



The New Standard in **AgChem Product** **Validation**



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Executive Summary

AgChem companies face growing pressure to prove product performance across a broader set of conditions including: biological complexity, environmental ROI, and post-launch variability. Although traditional field trials remain essential, combining them with advanced technology and agronomic models enhances their reach and delivers insights more quickly across real-world conditions.

This paper outlines how field-level agronomic models—built and ground-truthed across 50 million acres—are being used to extend trials, validate performance faster, and deliver spatially precise feedback. These models help R&D, sustainability, and commercial teams track subtle agronomic shifts, monitor environmental indicators, and differentiate product impact by zone, crop stage, and season.

The goal isn't to replace trials. It's to make them go further.

This whitepaper explores:

- What's driving the shift in AgChem validation standards
- How descriptive, predictive, prescriptive, and diagnostic models work
- Practical use cases from product launch to Scope 3 GHG reporting
- A clear path to assess model fit for your validation strategy



The New Standard in AgChem Product Validation

AgChem companies are no longer validating products solely on trial yield. Today's product performance must reflect **real-world, multi-metric success**: environmental outcomes, product adaptability, and ROI across variable field conditions.

What's Driving the Shift

AgChem leaders are responding to five key pressures:

Driver	Why It Matters
Sustainability Expectations	New products are expected to meet environmental benchmarks—GHG reduction, biodiversity protection, and compliance with regenerative frameworks.
Biologicals Complexity	Biostimulants and microbials have subtle effects, requiring new KPIs like root development, water uptake, and canopy growth.
Pressure to Reduce R&D Costs	Product development timelines and budgets are tightening. Field automation and data-driven approaches help improve efficiency and reduce trial load.
Digital Farming Readiness	Widespread adoption of sensors, imagery, and digital platforms has created the infrastructure for scaled, data-rich validation.
Trial-to-Market Speed	Farmers and commercial teams expect faster performance proof. Traditional multi-year trial cycles are increasingly impractical.



How Validation is Changing

AgChem validation is evolving in four clear ways:

1. **Data-centric** – integrating sensors, imagery, and predictive models
2. **Real-time** – moving beyond endpoint yield to season-long insights
3. **Multi-layered** – capturing agronomic, environmental, and commercial value simultaneously
4. **Farmer-integrated** – using commercial acres to augment traditional trial plots

Why Field Trials Alone Aren't Enough

“Product performance” is being redefined.

Modern R&D teams are:

- Moving from small-plot trials to geo-diverse, farmer-led data collection
- Using remote sensing and cloud platforms for trial deployment
- Tracking 15–20 KPIs per trial, including vigor, disease pressure, and Nutrient Use Efficiency (NUE)
- Aligning trial protocols with evolving digital validation standards (e.g., EPPO)

Expert Insight: Why the Industry Is Ready

"The challenges facing agriculture today—climate variability, labor shortages, rising input costs, and the growing need for sustainable practices—can no longer be met with intuition or tradition alone. Farmers, retailers, and agribusinesses are asking for precision, proactivity, and proof.

What's changed is that data is now more accessible—from satellite imagery and weather models to soil sensors and machine data. But raw data doesn't drive value. Actionable intelligence does.

I've seen firsthand how retailers are using zone-level data to recommend variable rate applications, how biological companies are testing products across diverse microclimates, and how digital tools are driving everything from seed selection to market timing.

The ag industry has always been rooted in science and observation. Technology now supercharges both—and that's why adoption isn't just likely. It's inevitable."



Sangeeta Verma
Director of Strategic Partnerships
Farmers Edge





The Farmers Edge Model Stack: Ground-Truth at Scale

Farmers Edge has developed a library of 50+ agronomic models, ground-truthed across 50 million acres. These models simulate and measure crop behavior with precision—layered into a framework that supports validation, optimization, and sustainability reporting at scale.

What Powers the Models

Each model is built on a dedicated infrastructure designed specifically for agricultural R&D. This includes:

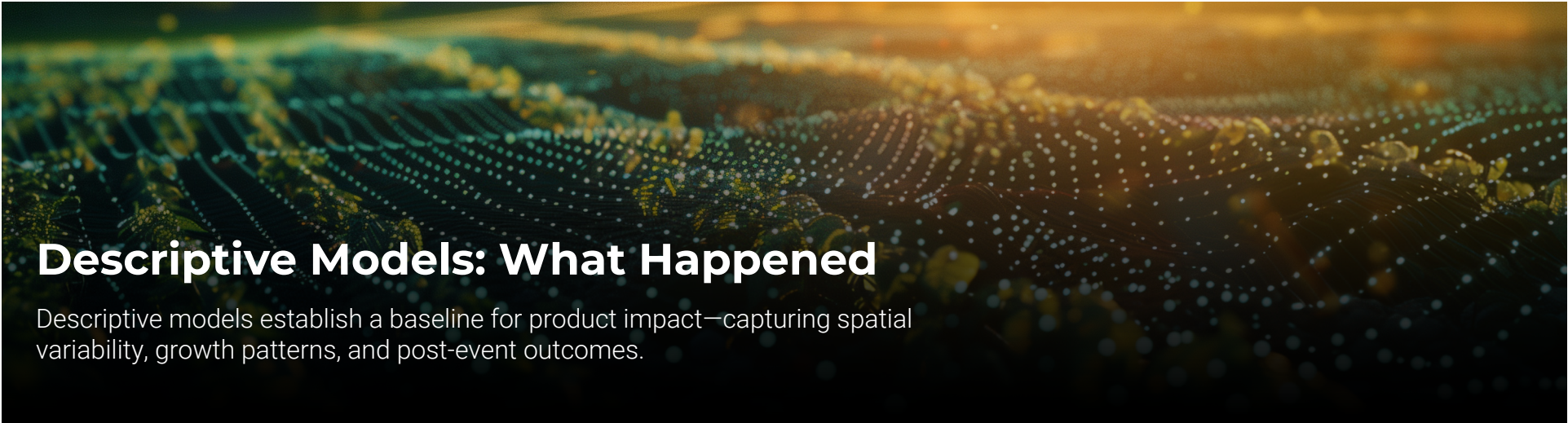
- **Multivariate inputs:** Satellite imagery, soil test data, weather observations, crop input records, and machine-level field activity
- **Continuous retraining:** Models are updated with each growing season to improve accuracy and regional fit
- **Local validation:** Ground-truthed with internal agronomy staff and third-party trial data
- **Seamless integration:** Delivered through FarmCommand®, LabCommand, and Smart Reporting for real-time usability

Whether used for R&D efficiency, CI scoring, or retail deployment, each model is designed to scale—from plot-level insight to full-acre validation coverage.



Model Categories Overview

MODEL TYPE	FUNCTION	KEY AGCHEM USE CASES	EXAMPLE MODELS
 Descriptive	Tracks “what happened”	Pre/post application comparisons, variability detection	FACT, GRASS, SWITCH, Border Anomaly Detection
 Predictive	Projects “what will happen”	Yield forecasting, disease alerts, stress anticipation	Yield Prediction, Pest/ Disease Prediction
 Prescriptive	Recommends “what to do next”	Nutrient placement, application timing, zone optimization	Zoning, Rec Engine, Corn N-Manager
 Diagnostic	Explains “why it happened”	Attribution of product failure or variability, ESG compliance	Cloud Masking, FACT, SWITCH



Descriptive Models: What Happened

Descriptive models establish a baseline for product impact—capturing spatial variability, growth patterns, and post-event outcomes.

Use Cases

FACT - Tracks NDVI (Normalized Difference Vegetation Index) vs. historical trends to flag gains or underperformance.

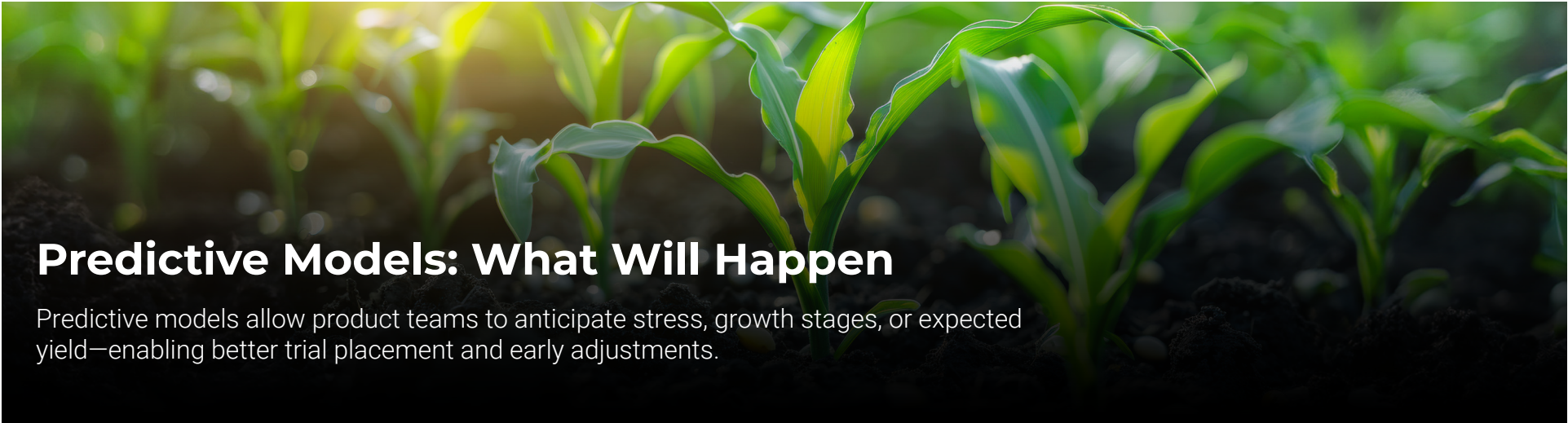
GRASS - Measures what percent of a field is showing live vegetation—useful for validating seed emergence or pre-treatment vigor.

SWITCH - Identifies weather-related damage using pre/post imagery, strengthening attribution in stress trials.

Border Anomaly Detection - Improves trial accuracy by flagging high-variability field zones.

AgChem Value

These models are especially relevant for biologicals and NUE products where changes are subtle. They provide spatial evidence of impact—validating what happened, where, and when.



Predictive Models: What Will Happen

Predictive models allow product teams to anticipate stress, growth stages, or expected yield—enabling better trial placement and early adjustments.

Use Cases

Yield Prediction (North America & Brazil) - Benchmarks in-season performance in treated zones.

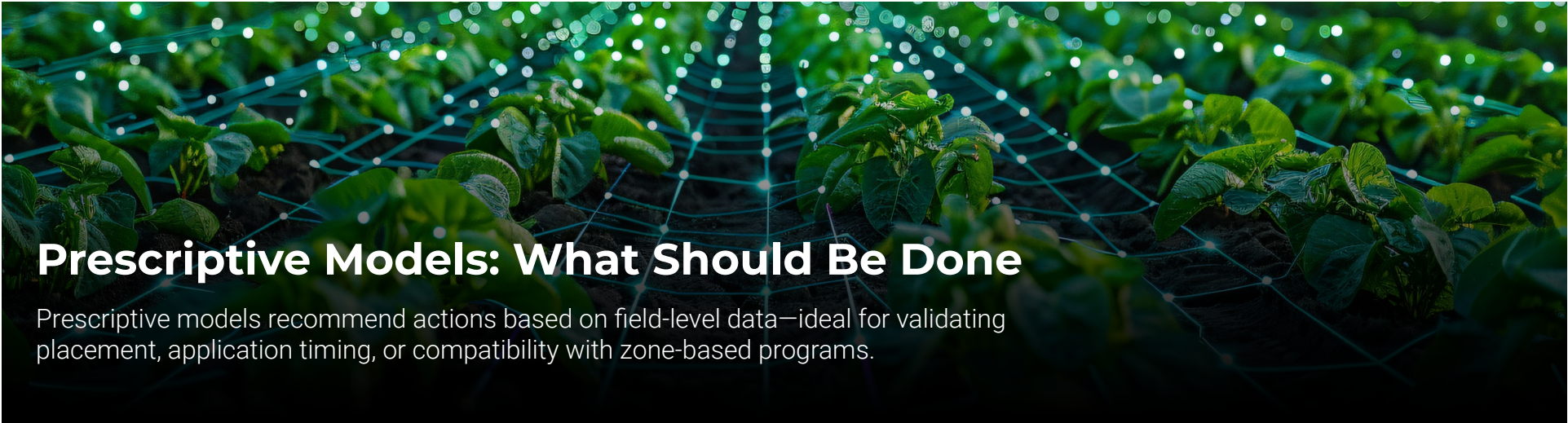
Pest & Disease Prediction - Pinpoints high-risk regions to preemptively validate treatment efficacy.

Canola Heat Blast - Estimates flowering stress windows—critical for foliar sprays or PGR timing.

Virtual Soil Testing - Provides nutrient profiles across fields without needing physical samples.

AgChem Value

These models guide strategic targeting—helping prioritize zones, forecast outcomes, and frame seasonal performance benchmarks.



Prescriptive Models: What Should Be Done

Prescriptive models recommend actions based on field-level data—ideal for validating placement, application timing, or compatibility with zone-based programs.

Use Cases

Zoning - Maps fields into agronomic management zones using NDVI.

Rec Engine - Calculates nutrient rates by crop, yield goal, and zone.

Corn N-Manager - Signals when a sidedress N application is needed.

Composite Fertility Rec Engine - Provides full-field baseline recommendations for conventional programs.

AgChem Value

Prescriptive tools increase product performance visibility under ideal and stress conditions—helping validate ROI under multiple agronomic strategies.



Diagnostic Models: Why It Happened

Diagnostic models explain why results varied—isolating the influence of weather, agronomic conditions, or application errors.

Use Cases

SWITCH - Quantifies hail, wind, or frost damage post-event.

FACT - Highlights unexpected trend divergence mid-season.

Cloud Masking - Ensures image quality by filtering unusable satellite data.

AgChem Value

When performance isn't consistent, diagnostic models help de-risk trial interpretations, support regulatory claims, and clarify attribution.



Applying Models Across the Product Lifecycle

Having access to the right models is only the starting point. The real value comes from embedding those insights into product development and post-launch validation. Models can extend trial impact, reduce costs, and help teams move from anecdote to evidence—across R&D, marketing, and ESG functions.

A. Improving R&D Efficiency

Field models help product teams scale validation without multiplying trial complexity. By layering predictive and descriptive insights onto existing programs, companies can optimize both site selection and execution.

Key Applications:

- **Extend Trial Reach:** Models like GRASS and NDVI Trends flag active zones, enabling broader geographic validation without additional plots.
- **Target High-Impact Locations:** Pest & Disease Risk and Canola Heat Blast support smarter trial placement under expected agronomic pressure.
- **Reduce Manual Observation:** Growth stages, yield forecasts, and weather overlays streamline scouting and automate common agronomic metrics.
- **Measure More Than Yield:** Flowering time, vegetative cover, and early-stage variability can all be captured with spatial, consistent metrics.





B. Supporting Post-Launch Monitoring

Validation doesn't end at commercial release. Field-scale models give commercial, stewardship, and sustainability teams the ability to track product performance in-market, under real-world conditions.

Key Applications:

- **Regional Performance Monitoring:** Use FACT and Yield Distribution to monitor product behavior by zone, season, or crop type.
- **Sustainability Reporting:** CI Score, Tillage Detection, and ESG Intersection models support Scope 3 and regenerative practice claims.
- **Retail + Grower Engagement:** Model outputs can be visualized in dashboards, helping build trust and reinforce value during adoption cycles.

From Insight to Execution

Whether it's tracking early-season crop emergence or validating environmental impact, the value of models isn't just in what they measure—it's in how they're applied. The most successful AgChem teams don't treat data as a siloed tool; they embed it across functions, from trial design to product positioning and sustainability reporting.

Hear from the expert:

Putting Models to Work: Why Execution Is the Real Differentiator

"Over the last 15 years, I've worked closely with agribusinesses, input manufacturers, and field teams to help them integrate new technologies. What I've consistently seen is that having great data or models isn't enough. The real value comes when those tools are embedded into everyday decisions—whether it's helping a sales team position a new product or supporting a sustainability lead preparing Scope 3 disclosures.

That's why operationalizing data matters. It moves insights from the lab to the field—and from the field to strategy."



Sangeeta Verma
Director of Strategic Partnerships
Farmers Edge

Partnering with Farmers Edge

Farmers Edge offers flexible pathways to integrate model outputs into your validation process.

Options include:

- Licensing access to individual models or model bundles
- Custom dashboards segmented by product line, crop, or geography
- Bundled services that combine models with CI scoring, soil testing, or reporting frameworks
- Integration with existing tools, including field trial platforms, CRM systems, or trial location databases

Whether you're exploring early-stage validation or tracking post-launch ROI, our team can help scope a pilot aligned to your internal priorities.





Conclusion: Closing the Gap with Field-Level Evidence

Product performance validation is evolving—but not every team needs to overhaul its approach. Small, structured integrations of field-level data can strengthen existing trial programs, support internal decision-making, and improve confidence in both agronomic and sustainability claims.

The opportunity isn't transformation—it's precision.

Next Step: Request a Field Validation Assessment

Farmers Edge offers a no-cost assessment to identify how field-level models can support your product validation efforts.

- Understand where your current trial data could be complemented by spatial insights
- See how existing grower acres can act as validation extensions
- Identify 2–3 models most aligned to your product category and claims

Contact us to schedule a 30-minute assessment and receive a tailored recommendation.



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