that hover above cropland taking pictures of insect infestations.

The changes are exciting to Amundson, beginning his 11th year as a grower. He and his brother-in-law and father-in-law will plant about 1,700 acres of corn and 300 acres of soybeans on family and rented land this season. “It feels good to be moving,” he said, looking across a 140-acre, gently rolling field near Zumbrota, Minn.

The University of Minnesota created the first Precision Agriculture Center in the country, and its director David Mulla is a pioneer in the field. “It’s amazing something that didn’t exist 30 years ago has now been adopted by large numbers of farmers across the whole globe,” he said.

Mulla said farmers traditionally spread uniform amounts of fertilizers, herbicides, insecticides and seeds across their farms, but scientists and farmers began to realize in the 1980s that the fields were more complicated than that. One field may have several different soil types, moisture levels and fertilizer needs, he said, and the amount of corn it would grow can vary significantly from acre to acre.

Precision agriculture figured out how to produce fertilizer prescriptions tailored to individual fields, Mulla said, so that more nutrients were applied where they were needed and less where they weren’t. He estimates that 30 percent to 40 percent of corn and soybean farmers in the Upper Midwest now use variable rate fertilizer systems. The same principle has been followed with herbicides, insecticides and seeds, he said, so that farmers waste less and save more.

Today, variable seed planters and chemical spreaders link to digital mapping programs that automatically adjust to deliver at different rates as they’re driven across a field. Yield monitors measure the number of bushels of corn or soybeans instantly as they’re being harvested in the field. Global positioning systems connect directly to hydraulic steering mechanisms that allow tractors and combines to run on autopilot.

“The first time you watch a tractor steer for a quarter mile as straight as a string without you touching the steering wheel, it’s close to magic,” said Todd Peterson, technology innovation manager for Winfield Solutions, a wholly owned subsidiary of Land O’Lakes.

At the controls

Amundson’s brother-in-law Craig Breuer entered commands on a touch pad screen last week in the cab of a Case International STX 325 four-wheel drive articulated tractor. He then drove onto a 140-acre field, pulling a 60-foot wide planter with 24 row units, or small hoppers. Each unit inserted seeds into a furrow 1 3/4 inches deep and spaced 6 1/4 inches apart with a squirt of starter fertilizer, and covered them with a layer of soil and a trickle of secondary fertilizer.

A monitor in the cab showed gray ahead and green behind as the planter crawled across the land, planting 24 rows at a time, 30 inches apart. If Breuer turned the tractor too sharply at the end of a pass and began to overlap any land already planted, individual units would be “told” by the program to shut off to avoid double-seeding.

A different map showed the 140-acre field divided into zones, color-coded according to fertility. Programmed software hooked to the GPS system automatically adjusted the distance between seeds as the planter moved across zones: about 6 inches apart in the more fertile areas, up to 7 inches apart in less fertile soil where the corn would not grow quite as robust, based on soil quality and past harvest results.

Costs and benefits

Mulla said costs for high-tech agriculture are always an issue, but farmers are increasingly finding that they can profit by using the devices. Precise planting and fertilizing can increase yields and the quality of crops, he said, and reduce expenses by using less seed, chemicals and fuel.

“And if we’re using less fertilizer or less herbicide, then less is getting into our surface and groundwater,” Mulla said.

Many of the systems have become standard as farmers upgrade their equipment. One survey suggested that 70 percent of the corn and soybean farmers in the Upper Midwest now use some type of automatic steering.

Precision farming has also created hundreds of companies that make and sell agricultural software, Peterson said, and train the service providers, local coops and farmers to use it.

“Not long ago you would advise a farmer using hand-drawn instructions,” he said. “Now we implement suggestions with a thumb drive, and ultimately it’ll be wireless. It’s how we do agronomy now.”

Unmanned help

Entrepreneurs and universities are experimenting with the next wave of futuristic farm tools: robots to tend plants and drones to check for crop stress or insects.

Rowbot Systems, a Minneapolis start-up company, showed off a prototype robot in several fields last fall that could motor between corn rows to add nitrogen fertilizer in midsummer when corn plants need it the most and heavy machinery isn’t an option.

“There’s lots of opportunities during the season when the needs of plants are changing and we can respond to those needs in a very tailored way,” said Rowbot CEO Kent Cavender-Bares.

The robots, 20-inch wide machines, could also be programmed to plant cover crops or sense where to target herbicides and insecticides, he said.

Unmanned aerial vehicles, or drones, also have a future in farming, said Ian MacRae, associate professor of entomology at the University of Minnesota, Crookston.

Remote sensing from satellites and aircraft allows farmers to see areas of stressed plants, he said, but it’s not always clear whether the poor growth is the result of drought, disease or insects.

Drones that can fly over a field at 100 feet can provide faster and better images of crops that are not doing well, he said, without the need to hire a pilot or wait for clouds to clear. Federal officials have not yet released regulations for commercial use of drones, he said, but the U has permits to use a 3-foot electric octocopter at certain research plots.

One of the mini-helicopter’s missions is to carry regular and near-infrared cameras to photograph stressed crops, MacRae said, and develop “spectral signatures” of their wavelengths to identify particular insects, such as soybean aphids. Data like that could allow farmers to pinpoint and treat insect hot spots before a whole field is infested, he said.

A few more years of research is needed for that technology, MacRae said, and federal rules need to be established.

“Once we get to that point, it’s going to take off, it really is,” he said.

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