



What's Next in Soil Testing

Expanding Agronomy Service
through Predictive Soil Models



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Executive Summary

While soil testing remains essential to agronomy, scaling physical sampling across millions of acres creates seasonal constraints. Retailers need new tools to extend insights between sampling cycles. As labor shortages increase and growers demand faster, more personalized recommendations, ag retailers are under pressure to modernize how they manage fertility decisions.

Virtual Soil Testing (VST) also known as Predictive Soil Models (PSM) solves this challenge by augmenting field sampling with AI-powered nutrient modeling. Built on 50M+ acres of training data, VST uses historical soil tests, weather, and crop history to generate lab-quality insights on demand, at a fraction of the cost.

For agronomists, adopting digital tools and predictive analysis means more acres served with less admin. For retailers, it offers a scalable, digital-first model to differentiate service offerings, drive product sales, and reduce cost-to-serve. VST integrates seamlessly into existing platforms like FarmCommand or can be deployed via API or white-label partnerships.

Farmers Edge brings not just the technology, but the infrastructure, validation, and agronomic depth to make virtual testing work at scale. For retailers looking to stay ahead, VST represents a practical, proven way to modernize agronomy, utilized across 1.4 million acres for the 2025 growing season.



The Problem

Physical soil sampling requires manpower, operational efficiency and rapid action to deliver quickly for growers during high volume agronomy windows. On top of agronomists' time, retailers need their lab partners to be delivering results quickly to ensure fertility decisions and plans can be implemented.

Top Concerns for Retailers & Agronomists:

- Field labor is constrained, with the average agronomist managing 50,000+ acres and struggling to grow coverage without burning out.
- Soil tests cost \$7 to \$25 a sample, limiting annual coverage and reducing ROI on subfield prescriptions.
- Most recommendations are built off carryover data from prior-year soil tests when fields are out of cycle rather than current, in-season insights.

Why it matters:

Physical soil testing delivers essential agronomic depth, but VST adds another layer of data that can inform and support agronomists' fertility prescriptions. It's not a replacement, it's added value to growers and retailers to supplement when manpower or costs are high, while not sacrificing the data and insights needed to deliver fertility prescriptions.

Macro Context

- North America has 900M+ acres of farmland, but only a small fraction is sampled annually.
- 56% of farmers cite lack of agronomic capacity as a barrier to digital adoption.
- Agronomy staffing levels are flat while farm-level data needs are exploding.
- Precision tools are growing, but most are bottlenecked by slow, static sampling infrastructure.

Why it matters:

Without scalable agronomy inputs, the digital transformation of agriculture stalls at the field edge.

Agronomy Workflow with VST

VST doesn't eliminate agronomy—it amplifies it.

Traditional Soil Testing Workflow

Time to recommendation: 7–14 days

Challenges: Time-consuming, costs per acre, constrained by labor availability, and limited scalability.

- Farmer requests soil recommendation (start / 1 day)
- Agronomist collects physical soil samples (2-3 days)
- Samples are sent to a lab for analysis (3-7 days)
- Lab sends results back to agronomist (1 day)
- Agronomist interprets results and creates fertility recommendation (2-3 days)
- Farmer applies fertilizer based on recommendation (end 1 day)

VST-Enabled Workflow

Time to recommendation: <48 hours

- Historical soil test, weather, and crop data are uploaded or synced
- VST model generates field- or zone-level nutrient predictions
- Agronomist reviews model outputs and creates fertility recommendation using software
- Farmer applies fertilizer based on the recommendation





Improvements:

By combining weather and crop data to the grower's previous soil test data the VST or Predictive Soil Model generates zone-level predictions, allowing the agronomist to soil sample strategically. This results in a reduced number of physical soil tests, leading to a faster turnaround of recommendations, more proactive agronomy decisions and is more scalable across larger acreages.

Why This Matters

VST technology streamlines agronomy processes by reducing **reliance** on real-time sampling, extending the value of lab-tested data throughout the season. Agronomists can deliver timelier, data-driven recommendations without sacrificing agronomic integrity or grower trust.

What Is Virtual Soil Testing?

It's not a replacement for agronomy—it's a multiplier.

Virtual Soil Testing is a machine learning model that predicts soil nutrient levels, activated by a baseline lab test or historical soil data. VST extends lab insights between cycles to enable faster, ongoing recommendations. Built on historical soil data, weather, and crop history, VST generates real-time NPKS estimates at the zone or field level. It delivers lab-quality insights on demand, enabling faster, scalable agronomic recommendations.



How It Works

- Pulls from weather history, past soil samples, and crop rotation data
- Trained on 50M+ acres and benchmarked against tens of thousands of lab tests
- Outputs include N, P, K, and S predictions, and trendline deltas
- Integrates into prescription platforms or via FarmCommand—no new system required

Accuracy Benchmarks (Mean Absolute Error)

- N: ± 3 ppm
- P: ± 4 ppm
- K: ± 40 ppm
- Validated across regions and growing conditions to match or exceed lab test reliability

VST turns agronomy from reactive to proactive—giving agronomists instant insights while the window for action is still open.

How VST Transforms the Retail Agronomy Model

With VST, you're not adding agronomy staff—you're extending their reach.

Virtual Soil Testing is a digital approach that modernizes the traditional agronomy process. By supplementing high-cost, high-friction steps with efficient, scalable digital workflows, it enables agronomists to serve more acres, deliver timely recommendations, and provide a streamlined, data-driven experience for growers.

Traditional vs. VST-Enabled Agronomy

Constraint	Traditional Model	VST-Enabled Model
Turnaround Time	7–14 days (sampling, shipping, lab)	On demand digital processing
Sampling Costs	\$8+ per acre	No per-sample cost; priced at scale
Agronomist Bandwidth	15–25K acres per FTE (manual workload limit)	2×–3× acre coverage with digital decision support
Geographic Coverage	High-resolution recs limited to intensive clients	Enterprise-wide insights with uniform resolution
Recommendation Precision	Often based on partial or outdated test data	Modeled using current weather, imagery, and historical
Value to Grower	Limited by timing or staff availability	Timely, personalized recommendations across the farm

VST helps retailers scale agronomy services without scaling costs—freeing staff to focus on high-value decisions, not sample logistics.

Agronomist Enablement: Scaling Expertise, Not Burnout

VST equips agronomists to deliver more value, faster

Agronomists are the trusted face of every agronomy program. VST is designed to make their jobs easier, not obsolete. By removing sampling delays and automating early-stage data processing, agronomists can spend less time chasing logistics and more time advising customers, selling product, and growing their book of business.



Why Agronomists Should Use a Predictive Soil Model

- **Faster Recommendations**
Recommendations can be delivered in hours, not weeks, enabling in-season adjustments and quicker grower response.
- **More Acres, Less Admin**
Digital workflows remove the need for scheduling, shipping, and follow-ups, allowing for 2–3× more acreage per agronomist.
- **Data-Backed Product Sales**
Modeled nutrient deficiencies give agronomists the confidence to recommend specific input packages backed by real insights.
- **Leverage Historical Investments**
VST makes past soil test data and cropping history actionable—extracting new value from years of sampling, without additional fieldwork.

Macro Pressure to Modernize

Modern agronomy blends field expertise with digital insights making agronomy teams indispensable to farm success.

Across North America, ag retailers are being forced to rethink how they deliver agronomic services. Input price volatility, staffing constraints, and shifting customer expectations have made manual workflows unsustainable. The next wave of retail growth will be driven by digital-first service models. VST enables that shift without compromising agronomic integrity.

What's Driving Change

- **Labor Pressure**
Agronomy teams are shrinking while service expectations grow. The average agronomist is nearing 50, and replacements are scarce.
- **Rising Costs**
Input prices are volatile, and field sampling adds cost and logistical load during peak demand.
- **Digital-First Growers**
88% of younger growers want digital tools, but only 6% feel confident using them, retailers can close this gap with practical, turnkey tools.
- **Precision Plateau**
Tools like Variable Rate (VR) seeding and imagery adoption are outpacing the infrastructure needed to support them, especially timely, field-level nutrient data.



Retailers that digitize agronomy now will define the next decade of input sales, customer loyalty, and service differentiation.

Why Farmers Edge?

Precision agronomy is only as good as the partner behind it.

Farmers Edge has built an entire ecosystem to support scalable, digital agronomy. With over 50 million acres of data, a proprietary tech stack, and deep agronomic expertise, Farmers Edge is a trusted partner offering both AI-powered insights and field-level experience.



What Sets Farmers Edge Apart

- **Proven at Scale**
VST is trained on over 50M acres and validated across multiple growing regions in North America.
- **End-to-End Infrastructure**
From soil labs to cloud APIs to VR prescription tools, Farmers Edge brings the full stack, no third-party patchwork required.
- **Agronomy + Tech**
Bridging the science and software behind fertility decisions with staff agronomists and 19+ tech patents.
- **Enterprise-Ready**
Whether you need white-label integration, multi-location rollout, or frontline enablement—we support from pilot to scale.

With Farmers Edge, VST isn't a prototype.
It's ready to deploy, ready to scale, and
backed by real agronomy.



Bringing It All Together

Retailers and co-ops need faster insights, broader reach, and tools that help agronomists serve more acres without burning out. Virtual Soil Testing delivers all three. By combining the power of remote sensing, historical data, and machine learning, VST turns soil testing into a continuously available asset—building on lab data to enable digital agronomy at scale.

See it in action

Request a sample VST report or talk to our enterprise team about integrating VST into your agronomy services.

✉ partners@farmersedge.ca  www.farmersedge.ca