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2025

Data Intelligence & Farmer-Centric Sustainability

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Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
EO	Earth Observation
ESG	Environmental, Social, and Governance
GHG	Greenhouse Gas
Ha	Hectare (=10,000 m^2)
IoT	Internet of Things
ISO	International Organization for Standardization
ISO 9001	Quality Management Systems – Requirements
ISO/IEC 27001	Information Security Management Systems
ISO/IEC 27701	Privacy Information Management Systems
ISO 14064-1	Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting
ISO 14064-2	Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring, and reporting
MRV	Monitoring-Reporting-Verification
NIR	Near-Infrared (spectroscopy or sensing)
P95	95th Percentile
QA/QC	Quality Assurance / Quality Control
R&I	Research and Innovation
SOC	Soil Organic Carbon
UAV	Unmanned Aerial Vehicle
VRA	Variable Rate Application

What *Pulse* Means

Pulse is farmB's annual, data-driven snapshot of agricultural systems as they operate in practice. It reflects the current state of farms, supply chains, and land-based activities, measured through field-level data, monitoring-reporting-verification oriented methodologies, and farmer-validated intelligence. Rather than reporting abstract outcomes or retrospective claims, *Pulse* captures what is observable, measurable, and repeatable at a given point in time.

observable + measurable + repeatable → credible data ≠ assumptions

Why *Pulse* Matters

Agriculture sits at the intersection of food security, climate pressure, environmental stewardship, and economic viability. Decisions in this space increasingly depend on credible data, not assumptions.

Pulse exists to:

- Translate complex on-farm data into decision-grade intelligence
- Support measurement, reporting, and verification processes across environmental and operational dimensions
- Enable farmer-centric sustainability, where digital systems serve practical agronomic and economic realities

How to Read This Report

This document is not an ESG narrative nor a marketing overview. It is a structured account of farmB's progress during 2025, focusing on:

- The systems deployed and the data they generate
- The methodological principles underpinning measurement and analysis
- The use cases and pilots through which data intelligence is applied in real contexts
- The technical, organisational, and research foundations supporting future scale

Pulse is designed for readers seeking clarity on how digital agriculture translates into verifiable, scalable outcomes.

> ### A Living Reference
> As agricultural systems evolve, so will the indicators, methods, and applications described here. *Pulse* is therefore not a one-off publication, but part of an ongoing, annual practice of measurement and reflection, aligned with farmB's commitment to transparency, scientific integrity, and farmer-first innovation.

Executive Summary

Pulse 2025 presents a structured snapshot of farmB's operational state during the 2025 calendar year. It documents how the company's platform, methods, deployments, and operating principles were exercised in practice, with the aim of enabling interpretation and trust rather than promoting outcomes, performance metrics, or future commitments.

The report is intentionally framed as a state-of-system account. It does not function as an ESG impact statement, a commercial brochure, or a certification declaration. Instead, it records what was operational, methodologically grounded, and actively governed during the year, while making explicit the boundaries between commercial deployment, verification-oriented application, and ongoing innovation.

During 2025, farmB operated as a commercially deployed digital agriculture platform, supporting a range of agricultural decision environments. Commercial and operational deployments formed the baseline of activity, complemented by research and innovation deployments that supported continuous system evolution across diverse crops, regions, and organisational contexts. The platform integrated heterogeneous data sources at field level and translated them into interpretable intelligence used in advisory workflows, precision field operations, biological monitoring, and structured reporting.

Environmental and climate intelligence in 2025 focused on measurement, interpretation, and transparency rather than attribution of impact. farmB applied in-house methodologies for greenhouse gas emissions estimation and carbon sequestration assessment across multiple crop systems. These methodologies were exercised within ISO 14064-1 and ISO 14064-2 certified project contexts, supporting external scrutiny and methodological robustness. While MRV-oriented analytics were operationally applied and documented, they were not yet commercialised as standalone MRV services, reflecting a deliberate and standards-respecting development trajectory.

The platform architecture described in *Pulse* reflects the configuration in active use during 2025. It operated as an integrated data intelligence layer, supporting data ingestion from multiple sources, harmonisation at field level, interpretable analytics, MRV-oriented data structuring, and interoperable data exchange with external systems. Architectural choices prioritised traceability, modularity, and governance, enabling system evolution without reliance on ad-hoc or opaque components.

The deployment references presented in the report are indicative and selectively chosen. They do not represent an exhaustive catalogue of activities, nor are they framed as success stories. Instead, they illustrate representative contexts in which the platform and methods were applied, spanning commercial supply chains, verification-oriented farm-level accounting, precision agronomy workflows, and large-scale biological monitoring. These references are used to ground the system description in real operational settings while avoiding claims of performance or impact.

farmB's operations during 2025 were underpinned by a scientifically grounded, interdisciplinary team and by operating principles centred on scientific integrity, data governance, and responsible use of AI and farmer data. These principles shaped how data were handled, how methods were documented, and how analytics were presented as decision support rather than automated prescription.

Looking ahead, the 2026 outlook focuses on consolidation and formalisation rather than redirection. A central priority is the transition of MRV-oriented methodologies from project-based application to formally approved and scalable commercial offerings, alongside continued scaling of commercial deployments and data services. This evolution is positioned as controlled and governance-led, building directly on systems and methods already exercised in practice.

Pulse 2025 should be read as a transparent account of how farmB operated during the year. It documents a platform that is commercially active, scientifically grounded, and deliberately governed, providing a clear reference point for understanding both current capability and near-term evolution.

Vision, Mission & System Perspective

farmB's vision and mission are grounded in the recognition that agriculture operates as a complex, interconnected system, where environmental, economic, technological, and social dimensions interact continuously. Digital tools are only meaningful to the extent that they respect this complexity and support informed decision-making, rather than isolated optimisation or abstract performance targets.

Within *Pulse*, this section frames farmB's role not as a provider of standalone digital solutions, but as a data intelligence layer operating across agricultural systems. It establishes the conceptual lens through which the platform, methods, and deployments described in subsequent sections should be interpreted.

Vision

farmB's vision is to enable transparent, interpretable, and scalable agricultural data intelligence that supports sustainability, productivity, and resilience, without oversimplifying the systems in which it operates. This vision does not assume a single pathway toward sustainable or efficient agriculture. Instead, it recognises that meaningful progress emerges from context-aware decisions grounded in credible data and explicit assumptions.

By prioritising interpretability and transparency, the vision acknowledges that trust, adoption, and long-term value in digital agriculture, depend not only on analytical sophistication, but on the ability of users and institutions to understand how insights are generated and where their limits lie.

Mission

farmB's mission follows directly from this vision. The platform is designed to translate heterogeneous agricultural data into decision-grade intelligence that can be understood, reviewed, and applied across different operational, advisory, and reporting contexts.

This involves integrating data from multiple sources, maintaining field-level specificity, and ensuring that analytical outputs remain interpretable rather than opaque. Utility and integrity are prioritised over scale for its own sake, reflecting the need for digital systems that can operate credibly across commercial agriculture, supply chains, and institutional environments.

System Perspective

The system perspective underlying farmB's approach acknowledges that agricultural decisions are shaped simultaneously by biophysical conditions, management practices, economic incentives, and policy or reporting frameworks. Digital systems operating in this space must therefore balance precision with flexibility, and analytical sophistication with usability.

Within *Pulse*, this perspective explains why emphasis is placed on methods before metrics, transparency before optimisation, and interpretation before claims of impact. It also defines clear boundaries regarding what the platform does not seek to do: replace human judgement, impose uniform prescriptions, or abstract away uncertainty. Instead, data intelligence is positioned as a means of supporting understanding and informed decision-making within the inherent complexity of agricultural systems.

This system-oriented framing informs the platform architecture, analytical workflows, and governance principles described in the sections that follow, and provides the conceptual foundation for how farmB operated during the 2025 reporting period.

> ### Position within *Pulse*
> This section establishes the conceptual lens through which all subsequent material should be interpreted. Within *Pulse*, farmB's vision and mission are not presented as aspirational statements, but as system-level principles that inform how data, methods, and deployments are structured and governed. The intent is to frame digital agriculture as a coordinated decision system rather than a collection of standalone tools.

2025 at a Glance

Pulse 2025 captures a snapshot of farmB's operational reality during the 2025 calendar year. It documents how the platform, methods, and governance structures were exercised in practice, focusing on system operation rather than outcomes or performance indicators. The section provides orientation for the reader, establishing the scope and boundaries of what the report reflects.

During 2025, farmB continued its commercial operation as a digital agriculture platform, supporting a variety of agricultural decision environments, Commercial and operational deployments formed the baseline of activity, while research and innovation deployments complemented this baseline by informing methodological refinement and system evolution. These parallel modes of operation were deliberately maintained, ensuring that innovation activity remained connected to, but distinct from, live operational use.

The year was characterised by the continued integration of heterogeneous agricultural data at field level and its translation into interpretable intelligence. This intelligence was applied across advisory workflows, precision field operations, biological monitoring, and structured reporting contexts. Emphasis was placed on maintaining field-level specificity while enabling aggregation where required, allowing the same underlying data structures to support multiple decision and reporting needs.

Environmental and climate-related analytics formed an integral part of system operation during 2025. farmB applied in-house methodologies for greenhouse gas emissions estimation and carbon sequestration assessment across multiple crop systems. These methodologies were exercised within project-based and certification-oriented contexts, including ISO-aligned applications. At the same time, clear boundaries were maintained between methodological application and commercial productisation, particularly with respect to MRV services, which were not yet offered as standalone market products during the reporting period.

Operational deployments during the year spanned a range of organisational and geographic contexts, including individual farms, cooperatives, supply-chain arrangements, and public or institutional settings. The deployment references presented later in this report are indicative and selectively chosen. They are intended to illustrate representative contexts in which the platform and methods were applied, rather than to provide an exhaustive account of all activities undertaken during the year.

Across all contexts, 2025 operations were underpinned by an emphasis on methodological transparency, data governance, and responsible system use. Analytical outputs were treated as decision-support inputs rather than prescriptive instructions, and uncertainty and assumptions were documented rather than obscured. These principles shaped how the platform was operated throughout the year and form a recurring theme across the sections that follow.

This snapshot of 2025 provides the reference point for the remainder of *Pulse*. Subsequent sections expand on the environmental intelligence, technology architecture, deployment contexts, research backbone, and operating principles that together defined how farmB functioned during the year.

Environmental & Climate Intelligence

Within *Pulse*, environmental and climate intelligence is presented as a description of how indicators are generated, contextualised, and governed, rather than as an attribution of outcomes.

Environmental and climate intelligence within farmB's platform refers to the structured generation, interpretation, and contextual use of data relevant to environmental performance and climate-related decision contexts. Within *Pulse*, this intelligence is presented as an analytical capability in active use, not as evidence of environmental impact, improvement, or attribution.

The purpose of this section is to clarify what is measured, how it is interpreted, and under which assumptions, while making explicit the boundaries between analytical support, verification-oriented application, and commercial positioning.

Role and Scope within the Platform

Environmental and climate intelligence operates as a cross-cutting analytical layer within farmB's system architecture. It draws on field-level, spatial, and contextual data to support interpretation at multiple scales, while remaining anchored in field-specific conditions and management realities.

During 2025, this capability was applied in both operational and project-based contexts, supporting the analysis of greenhouse gas emissions, soil-related carbon dynamics, and environmentally relevant indicators alongside agronomic and operational data. These analyses were embedded within broader platform workflows rather than functioning as isolated or standalone modules.

Within *Pulse*, environmental intelligence is therefore framed as a means of interpretation and documentation**,** rather than as a mechanism for claiming outcomes or performance.

Greenhouse Gas Emissions Intelligence

farmB applies an in-house greenhouse gas emissions estimation methodology designed to operate at field and crop level**,** while remaining compatible with aggregation and reporting requirements at farm, cooperative, or project scale.

The methodology is based on structured activity data, management information, and scientifically grounded emission factors. Throughout 2025, it was applied across multiple crop systems and organisational contexts, including certification-oriented projects aligned with ISO 14064-1 and ISO 14064-2**.**

Emissions outputs generated by the platform are treated as interpretable indicators**,** accompanied by explicit documentation of system boundaries, assumptions, and methodological choices. They are not presented as direct measurements, nor as claims of reduction or avoidance, but as structured estimates intended to support transparency, review, and informed interpretation.

Carbon Sequestration and Soil Carbon Intelligence

Carbon sequestration and soil organic carbon (SOC) intelligence form a complementary component of farmB's environmental analytics. The system supports the estimation and interpretation of SOC-related indicators through an integrated methodological approach combining Earth observation data, proximal sensing (including NIR measurements), and laboratory soil analysis. This multi-layered process is designed to address spatial variability and uncertainty inherent in SOC assessment, while maintaining transparency on assumptions and boundary conditions.

During 2025, these methodologies were exercised in project-based contexts aligned with ISO 14064-2 and VM0042 methodology, supporting the assessment of carbon removal dynamics at field and farm level. Outputs were generated with explicit reference to baseline definition, temporal scope, and uncertainty considerations.

As with emissions intelligence, emphasis is placed on methodological consistency and transparency, rather than on maximising estimated removals or presenting crediting claims.

Field-Level Resolution and Aggregation Logic

A defining characteristic of farmB's environmental and climate intelligence is its anchoring at field (parcel)-level resolution, combined with a disciplined approach to aggregation.

All environmental indicators originate from task-level to field-specific data structures. Aggregation to higher levels, such as farm, cooperative, or supply-chain scale, is performed through explicit and documented logic, preserving traceability between aggregated values and their underlying parcel-level and task-level components.

This approach ensures that aggregation supports reporting and interpretation needs without obscuring spatial heterogeneity or introducing implicit assumptions about uniformity.

Uncertainty, Interpretation, and Use

Environmental indicators are inherently influenced by variability in data availability, temporal resolution, modelling assumptions, and external conditions. Within farmB's platform, uncertainty is treated as an explicit analytical dimension, not as residual noise.

Throughout 2025, this was addressed by distinguishing observed data from model-derived estimates, documenting assumptions and boundaries, and avoiding extrapolation beyond defined system limits. Analytical outputs are positioned as decision-support inputs, intended to inform understanding and discussion rather than to automate conclusions or substitute verification processes.

System-Level Interconnections Enabled by Data Intelligence

Environmental and climate intelligence within farmB's platform does not operate in isolation. Instead, it is integrated with agronomic, operational, and organisational data to support system-level interpretation.

This integration enables the exploration of interconnections between environmental indicators, production systems, management practices, and governance or reporting contexts. Within *Pulse*, these interconnections are illustrated conceptually to demonstrate how environmental intelligence contributes to a broader understanding of agricultural systems, without attributing causality or impact (Fig. 1).

Figure 1 - This figure illustrates how farm-level data intelligence connects environmental, economic, and societal dimensions of agricultural systems. Rather than representing direct or attributed impacts, it shows interdependencies where verified data, monitoring, and decision support enable informed action across productivity, resource efficiency, climate mitigation, and governance contexts.

The figure accompanying this subsection provides a schematic representation of these interconnections, supporting interpretation of how environmental intelligence interacts with other system components described throughout the report.

Position within *Pulse*

This section positions environmental and climate intelligence as an analytical capability embedded within farmB's broader data system, not as a standalone impact assessment. Within *Pulse*, the focus is on how environmental indicators are generated, contextualised, and governed, rather than on attributing outcomes or benefits. The content is intended to support interpretability and verification, not performance claims.

Technology & Platform Overview

farmB's technology platform is designed as an integrated data intelligence system supporting agricultural decision-making across commercial, advisory, and verification-oriented contexts. Rather than operating as a collection of discrete tools, the platform functions as a coherent architecture that enables data ingestion, harmonisation, analysis, and interpretation within a governed and traceable environment. This section describes the platform configuration as it was operational during 2025, focusing on architectural principles and functional layers rather than on individual features or products.

$Data\ Sources \rightarrow Integration \rightarrow Analytics \rightarrow \{Operating\ Centre, MRV\} \rightarrow Interfaces$

Platform Architecture and Design Principles

The platform architecture is structured around a set of guiding principles:

- Interoperability by design
  The system integrates data from satellites, field inputs, sensors, machinery, UAVs, and external services through standardised interfaces, avoiding vendor lock-in and data silos.
- Modularity and extensibility
  Functional components are developed as modular services, enabling selective deployment, iterative enhancement, and controlled scaling.
- Field-level primacy
  All analytics are anchored at the level of individual fields or land assets, with aggregation applied only through explicit and documented logic.
- Traceability and transparency
  Data lineage, analytical steps, and methodological versions are preserved to support review and verification.

These principles ensure that platform growth does not compromise interpretability or governance.

Data Ingestion and Integration Layer

farmB's data ingestion layer accommodates heterogeneous data types and temporal resolutions relevant to agricultural systems. These include earth observation and geospatial datasets, aerial survey data from unmanned platforms where available, field-level operational and management data, environmental and contextual datasets, and external agronomic or sustainability-related services.

All incoming data are harmonised into a common internal structure. This process preserves the original spatial and temporal characteristics of each source, along with associated uncertainty, enabling coherent analysis without flattening heterogeneity or forcing artificial uniformity.

Analytics and Intelligence Layer

The analytics layer translates integrated data into interpretable indicators and analytical outputs that support decision-making rather than automated prescription. Analytical approaches include statistical modelling, rule-based logic, and machine-learning methods, applied selectively depending on data availability and use context.

Throughout 2025, emphasis was placed on explainability and interpretability, ensuring that analytical outputs could be reviewed, contextualised, and discussed by users rather than treated as opaque results. This orientation supports use across commercial operations, advisory workflows, and institutional or verification-oriented contexts.

Decision Support and Operational Workflows

Analytical outputs generated by the platform are embedded within workflows that support operational use, including advisory processes, precision agriculture applications, and structured reporting. These workflows are designed to accommodate human interpretation and decision-making, rather than to enforce uniform actions.

During 2025, the platform supported repeated execution of data-to-action workflows, enabling translation of spatial and temporal intelligence into field-level operations, while maintaining documentation and traceability of underlying assumptions.

Interoperability and External Integration

Interoperability is a core characteristic of the platform architecture. farmB supports structured data exchange with external systems through standardised interfaces and APIs, enabling downstream use of agricultural intelligence by third-party platforms and services. This capability allows the platform to function as an intermediate intelligence layer, rather than as a closed ecosystem, supporting integration with machinery terminals, advisory systems, and industry or institutional applications.

MRV-Oriented Functionality and Positioning

The platform includes functionality that supports MRV-oriented data structuring, analysis, and documentation. During 2025, these capabilities were exercised in project-based and verification-oriented contexts, including ISO-aligned applications. However, MRV functionality was not exposed as a standalone commercial service during the reporting period. This reflects a deliberate positioning that prioritises methodological robustness, governance, and formal approval processes over premature productisation.

Beyond individual components, the platform architecture is designed to support controlled operation across heterogeneous agricultural contexts. Data ingestion, processing, and analytical execution are governed through consistent internal structures, versioning practices, and separation between production and experimental environments. This ensures that deployed analytics remain reproducible and interpretable, while allowing methods and models to evolve through structured research and validation pathways. Within *Pulse*, the technology layer is therefore presented not as a catalogue of capabilities, but as the enabling infrastructure that allows deployments, environmental intelligence, and MRV-oriented workflows to operate under defined technical and governance conditions.

> ### Position within *Pulse*
> The technology and platform elements described in this section define the structural conditions under which farmB's analytics and services operate. Within *Pulse*, this overview is intended to demonstrate architectural coherence, interoperability, and governance readiness, rather than to catalogue features or claim technical superiority. It provides the technical context required to interpret later sections on deployments, methods, and data governance.

Use Cases & Deployments

farmB's systems are deployed across commercial and operational contexts, complemented by research and innovation deployments that support continuous system evolution across diverse agricultural systems and decision environments.

Within *Pulse*, use cases are presented as deployment contexts rather than success stories. The emphasis is placed on how data intelligence is applied in practice, under which assumptions and constraints, rather than on claimed outcomes, performance metrics, or impact attribution.

Framing of Deployment Contexts

During 2025, farmB's platform was exercised across a range of real-world contexts, including individual farms, cooperatives, supply-chain arrangements, and verification-oriented projects. These contexts differed in scale, crop systems, organisational structure, and decision needs, yet were supported through a common underlying platform architecture and methodological logic.

At farm and cooperative level, deployments focused on field-specific monitoring, analysis, and decision support anchored in operational constraints. In MRV and sustainability-oriented contexts, deployments prioritised traceability, documentation, and standards-aligned interpretation of greenhouse gas and carbon-related indicators. Supply-chain and aggregated contexts required disciplined aggregation logic that preserved field-level traceability while enabling group-level reporting and comparison. Research-driven and pilot deployments operated alongside these contexts, enabling testing and refinement of methods under controlled assumptions without blurring the boundary with validated operational use.

The deployment references presented below are indicative and selectively chosen. They do not constitute an exhaustive catalogue of activities undertaken during 2025. Instead, they illustrate representative contexts in which the platform, methods, and governance principles described in this report were exercised in practice.

Deployment References

The deployment references presented in this section provide selected, indicative examples of how farmB's platform was applied across different operational contexts during 2025. They are not intended as an exhaustive catalogue of deployments, nor as a comparison of performance or outcomes. Instead, each reference illustrates a specific configuration of data sources, analytical methods, and governance conditions under which the system operated in practice, highlighting the diversity of use cases while maintaining consistent internal structures and methodological logic.

Deployment Reference → Cereals Supply Chains

Deployment context:
Commercial supply-chain deployments supporting food and beverage processors and their contracted producer networks.

Scope:
Monitoring of approximately 4,000 ha of cereal crops (barley and wheat), including field-level crop monitoring, advisory support delivered by agronomic experts, and greenhouse gas emissions reporting associated with crop production.

Methods applied:

- Field-level data integration and monitoring
- Agronomic analytics supporting advisory workflows
- Greenhouse gas emissions estimation using farmB's in-house methodology
- Aggregation of field-level indicators at supply-chain level
- Delivery of structured reporting outputs

Role within *Pulse*:
Demonstrates use of farmB's platform in supply-chain contexts, combining agronomic monitoring and CO_2 emissions reporting based on consistent, field-level data flows.

Deployment Reference → ISO-Aligned Farm-Level GHG & Carbon Sequestration | Multiple Crops

Deployment context:
Project-based deployments supporting individual agricultural producers in the preparation and verification of greenhouse gas inventories and emission reduction and/or removal projects under ISO frameworks.

Scope:
Farm-level application of greenhouse gas emissions accounting and soil organic carbon sequestration methodologies across multiple crop systems, including wheat, cotton, walnuts, and kiwi. Deployments covered the full process from data preparation and methodological implementation to support during third-party verification.

Methods applied:

- In-house greenhouse gas emissions calculation methodology aligned with ISO 14064-1
- Carbon sequestration and soil organic carbon methodologies aligned with ISO 14064-2
- Field-level data structuring, baseline definition, and boundary setting
- Digital documentation and reporting support for verification processes

Role within *Pulse*:
Demonstrates operational use of farmB's GHG and carbon sequestration methodologies within externally verified ISO contexts, across diverse crop systems, validating their crop-agnostic design.

Deployment Reference – Data Fusion-based Variable Rate Applications (VRA) | Multiple-Crops | Multiple Regions

Deployment context:
Commercial and operational deployments supporting precision agriculture workflows, connecting farmB's data intelligence platform with agricultural machinery and equipment terminals.

Scope:
Implementation of dozens of variable rate application (VRA) processes across diverse crop systems, ranging from arable crops to perennial systems such as vineyards. Deployments covered the full chain from data fusion and prescription generation to execution on tractors and field equipment.

Methods applied:

- Unified data fusion integrating multiple information layers, including crop status indicators, soil variability, management history, and digital elevation models
- Generation of spatially explicit prescription maps beyond single-index approaches (e.g. not limited to NDVI-based zoning)
- Export and transfer of prescriptions from the farmB platform to machinery and equipment terminals
- Field-level execution of variable rate operations

Role within *Pulse*:
Demonstrates mature operational use of farmB's data fusion and analytics capabilities to support precision input application across crops and regions, validating the platform's ability to translate complex spatial intelligence into executable field operations.

Deployment Reference → Remote Sensing Pest Monitoring | Multiple-Crops | Multiple Regions

Deployment context:
Commercial and operational deployments of remote sensing pest monitoring systems supporting individual farmers, cooperatives, public entities (municipalities and prefectures), and downstream integration with the agrochemical industry through API-based data exchange.

Scope:
Deployment and operation of approximately 300 remote sensing pest traps across diverse crop systems, including cotton, industrial tomato, maize, vineyards, and nut crops, where *Lepidoptera* species represent a significant agronomic risk. Systems were used for continuous monitoring and data collection across growing seasons.

Methods applied:

- Automated pest monitoring using networked electronic traps
- Integration of biological observations with spatial and temporal context
- Aggregation and structuring of pest activity data at field and regional levels
- API-based delivery of processed monitoring data to external platforms, including agrochemical industry applications

Role within *Pulse*:
Demonstrates farmB's capability to operate large-scale, real-time biological monitoring systems and to deliver structured, interoperable data to multiple stakeholder groups, including third-party platforms, while maintaining consistency in data governance and system integration.

Together, these selected-indicative deployment contexts illustrate how farmB's platform operates across commercial agriculture, verification-oriented accounting, precision field execution, and real-time biological monitoring, while maintaining consistent data structures, methods, and governance.

Lessons from Deployment Contexts

Across deployment types, several cross-cutting lessons were reinforced during 2025. Field-level specificity remains essential for meaningful interpretation of agricultural and environmental indicators. Transparency of assumptions supports trust across farmers, advisors, and institutional users. Human interpretation continues to play a critical role in complex or uncertain contexts, despite increasing analytical sophistication. Finally, iterative refinement remains necessary as systems scale across crops, regions, and organisational settings.

These lessons directly inform platform design choices, methodological development, and operating principles described elsewhere in *Pulse*.

Position within *Pulse*

Taken together, these deployment references illustrate how farmB's platform operated across commercial agriculture, verification-oriented accounting, precision field execution, and biological monitoring contexts during 2025. They demonstrate operational maturity and methodological consistency under real conditions, while preserving clear boundaries regarding performance claims, impact attribution, and commercial positioning. The examples are indicative rather than exhaustive and are presented to evidence system operation rather than outcomes.

Research, Methods & Innovation Backbone

farmB's platform is underpinned by a sustained research and innovation backbone that informs system design, methodological choices, and long-term evolution. Research activity is not treated as an isolated or exploratory function, but as a structuring input to operational systems, ensuring that analytical approaches remain grounded in scientific validity and external scrutiny.

Within *Pulse*, this section documents how research, methodological development, and innovation activity contribute to platform maturity, while maintaining a clear boundary between validated deployment and experimental development.

Role of Research within the Platform

Research plays a dual role within farmB. It supports the development and validation of analytical methods used in operational contexts, and it provides a controlled environment for testing new approaches before they are incorporated into live systems.

This role is characterised by continuity rather than episodic experimentation. Research outputs are expected to inform platform components only when methodological robustness, interpretability, and governance requirements can be met.

Publicly Funded and Collaborative R&I Actions

During 2025, farmB actively participated in publicly funded and collaborative research and innovation actions at national and European level. These activities provided structured environments for methodological development, validation, and peer review, while remaining aligned with the platform's operational orientation and governance principles.

Participation in such actions is not treated as parallel or detached research activity. Instead, it supports the maturation of analytical methods, data structures, and system components that are subsequently exercised in operational contexts, subject to appropriate validation and separation between research and deployment.

Indicative research and innovation actions in which farmB has participated include:

- European and nationally funded projects focused on digital agriculture, geospatial analytics, and data-driven decision support
- Collaborative research initiatives addressing greenhouse gas accounting, carbon sequestration, and MRV-oriented methodologies
- Multi-actor projects exploring interoperability, system integration, and the application of digital technologies in agricultural sustainability contexts
- Joint research activities with academic and applied research partners on explainable artificial intelligence, field geometry analytics, and spatial modelling

These actions contribute to methodological depth, standards awareness, and external scrutiny, while maintaining a clear boundary between experimental development and validated operational use.

Methodological Development and Standards Alignment

Methodological development within farmB follows a standards-aware and validation-oriented approach. Analytical methods are designed to be interpretable, documented, and compatible with recognised frameworks where applicable.

During 2025, this included alignment of greenhouse gas emissions and carbon sequestration methodologies with ISO 14064-1 and ISO 14064-2, as well as attention to emerging practices related to MRV, data governance, and audit readiness. Method development is treated as an iterative process, with explicit versioning and documentation to support traceability and review.

A structured description of farmB's MRV-related methodological architecture, including boundary definitions, model provenance, uncertainty treatment, and verification interfaces, is provided in Annex B.

Position within Agri-Industry Data Ecosystems

farmB's platform is designed to operate within broader agri-industry data ecosystems, rather than as a closed or self-contained system. Its role is that of an intermediate data intelligence layer, capable of both ingesting external agronomic and operational data and delivering structured analytical outputs to downstream systems, while retaining control over analytical logic, data governance, and interpretation.

During 2025, this positioning was exercised through system-level interconnections with established agri-industry platforms and infrastructures. These interconnections enabled bidirectional data exchange in specific operational contexts, supporting integration with fertiliser and crop nutrition intelligence services (e.g., Yara FX Insights), machinery and farm operations management environments (e.g., John Deere Operations Center), distributed sensing and IoT infrastructures (e.g. Libelium), and soil and plant analytics providers (e.g. AgroCares).

These interconnections are implemented through standardised interfaces and APIs and are governed by purpose-bound data exchange principles. They do not imply exclusivity, dependency, or delegation of analytical responsibility. Instead, they demonstrate the platform's capacity to function within heterogeneous agri-industry environments while maintaining methodological integrity, data traceability, and independent interpretation.

Within *Pulse*, this ecosystem positioning provides context for how farmB's platform interacts with external systems across commercial, advisory, and verification-oriented settings, without shifting focus from the platform's core role as a governed data intelligence system.

Scientific Publications and Intellectual Output

Peer-reviewed scientific publications form an important component of farmB's research backbone, providing external scrutiny of analytical approaches and contributing to broader scientific discourse.

During 2025, farmB-affiliated researchers authored or co-authored peer-reviewed publications in high-impact scientific journals, including:

- *Explainable artificial intelligence-driven geometric feature selection for enhanced field traversing efficiency prediction*. Advancing interpretable AI

methods for analysing field geometry and operational efficiency in agricultural machinery workflows.
- *Interpretable machine learning for legume yield prediction using satellite remote sensing data*. Demonstrating transparent, crop-specific yield modelling using Earth observation data.
- *Benchmarking large language models in evaluating workforce risk of robotization: insights from agriculture*. Assessing the applicability and limitations of large language models in analysing socio-technical change in agricultural systems.
- *Simplifying field traversing efficiency estimation using machine learning and geometric field indices*. Providing robust, scalable methods for estimating field operational performance using geometric indicators.
- *Soil organic carbon assessment for carbon farming: a review*. Synthesising current approaches, uncertainties, and methodological challenges in soil carbon assessment relevant to MRV and carbon farming.
- *Explainable AI-enhanced human activity recognition for human–robot collaboration in agriculture*. Contributing to safe, interpretable human–robot interaction in agricultural operations.

Together, these publications span AI interpretability, geospatial analytics, crop monitoring, soil carbon assessment, and socio-technical dimensions of agricultural digitalisation, all of which directly inform farmB's platform design and methodological choices. These scientific outputs inform system development by validating analytical approaches, supporting their translation into operational components, and clarifying methodological boundaries.

Role of Research Outputs within System Development

- Credibility & Validation
  Core analytical methods are developed and tested within structured research frameworks and underpinned by externally peer-reviewed work, rather than in isolation.
- Continuity
  Operational capabilities exercised in 2025 build on a sustained research and innovation trajectory, rather than one-off development efforts.
- Translation & Transferability
  Research insights are systematically converted into deployable MRV and decision-support components designed for repeatable use across contexts.
- Boundaries
  Robustness, uncertainty, and validation requirements are explicitly defined and documented rather than assumed.

Position within *Pulse*

This section positions research and methodological development as a continuous backbone to farmB's operational systems rather than as isolated scientific activity. The work described here supports validation, transparency, and controlled evolution of deployed methods, while maintaining clear separation between experimental development and production use. Within *Pulse*, research outputs are treated as evidence of methodological maturity and boundary-setting, not as endpoints in themselves.

Team & Operating Principles

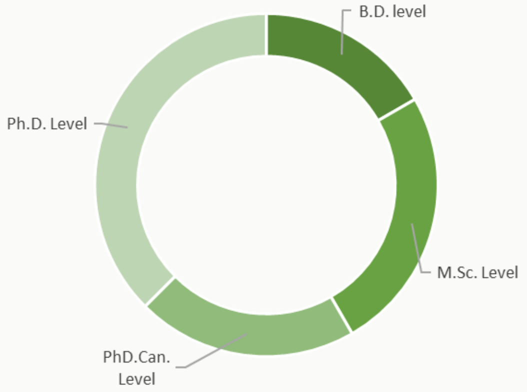
Team and Capability Structure

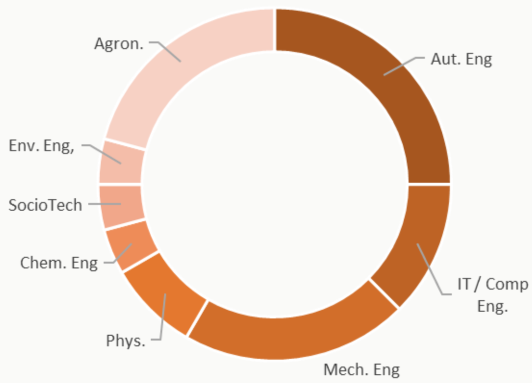
farmB's team structure reflects a deliberate balance between scientific depth, engineering capability, and operational execution. The organisation is built to support continuous research and innovation while maintaining the capacity to deploy, operate, and support digital agriculture systems in real-world contexts.

The team brings together expertise across agriculture, engineering, data science, sustainability assessment, and socio-technical analysis. A defining characteristic is the high concentration of advanced academic profiles, combined with long-term involvement in applied research and operational projects.

Figure 2 - The figure illustrates the distribution of academic qualification levels within the farmB team. The profile reflects a high concentration of advanced academic training, supporting research-informed system development and methodological rigour.

Figure 3 - The figure shows the disciplinary composition of the farmB team across engineering, agronomy, data, and socio-technical domains. This diversity enables interdisciplinary system design and integration across research, development, and deployment contexts





Operating Principles

- Research-Informed Development
  System components and methods are grounded in peer-reviewed research and validated practice.
- Interdisciplinary Integration
  Engineering, agronomy, data science, and socio-technical perspectives are combined by design.
- Operational Feedback Loops
  Field deployments continuously inform refinement of methods and tools.
- Standards Awareness & MRV Readiness
  Long-term engagement with standards and verification frameworks informs system design and use.

Scientific Integrity & Data Governance

Scientific integrity and data governance are foundational to how farmB designs, deploys, and operates its data intelligence systems. Given the reliance on field-level data, modelling, and MRV-oriented analytics, emphasis is placed on traceability, methodological transparency, and responsible data handling, rather than on opaque or ad-hoc processing practices. This approach ensures that data and indicators presented in *Pulse* are interpretable, reviewable, and fit for their intended purpose.

Methodological Transparency and Traceability

Methodological transparency and traceability are supported through explicit documentation of data sources and data types used within system components, the analytical steps and modelling assumptions applied, and the versioning of methods and parameters over time. This documentation enables traceability from analytical outputs back to underlying data and assumptions, supporting internal review, external scrutiny, and potential future verification processes.

Data Quality and Consistency

Data quality and consistency are addressed through structured handling of inputs across crops and operational contexts, alongside explicit identification and treatment of incomplete or uncertain data. Where data limitations exist, they are documented rather than concealed. This ensures that indicators are interpreted within appropriate bounds and that uncertainty is treated as an analytical characteristic rather than an error to be suppressed.

Governance of Research and Operational Data

Clear governance distinctions are maintained between research data and operational data. Research data generated or used within experimental or pre-commercial contexts are managed separately from operational data produced through live deployments and services. This separation supports appropriate data use, retention, and interpretation, while allowing structured feedback between research and operational domains without conflating validated deployment with experimental development.

As part of its governance structure, farmB conducts a portion of its research and methodological development activities through farmB Labs Ltd., its UK-based research and development entity. farmB Labs Ltd. provides a dedicated organisational environment for experimental development, participation in publicly funded research and innovation actions, and advancement of analytical methods, while maintaining clear organisational and operational separation from commercial service delivery. This structure supports methodological rigour, external collaboration, and controlled transfer of validated outputs into the operational platform.

Audit Readiness and External Review

Data governance practices are designed to support audit readiness, particularly in contexts related to MRV, sustainability reporting, and ISO-aligned certification. This includes maintaining clear data lineage, reproducible analytical workflows, and documentation sufficient to support third-party review at project level. While *Pulse* does not claim formal certification, the underlying governance framework is aligned with principles required for independent assessment and external scrutiny.

Quality, Information Security & Privacy Frameworks

farmB's scientific and data governance practices are supported and certified by structured management frameworks aligned with internationally recognised standards, including:

- ISO 9001 – Quality Management Systems
- ISO/IEC 27001 – Information Security Management Systems
- ISO/IEC 27701 – Privacy Information Management

These frameworks support consistent operational processes, information security, and responsible handling of personal and sensitive data. Their role within farmB is to reinforce discipline, traceability, and risk management, rather than to substitute methodological transparency or scientific validation.

Ethical Use of AI & Farmer Data

The ethical use of artificial intelligence and farmer data is integral to how farmB designs and operates its data intelligence systems. As automated analytics, modelling, and decision-support tools play an increasingly prominent role in agriculture, emphasis is placed on explainability, proportionality, and purpose-bound data use, rather than on opaque optimisation or unrestricted data exploitation. This approach reflects both practical agronomic realities and the responsibility inherent in handling field-level and farm-level information.

Explainable and Interpretable AI

farmB prioritises the use of explainable and interpretable AI methods, particularly in contexts where analytical outputs inform agronomic, environmental, or management decisions. Methodological choices favour models whose behaviour and drivers can be examined and communicated, and where limitations can be understood alongside results. Where more complex analytical techniques are applied, interpretability tools are used to explore model sensitivity, assumptions, and constraints. This orientation is reinforced by farmB's peer-reviewed scientific contributions in explainable artificial intelligence, ensuring that methodological approaches are subject to external scrutiny and scientific validation.

Human-in-the-Loop Decision Support

AI-driven outputs within farmB systems are designed to support human decision-making rather than to replace it. Indicators, analytics, and recommendations are presented as decision-support inputs that require contextual interpretation by farmers, advisors, or institutional users. This human-in-the-loop approach recognises the inherent variability and complexity of agricultural systems and avoids over-automation in decision-critical contexts where professional judgement remains essential.

Farmer Data Stewardship

Farmer and farm-level data are treated as entrusted information rather than as a detached commodity. Data stewardship is guided by principles of purpose limitation, context awareness, and respect for farmer expectations. Data are used only for clearly defined analytical and operational objectives, and interpretation explicitly considers agronomic, geographic, and management conditions. Secondary uses that would conflict with farmer trust or the original context of data provision are avoided across both research and operational activities.

Responsible Scaling of AI and Data Systems

As data intelligence systems scale across regions, crops, and use cases, ethical considerations are incorporated into system design and development processes rather than addressed retrospectively. This includes attention to potential bias or misrepresentation in analytical models, awareness of the socio-technical implications of automation in agricultural settings, and alignment between technical capability and responsible deployment. Ethical considerations are therefore embedded within development cycles alongside performance, robustness, and governance criteria.

Position within *Pulse*

The governance principles outlined in this section define the conditions under which farmB's systems are designed, operated, and interpreted. They frame data integrity, AI use, and methodological transparency as foundational requirements rather than compliance afterthoughts. Within *Pulse*, these principles serve to contextualise all reported analytics and deployments, ensuring that system maturity is assessed in terms of control, accountability, and responsible use rather than scale alone.

Looking Ahead: 2026 Outlook

The 2026 outlook builds directly on the operational, methodological, and deployment foundations documented in *Pulse 2025*. Rather than introducing new strategic directions, the emphasis is placed on consolidation, formalisation, and scaling of capabilities already exercised in practice. The outlook therefore reflects controlled evolution**,** not strategic redirection.

Transition of MRV from Project Context to Market Offering

A central focus for 2026 is the transition of MRV-oriented methodologies from project-based and verification-oriented application to formally approved and scalable commercial offerings.

During 2025, farmB's greenhouse gas emissions and carbon sequestration methodologies were applied within ISO 14064-1 and ISO 14064-2 certified contexts, exercised across multiple crops and farm types, and supported end-to-end at farm level, including documentation and engagement with third-party verification processes. These applications established methodological robustness and operational feasibility, while maintaining clear boundaries around commercial positioning.

In 2026, the emphasis shifts toward completion of formal approval processes, structuring MRV functionality as a repeatable service layer, and reinforcing the separation between commercial MRV services and research or pilot activity. This transition is treated explicitly as a quality and governance milestone, rather than as a rapid market expansion exercise.

Scaling of Commercial Deployments and Data Services

Building on commercial deployments active in 2025, 2026 priorities focus on extending existing operational patterns rather than introducing bespoke solutions. Expansion of supply-chain and cooperative-level deployments continues alongside the repeated execution of precision agronomy and data-driven field operations across crops and regions.

In parallel, data-as-a-service integrations are further developed through structured, API-based delivery to external platforms. Scaling is approached through repeatability of workflows, consistency of data structures, and governance discipline, rather than through ad-hoc or customised implementations.

Deepening of Environmental and Climate Intelligence

Environmental and climate intelligence in 2026 is expected to deepen through improved integration of temporal dynamics across seasons, refinement of uncertainty handling and documentation practices, and stronger linkage between field-level intelligence and aggregated reporting needs.

These developments are intended to enhance interpretability, comparability, and institutional usability, particularly in contexts where environmental data inform financial, governance, or reporting processes.

Continued Research and Methodological Evolution

Research and innovation remain integral to system evolution beyond 2025. In 2026, emphasis is placed on translating research outputs into stable and governed platform components, advancing explainable and interpretable artificial intelligence methods, and maintaining alignment with emerging standards and verification practices.

Research activity continues to inform operations without blurring the boundary between validated deployment and experimental development, ensuring that innovation contributes to system evolution in a controlled and transparent manner.

Positioning Beyond 2026

Beyond 2026, farmB is positioned to operate as a mature data intelligence platform for agriculture, anchored in systems in active commercial operations, standards-aligned and externally verified methodologies, and responsible governance of data and artificial intelligence. A defining characteristic of this positioning is the clear separation between operational services and innovation pipelines, ensuring that research and development continue to inform system evolution without blurring the boundaries of validated deployment.

Rather than driven by short-term expansion or unverified claims, this positioning is intended to support growth that remains credible, auditable, and farmer-centric, anchored in methodological transparency and operational discipline.

> ### Position within *Pulse*
> The 2026 outlook is presented as a continuation and consolidation of capabilities already exercised during 2025, not as a statement of strategic redirection or speculative growth. Within *Pulse*, forward-looking references are intended to clarify system trajectory, governance priorities, and formalisation milestones, while avoiding premature commercial or performance claims. This positioning ensures continuity between documented operation and anticipated next steps.

Annex A - System Telemetry Dashboard

Purpose. This dashboard provides an anonymised, non-competitive snapshot of operational telemetry for farmB's data intelligence platform during the reporting period. It is intended to demonstrate system operation under real conditions, data health, and governance controls. It does not present impact, performance, or outcome claims.

Reporting period. [01 JAN 2025 – 31 DEC 2025]

Data status. Data as of 31 DEC 2025, including late-arriving records up to +14 days.

Scope. Production systems only. Sandbox, pilots, and experimental environments are excluded unless explicitly labelled.

Indicator	Value
A. Coverage and Adoption (Anonymised)	
Active operational entities[1]	184
Monitored agricultural area[2]	52,500 ha
Retention[3]	91%
Engagement intensity[4]	112 (actions/entity/M)
B. Data Pipeline Health	
Data streams live in production[5]	• Earth observation (satellite imagery, derived indices) • Field-level operational data (management records, inputs, operations) • Environmental and contextual data (weather, terrain, soil attributes)

[1] Definition. Number of distinct operational entities (e.g., farms, cooperatives, supply-chain programmes, institutional deployments) that generated at least one production event during the reporting period. An "operational entity" is counted as one organisational decision unit (e.g., farms, cooperatives, supply-chain programmes, and carbon projects), regardless of its internal size (e.g., number of farmers) or structure. An "operational event" is any of the following recorded in production systems: creation or update of a field/parcel geometry used for analysis, ingestion of new data associated with a field (EO/IoT/manual/third-party/API), execution of an analytical workflow resulting in stored outputs (e.g., VRA prescription export, emissions report generation, pest monitoring output), export or delivery of outputs (file export/API delivery/report issuance).

[2] Definition. Total unique agricultural area (in ha) associated with fields/parcels that were actively (with ≥1 data refresh or analytical output during the reporting period) monitored during the reporting period.

[3] Definition. Percentage of operational entities that were active in a prior reference period and remained active in the subsequent period, based on the operational activity definition.

[4] Definition. The median number of production operational actions performed per active operational entity per month during the reporting period.

[5] Definition. Categories of data streams (by functional category) that were actively ingested and processed in production environments during the reporting period.

	• In-field and remote sensing (IoT sensors, pest traps, proximal sensing, UAVs, Agri-Machinery) External agronomic and sustainability services (API-based inputs)
Refresh coverage[6]	Majority of active units met minimum cadence requirements across core data streams. No exact value presented due to cadence definitions evolving during 2025 and to significant variation in seasonal applicability.
Latency[7] (ingest → analytics)	10s / <30s (median/P95)
Failed ingest rate[8]	Failed ingest rate: Monitored internally; not reported due to evolving validation rules.
C. Data Quality and QA/QC	
Completeness[9]	(% records meeting schema) Completeness: Tracked internally; schema enforcement stabilised in 2026 following progressive schema formalisation during 2025.
Validation pass[10]	Rate: ~90–95% (Based on validation rules active at time of processing).

[6] Definition. Percentage of active monitored fields for which data refreshes met or exceeded a predefined minimum cadence during the reporting period. Minimum cadence represents the minimum acceptable data refresh frequency required for a given analytical workflow to function as intended (is defined per data category). On going process for farmB – examples identified include: earth observation inputs: ≥1 valid refresh per 30 days during the growing season; pest monitoring inputs: ≥1 valid refresh per 3 days during active periods.

[7] Definition. Elapsed time between successful ingestion and availability of analytical outputs, measured under normal production conditions. Latency reflects processing execution time and excludes upstream data acquisition delays.

[8] Definition. Percentage of attempted data ingestion events in production environments that did not successfully pass validation and enter analytical workflows, during the reporting period. Ingest attempt definition: An ingest attempt is any discrete data submission or pull (file, API payload, sensor batch) intended for production processing

[9] Definition. Percentage of ingested production data records that fully conform to the defined data schema, including presence of all mandatory fields and correct data types, during the reporting period. Schema definition: A schema is the formal specification of required fields, data types, and structural constraints defined per data stream category. Counts as complete: All mandatory fields present, Field types and formats valid, Record accepted for analytical processing, counts as incomplete: Missing mandatory fields, Invalid field types or formats, Records rejected or partially ingested due to schema violations.

[10] Definition. Percentage of production data records that passed all defined validation rules and were accepted for analytical processing during the reporting period. Validation rules include: range checks (e.g., values within physically plausible bounds), consistency checks (e.g., internal field relationships, unit coherence), temporal checks (e.g., timestamps within expected windows), cross-field or cross-stream coherence where rules are defined. Counts as passed: Record meets all active validation rules or is accepted for downstream analytics.

D. Analytics and Change Control

Analytical outputs with full provenance trace[11]	~85–90% (Coverage increased during the reporting period as provenance controls were deployed.)
Change-controlled production releases[12]	8

[11] Definition. Percentage of analytical outputs generated in production environments for which a complete provenance record is available, enabling traceability from output back to input data, method version, and execution context. Full provenance trace includes: unique identifier for the analytical output, identifiers for all input datasets used version identifier of the analytical method or model applied, timestamp of execution, execution environment identifier (e.g., production release/version). Counts as having full provenance: All elements above are recorded and retrievable, Output can be recomputed using the same inputs and method version.

[12] Definition. Number of distinct production releases during the reporting period in which analytical logic, models, or data processing workflows were modified under a formal change-control process. Counts as a change-controlled release if: the change was deployed to production environments, the change is associated with a version identifier, documentation exists describing the scope of change, release approval followed defined internal procedures.

Annex B - MRV Methods and Verification Interface

B.1 Purpose and Reading Context

This annex provides a concise, verifier-facing description of the MRV-related methodological architecture applied by farmB during the 2025 reporting period. It clarifies accounting boundaries, methodological provenance, uncertainty handling, and verification interfaces for greenhouse gas (GHG) accounting and soil organic carbon (SOC) monitoring.

This annex does not constitute a certification claim, registry submission, or standalone MRV protocol. It documents how methods were applied in practice within defined inventory and project contexts.

B.2 Accounting Contexts and Boundary Definition

farmB applies MRV-related methodologies under two distinct accounting contexts:

- Inventory accounting, aligned with ISO 14064-1, where emissions and removals are quantified within a defined organisational or operational boundary.
- Project accounting, aligned with ISO 14064-2, where changes in emissions or removals are assessed relative to a defined baseline scenario.

Boundary definition (activities included, temporal scope, organisational responsibility) is established at client or project level. farmB implements calculations and methodological logic within these externally defined boundaries and does not act as the boundary-setting authority.

B.3 Greenhouse Gas Accounting Architecture

GHG accounting is implemented through a source-explicit, tiered calculation architecture, as documented in the farmB GHG methodology.

Key characteristics include:

- Explicit definition of agricultural emission source categories relevant to crop production systems.
- Use of emission factors sourced from internationally recognised guidelines and peer-reviewed literature, with documented provenance.
- Differentiation between direct, indirect, and biogenic CO_2 flows, treated in accordance with ISO guidance.
- Tier selection based on data availability and context, with higher-resolution approaches applied where defensible.

Calculations are deterministic and reproducible. No opaque or self-learning estimation is applied at the accounting layer.

B.4 Soil Organic Carbon and Removals Methodology

SOC monitoring and sequestration assessment follow a **hybrid, staged methodology**, combining spatial modelling with progressive integration of measured data.

Core elements include:

- High-resolution baseline estimation using satellite data, terrain attributes, and machine-learning models.
- Stratified random sampling and integration of proximal (NIR) and laboratory soil measurements.
- Iterative correction of model outputs based on measured data, reducing uncertainty over time.
- Explicit separation between baseline establishment and monitoring phases.

This approach balances spatial coverage, statistical robustness, and cost efficiency, while maintaining transparency on assumptions and limitations.

B.5 Uncertainty Treatment

Uncertainty is treated as an explicit analytical dimension.

- For SOC estimates, uncertainty is quantified at stratum and field level using sampling design and confidence intervals where measurement density allows.
- For GHG accounting, uncertainty is addressed through tier selection, emission factor provenance, and qualitative uncertainty classes where quantitative propagation is not defensible.

Uncertainty statements are included in supporting documentation provided during verification processes.

B.6 Verification Interface and Reproducibility

Verification activities supported during 2025 were conducted by independent, accredited certification bodies, under client-defined organisational boundaries.

farmB's role in the verification interface includes:

- Provision of input datasets, calculation logic, and methodological documentation.
- Reproducible workflows allowing recalculation using identical inputs and factors.
- Clear data lineage linking reported values to source data and assumptions.

Verification applies to inventories or project results prepared by clients. The farmB platform itself is not presented as a certified system.

B.7 Applicability and Limitations

Methods described are applicable only within explicitly defined boundaries and data contexts. They are not applied as default or universal methods without reassessment. No claims are made regarding credit issuance, permanence guarantees, or regulatory approval unless explicitly scoped.

B.8 ISO 14064 Requirements–to–Method Crosswalk

This table maps key ISO requirements to the methodological elements applied by farmB. It is illustrative rather than exhaustive.

ISO 14064-1 (GHG Inventories)

ISO Requirement (High Level)	farmB Method Element	Evidence Provided
Organisational / operational boundary definition	Boundaries defined at client/project level; implemented in calculations	Project documentation, boundary statements
Identification of emission sources	Source-explicit agricultural categories	GHG methodology documentation
Emission factor selection	Factors from recognised guidelines and literature	Factor provenance records
Quantification methodology	Tiered, deterministic calculations	Reproducible calculation workflows
Documentation and transparency	Inputs, assumptions, versioning documented	Calculation logs, method versions

ISO 14064-2 (Projects and Removals)

ISO Requirement (High Level)	farmB Method Element	Evidence Provided
Baseline scenario definition	Baseline established per project context	Baseline documentation
Monitoring methodology	Hybrid SOC modelling + sampling	SOC methodology framework
Data management and QA	Stratified sampling, correction logic	Sampling plans, QA records
Uncertainty consideration	Quantitative or qualitative uncertainty treatment	Uncertainty statements
Verification readiness	Reproducible datasets and calculations	Verification support materials

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