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PRECISION AGRICULTURE & SCOPE 3

Part 1: The **Scope 3** Dilemma

Why CPGs Can't Reach Net Zero Without the Farm

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Executive Summary

Consumer packaged goods (CPG) companies face a structural and data-driven bottleneck in their path to net-zero emissions.

80–90% of total emissions for food, beverage, and consumer goods companies originate upstream in agricultural supply chains.

Yet the vast majority of Scope 3 reporting still relies on modeled averages, generic emission factors, or unverifiable supplier surveys, creating a widening disconnect between corporate commitments and provable outcomes.

Regulatory standards, including the GHG Protocol Land Sector and Removals Guidance, SBTi FLAG, the EU Corporate Sustainability Reporting Directive (CSRD), and the proposed U.S. SEC climate rules, are converging toward a single expectation.

> *Farm-level, auditable, primary data is now required, not optional, to claim Scope 3 reduction.*

What Is Precision Agriculture?

Precision agriculture (PA) technologies enabled by in-field sensors, satellite analytics, soil testing, telemetry, and integrated MRV (Measurement, Reporting, Verification) platforms represent the first scalable pathway to meet these requirements.

By shifting from modeled to measured data, PA provides a credible, scientifically rigorous basis for:

- Quantifying nitrogen-use reductions
- Tracking soil carbon outcomes
- Measuring land-use change impacts
- Verifying farm management practices
- Generating verified Scope 3 reductions

This white paper outlines the quantitative scale of the Scope 3 challenge, explains why farm-gate visibility is critical and demonstrates how precision agriculture enables credible, auditable, and investor-grade Scope 3 reporting.

It positions agricultural data integration as a core requirement for sustainable procurement, regulatory compliance, and long-term competitiveness for global CPG companies.

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1.1 Introduction & Purpose

For the past decade, CPG climate strategies have focused heavily on operational efficiency—renewable energy procurement, packaging improvements, and logistics optimization. While these remain important, they barely touch the true emissions footprint of the sector. Across leading food and beverage companies:

- **Scope 1 + 2 emissions make up less than 15% of total CPG emissions**
  Most operational emissions are already optimized; they contribute only a small fraction of the overall footprint.

- **Scope 3 contributes 85–95% of total emissions for leading CPGs**
  Agriculture, land use, and upstream inputs dominate the climate impact and require farm-level data to measure accurately.

- **The median food company emits 6–8× more carbon in its supply chain than in its own operations**
  This imbalance highlights the need to focus decarbonization strategies on partnerships with growers and the broader agricultural supply chain.

1.2 The Scale of Scope 3 in CPGs

Scope 3 emissions dominate the GHG profiles of global CPG companies. Depending on the commodity mix, **80–90% of total emissions are derived from upstream value chains, with agriculture and land use representing 60–75% of this share.**

Emission Source	Typical % of Scope 3	Data Confidence	Measurement Approach
Agricultural Inputs (fertilizer, diesel, pesticides)	45–60%	Low	Modeled factors, supplier invoices
Land-use Change (deforestation, tillage)	15–25%	Low	Regional models, remote estimates
Transportation & Distribution	5–10%	High	Fuel logs, telematics
Manufacturing & Packaging	10–15%	High	Direct metering, utility data

The problem is fundamental

CPGs are reporting on the largest part of their emissions using the weakest data sources.
As verification becomes mandatory, Scope 3 estimation based on average coefficients can introduce ±50–60% error, exposing companies to compliance, reputational, and investor risk.

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1.3 Why Farm-Gate Visibility Is the Missing Piece

Achieving credible Scope 3 reductions requires a level of granularity that today's procurement-level or supplier-average models simply cannot deliver. Farm-gate visibility—the ability to measure, verify, and attribute emissions at the level of individual fields—provides this missing foundation.

What Farm-Gate Visibility Really Means

It goes beyond periodic data collection or farmer self-reporting. It refers to a continuous, high-resolution record of the variables that materially influence agricultural emissions, including:

- Soil organic carbon trajectories
- Fertilizer type, rate, timing and placement
- Tillage intensity and residue retention
- Irrigation volumes and associated energy use
- Crop yield, biomass and nutrient removal
- Land-use and cover change at sub-field scale
- Machine operations, fuel burn and passes

These variables drive >80% of emissions variability in major row crops, yet none of them can be reliably inferred from supplier certificates, averages, or spend-based proxies.

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The Precision Ag Layer That Makes It Possible

Modern precision agriculture systems close this gap by combining:

- Machine telemetry from application and harvest equipment
- Geolocated soil sampling and standardized laboratory assays
- Satellite-derived indices (NDVI, NDMI, biomass, canopy temperature)
- IoT environmental sensors for microclimate and soil moisture
- Agronomic models that simulate nitrogen, carbon, and water dynamics

The result is a live, integrated data stream that captures practice changes and biological responses with sub-field resolution.

Why It Matters:

Moving From Estimation to Attribution

Farm-gate visibility replaces modeled estimates with real, field-level data.

It shows the true impact of practice changes and highlights high-performing acres.

Brands can then credibly claim and verify reductions with assurance-ready evidence.

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1.4 Why Traditional Corporate Efforts Fall Short

Historically, CPG companies have approached decarbonization through initiatives such as energy procurement, packaging redesign, logistics optimization, supplier surveys, and small, isolated sustainability pilots.

These strategies improve operational emissions but have little influence on upstream agricultural emissions, where the majority of climate impact is generated.

The Core Challenge Is **Data Discontinuity**

Corporate reporting systems capture emissions only at the Tier 1 supplier level, leaving the farm gate invisible. Farm-level visibility closes this gap, giving companies access to the 60–75% of emissions that originate upstream.

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Why Traditional Decarbonization Fails and How Farm-Gate Visibility Fixes It

Category	What's Happening Today	Why It Fails	The Opportunity with Farm-Gate Visibility
Data Capture	Emissions reported at Tier 1 supplier level using surveys, certificates, and spend-based models.	50–80% uncertainty; no visibility into soil carbon, nitrogen use, tillage, irrigation or land-use change.	High-resolution, field-level data captures real drivers of agricultural emissions.
Interventions	Packaging redesign, energy procurement, logistics tweaks, and small sustainability pilots.	Improves Scope 1 & 2 but barely touches agricultural Scope 3 (60–75% of total impact).	Direct measurement of practice changes enables targeting and scaling of interventions that actually reduce emissions.
Verification	Claims depend on averages, proxy factors, and unverifiable supplier reporting.	Not audit-ready; fails emerging disclosure/assurance rules (EU, SEC, voluntary markets).	Continuous, traceable data stream supports third-party verification and compliance.
Attribution	Reductions cannot be tied to specific acres, practices, or procurement decisions.	No basis for allocating reductions to brands, SKUs, or investment programs.	Outcome attribution enables companies to claim verified reductions and link them to funding mechanisms.
Supply Chain Engagement	Limited farmer participation; incentives unclear; impact hard to quantify.	Farmers lack proof-of-impact and compensation pathways; programs don't scale.	Acre-level analytics show which farmers deliver measurable reductions, enabling incentive programs that scale.
Strategic Value	Reporting is compliance-driven and backward-looking.	Little differentiation; low credibility; weak investor confidence.	Emissions become a finance-grade asset that drives brand, regulatory, and investor advantage.

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1.5 Regulatory & Standards Context

The regulatory landscape is shifting rapidly. Global climate frameworks are moving in a consistent direction: **verified farm-level data will soon be mandatory for land-sector emissions reporting.**

Key Frameworks Shaping the Future of Agricultural MRV

Framework	Primary Focus	Key Requirement	Effective Date / Region
GHG Protocol Land Sector & Removals Guidance	Land-use emissions, SOC, biomass	Field-level activity data; primary data preferred	Global / 2025+
SBTi FLAG	Target-setting for agriculture	FLAG targets; deforestation-free sourcing	Global / Mandatory 2025
EU CSRD	Corporate sustainability disclosure	Auditable digital datapoints; Scope 3 required	EU / 2024–2026
U.S. SEC Climate Rule (proposed)	Investor disclosures	Scope 3 if material; audit requirements	USA / Expected 2025

> *Emerging regulatory and investor frameworks are converging on three core requirements, primary farm-level data, continuous verification, and seamless integration with corporate reporting systems.*
>
> *Meeting these requirements demands purpose-built agricultural MRV infrastructure.*

1.6 Corvian Advantage

Corvian provides one of the most advanced agricultural MRV ecosystems globally, integrating:

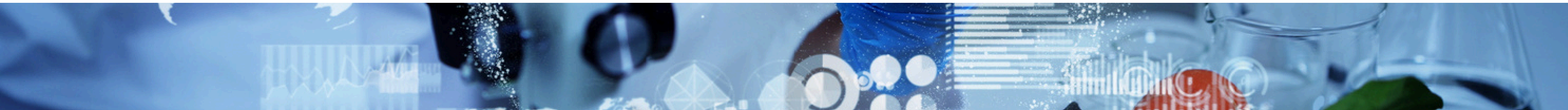
These systems generate high-quality, audit-ready MRV datasets that can flow directly into corporate reporting platforms.

FarmCommand	LabCommand	Remote sensing	AI analytics
machinery telemetry, yield maps, application data	**soil testing, SOC baselines, nutrient mapping**	**NDVI, moisture stress, growth models**	**nitrogen-use optimization, anomaly detection**

Illustrative Case Examples

Region / Crop	Baseline N (kg/ha)	Optimized N (kg/ha)	Emission Reduction (kg CO_2e/ha)	Practice Implemented
Canadian Prairies / Wheat	95	80	≈220	VRT + Soil Mapping
US Midwest / Corn	185	160	≈310	4R Nutrient Management + Telemetry
Argentina / Soybean	75	60	≈190	Precision Seeding + Input Optimization

Across deployments, PA-enabled nutrient management reduced N_2O emissions by 15–25% with neutral or positive yield outcomes, providing CPGs with verifiable Scope 3 reductions that meet FLAG and GHG Protocol requirements.



Results are based on field-level measurements using calibrated equipment and standardized protocols. Emissions outcomes were assessed using split-field and controlled comparisons where possible, with yield impacts evaluated against localized historical baselines and adjusted for field variability.

1.7 Call to Action & Next Steps

CPGs can no longer rely on estimation-based reporting. Verified Scope 3 reductions require an integrated data ecosystem linking farm practices with corporate accounting systems.

Recommended Immediate Actions for CPGs

- **Conduct a Scope 3 relevance assessment** to prioritize high-emission commodities and regions.
- **Initiate a precision agriculture pilot** to create verified baselines and test MRV readiness.
- **Integrate MRV outputs** with procurement and ESG systems for automated reporting.
- **Revise procurement contracts** to embed data sharing and FLAG aligned KPIs.
- **Publish verified Scope 3 results within 12–18 months** to strengthen investor confidence.

> *Precision agriculture is not merely a farm-level improvement, it is a data infrastructure revolution linking soil-level decisions with boardroom-level reporting.* ***The future of Scope 3 decarbonization relies on building this bridge through digital, science-based farming systems.***

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