

# Soil sampling goes to the robots

**The rubber-tracked AgroBotics AutoProbe travels over fields at 11 km-h, plucking a soil core on-the-go every five metres**

**Ron Lyseng**  
Winnipeg bureau

Farmers, engineers and soil labs have been trying to take the drudgery out of soil sampling for decades. A new machine might be just what they've been looking for.

Introduced this winter by the Agro-

Botics company in Arkansas, AutoProbe is an automated robotic soil sampling machine that penetrates six inches into the soil to pull cores for the soil test lab.

The device runs on a 15 foot rubber track pulled by a utility vehicle. Once every rotation, the synchronized probe is triggered to plunge through the one hole in the track to snatch a core.

At a ground speed of 11 km-h, one core is lifted every 1.5 seconds.

The rapid-fire probe and core gathering equipment are pneumatically driven to achieve the instant response required to push the probe into the soil and pull it out again as the machine maintains its ground speed.

AutoProbe is capable of continuous operation and doesn't need to stop until the utility vehicle needs gas or the driver needs a coffee break.

The machine gathers 19 or 20 cores every 100 metres, totalling approximately 0.45 kilograms of soil. The soil is then pneumatically transferred to the utility vehicle, bagged as a single sample and labelled.

A 100 metre run is used because grid system sampling is commonly performed on a 2.5 acre grid, measuring 100 by 100 metres.

With this calibration, the GPS controlled AutoProbe can automatically sample a grid. Depending on the accuracy of the GPS, an operator may be able to pull cores from exactly the same



The AgroBotics AutoProbe automatically pulls 20 soil cores from each 2.5 acre grid, as it prints out a label with the exact field co-ordinates and data needed by the lab. (Photos courtesy of AgroBotics)

spots in the field year after year.

Operators can use GPS guided auto-steer on the utility vehicle to keep their hands free to apply a label to each sam-

ple. Labels include field co-ordinates and other relevant data needed by the soil lab.

AgroBotics chief executive officer Jeff Burton said the AutoProbe never becomes confused, despite multi-tasking at a high ground speed.

"The machine's just fine at that speed," he said.

"But the operator might get confused with all that stuff happening at the same time."

He said AutoProbe is more accurate than previous sampling methods.

"The typical method has always been to go out to the middle of the grid and pull a core. With this system, you get a uniform representation because you

**"With this system, you get a uniform representation because you have 19 or 20 cores from one side to the other."**

— Jeff Burton,  
AgroBotics CEO

have 19 or 20 cores from one side to the other."

The idea for AutoProbe originated with Jeff's father, Jim Burton, who farms with his son near Tupelo, Ark.

The elder Burton said that in his 35 years of farming, soil sampling was the most mundane chore he had to endure.

"It's just no fun. It's backbreaking, tedious and hot. But there's no

doubt that farmers are more successful when they have their nutrients right."

He said even though farmers know

soil testing is critical to profitable farming, the average producer might only sample a field once every three years.

Jim started farming after graduating as an agricultural engineer in 1965. When GPS became available in the early 1990s, he envisioned it as a key to simplifying the task of soil sampling. The challenge would be to marry GPS to an automated robot that could collect cores at precise locations.

## On-the-go sampling

It wasn't until 2002 that his first AutoProbe prototype finally went into the field. Although there are other mechanized soil samplers, Jim said their machine is the only one that has fully automated, programmable GPS steering and that can pull cores on-the-go.

Added Jeff: "Everything is mapped

out for each individual farm. More accurate historical records can be kept almost down to the exact centimetre of farmland. That ends up saving on chemical and treatment costs."

He said the initial target markets are soil sampling services, ag retailers, agronomy consultants, fertilizer co-ops and farmers with large acreages or high value crops.

The Burtons had originally planned to sell the AutoProbe for about \$25,000 each, but decided instead to put the first batch into the hands of clients who they think will make the most use of them.

For 2008, they will have six machines in the

**AutoProbes are available to rent in some U.S. states but are not yet available in Canada.**

field on a contract basis with high-use customers. Jeff said the charge of \$2.50 per acre for sample collection is similar to industry rates.

"For this year, all the AutoProbes will be in the lower 48 states. But we've already had inquiries from your neck of the woods (Canadian Prairies) so we'll be heading there eventually.

"Also, we anticipate developing a probe that will pull a 12 inch (deep) core."

On Feb. 14, the AutoProbe was named one of the Top 10 new products at the 2008 World Ag Expo in Tulare, California.

For more information, phone Jeff Burton at 501-551-7999 or visit www.AgroBotics.com.

Soil samples are delivered to the cab of the utility cart. Autosteer allows the driver to label samples according to information on the data screen.

(Photos courtesy of AgroBotics)

## Soil sampler says probe will save on fertilizer

Winnipeg bureau

AgroBotics' AutoProbe was a dream come true for Scott McKee.

The chief executive officer of A&L Soil Labs in Memphis, Tennessee, had been talking with his staff about how they might develop a GPS-driven robotic automatic soil sampling machine to make sampling easier.

"Then all of a sudden these guys from Arkansas showed up here with their invention," McKee said.

"They had just gone ahead and flat out built the very machine we were already talking about. I just got back yesterday (April 15) from watching the machine at some field demos in California. It's an ingenious piece of engineering. And it really works."

He estimated the new probe is 10 times faster than a conventional probe mounted on a truck and will probably allow an operator to take 10 times as

many cores in a day.

McKee said mechanical automation removes the human fatigue factor from sampling.

As long as the operator can drive the utility vehicle, every sample from morning until night will be consistent and from the same depth.

He said 20 cores per grid are far better than most people deliver.

"A lot of guys, when they're doing sampling, will drive to the centre of

the grid and just take one big sample, especially later in the afternoon," he said.

"The machine gives us 20 uniform cores per grid. The result is a more accurate fertilizer recommendation and better use of your fertilizer dollar."

McKee said he and Jeff Burton of AgroBotics are talking about how A&L and AgroBotics can work together to expand the probe's use.

"What we want to do is ride along on their success wagon because they have the technology. And Jeff says they want to ride along on our wagon because of our reputation. But really, we're in this together."

## Improvements underway

McKee said he wants to improve the automated container and labelling system so that samples will move seamlessly from field to lab, improving turn around time for the results.

While AgroBotics is targeting producers of high-value crops such as fruit and vegetables, McKee said broad acre crops such as wheat and canola will benefit as well.

"I think this machine has a fit any

The soil sampling probe sticks through the tracks and is set up for a depth of six inches. Plans are underway for a 12 inch probe.

place a farmer is doing some sort of precision agriculture or trying to do a better job of managing his fertility program."

— LYSENG

### Soil sampling 101: A field guide

**Field sample depths**

Test 15 to 20 sites per field. Samples should be taken at zero to 15 cm, 15-30 cm and 30-60 cm for each field.

Source: Staff research, Alberta Agriculture, Farmer's Edge Consulting, Westco Fertilizers  
WP graphic by Michelle Houlden

### Soil sampling tips

- Soil samples taken from the wrong areas of a field can create an inaccurate picture of a field's nutrient inventory.
- Topography is not the only issue when it comes to sampling. History plays an important role in defining where to sample and what defines a field.
- Fields that have grown several different crops in selected areas will leave those zones with unique nutrient profiles. Areas where manure was applied or that were part of a long-term forage rotation or the subject of a reduced tillage regime may have increased capacity to make nutrients available and may respond better to fertilizers than other areas.
- Economically significant areas that are historically different from the rest of the land need to be sampled separately, say agronomists. This also applies to areas with different soil types and textures.
- Once the samples are taken, the soils from zones that will be managed uniformly can be blended based on the depths from which they were acquired.
- Samples should be segregated and unique areas recorded if variable rate management is anticipated.
- Samples need to be kept in plastic containers or bags and producers should dry the dirt without excessive heat that might cause losses or transformation of nutrients.
- Moist samples should be transferred to labs immediately.
- Historical information should be provided on the soil sample information sheets so the soil lab can provide the most accurate nutrient recommendations.

### Areas to avoid when sampling

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## I didn't think it was that windy...

...one good gust was all it took.

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