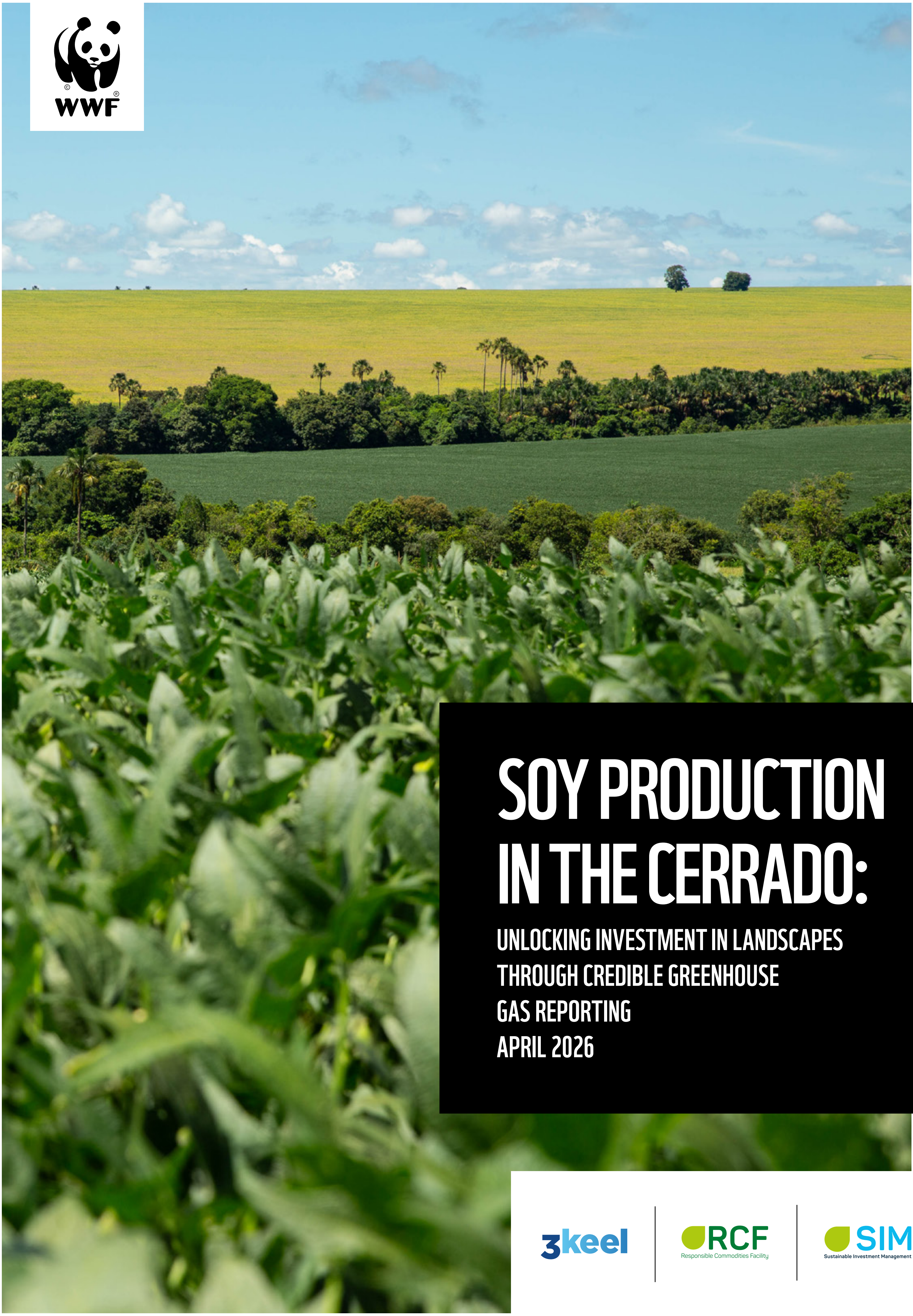

WWF

SOY PRODUCTION IN THE CERRADO:

UNLOCKING INVESTMENT IN LANDSCAPES THROUGH CREDIBLE GREENHOUSE GAS REPORTING

APRIL 2026

3keel

RCF
Responsible Commodities Facility

SIM
Sustainable Investment Management

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Acknowledgements

We thank all stakeholders for sharing their experience to support the preparation of this report, including representatives from Agro New Life, Amaggi, CCarbon, Cefetra, CJ Selecta, Louis Dreyfus Company, Greencore, Produzindo Certo, Proforest, Sainsbury's, Satelligence, Solidaridad, Tesco, Westbridge Foods, 2 Sisters Food Group and Cool Farm Tool.

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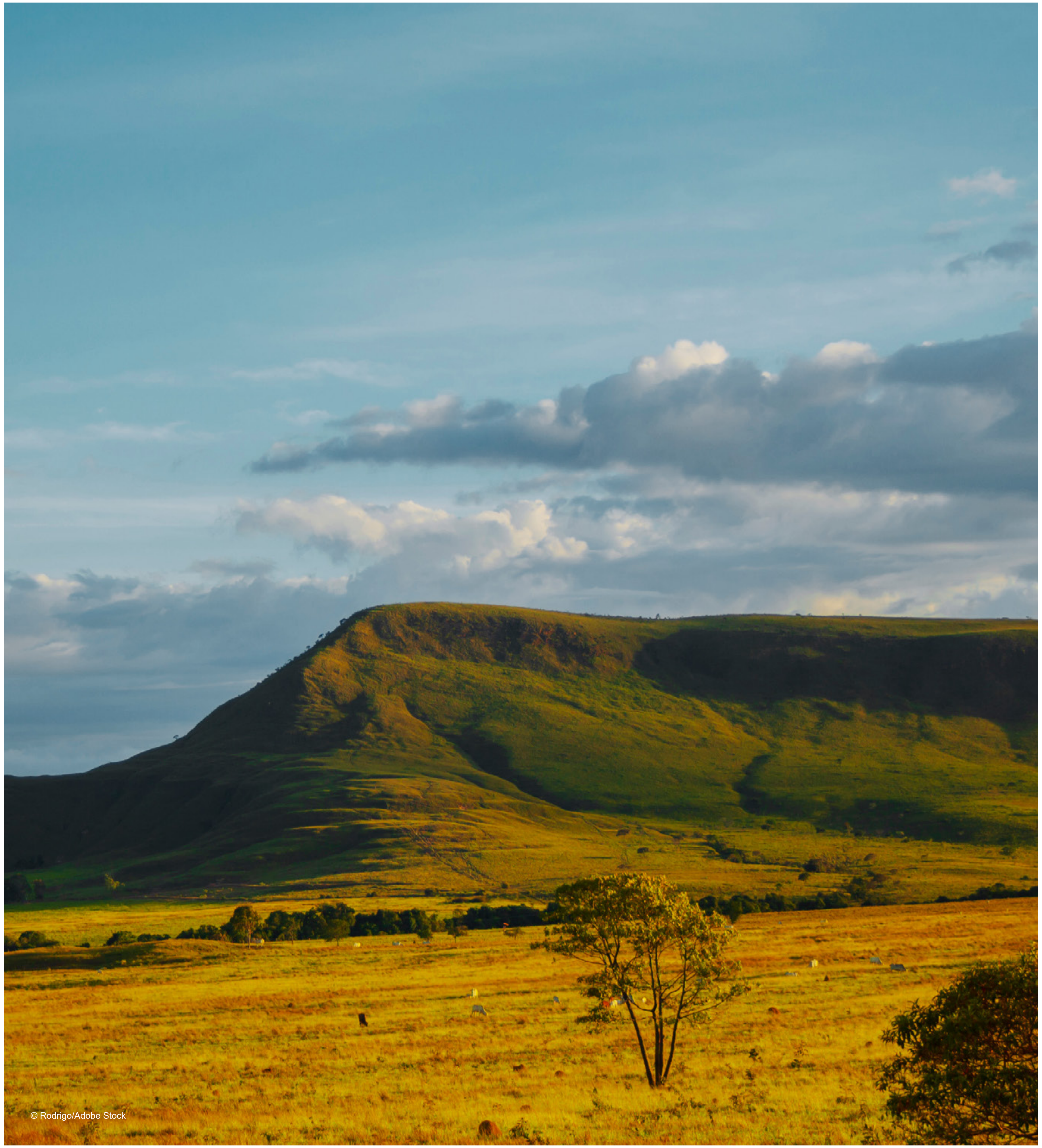

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EXECUTIVE SUMMARY

CONTEXT

The Brazilian Cerrado is a globally significant agricultural landscape, producing nearly half of Brazil's soy while also playing a critical role in climate mitigation, water regulation, and biodiversity. Despite its importance, the Cerrado has experienced high levels of conversion of native vegetation, primarily driven by agricultural expansion, highlighting the urgent need for soy production methods that can meet demand without further ecosystem loss.

Within this context, companies that source from the Cerrado are increasingly setting science-based climate targets to reduce the greenhouse gas (GHG) emissions from their supply chains. By enabling companies to invest in sustainable, deforestation and conversion free (DCF), soy production in the Cerrado and recognising resulting greenhouse gas outcomes within their scope 3 GHG inventories, companies can align corporate decarbonisation objectives and budgets with on-the-ground conservation of this critical habitat.

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The guidance and standards governing how outcomes within indirect, multi-actor supply chains, can be accounted for in scope 3 GHG inventories are nascent and best practice for their application is still emerging. This report examines what alignment with these key standards means in practice for agricultural and landscape-level interventions in soy production within the Cerrado. It focuses on how a company can prove sufficient traceability to these interventions and the requirements for the monitoring and reporting of the resulting GHG outcomes. The findings are then applied to the Responsible Commodities Facility (RCF), a blended finance fund, involved in the financing of DCF soy within the Cerrado, in a practical case study.

PROVING SUFFICIENT TRACEABILITY

Traceability requirements represent the most immediate challenge to companies accounting for GHG outcomes within Cerrado soy supply chains. Under current guidance, to include an intervention within their GHG inventory, organisations must demonstrate physical traceability to the land where interventions take place using an accepted chain of custody (CoC) model. CoC models must demonstrate sufficient connectivity across the supply chain, with any mixing and reconciliation of materials occurring in defined temporal and spatial boundaries. In practice, physical traceability can often be established to farms or groups of farms at early aggregation points, but is challenging to maintain through international logistics, processing into feed, and incorporation into livestock products.

Currently, there is ambiguity when applying these requirements in indirect, commodity supply chains but within this grey area, there are opportunities to test approaches that strengthen supply chain connectivity sufficient for proving physical traceability. Companies must participate and provide evidence from real life programmes, such as the RCF, which are testing solutions to these challenges to support the development of best practice. This also presents an opportunity to trial CoC systems that enable traceability sufficient for both GHG accounting and DCF claims.

NOTE ON MASS-BALANCE TERMINOLOGY

This report focuses on GHG accounting standards and their application to soy supply chains. Unless otherwise stated, references to mass balance in this report refer to mass balance systems used for the purpose of GHG inventory accounting. With respect to DCF claims, only mass balance systems in which all volumes entering the system are DCF-verified at origin are considered acceptable. Accordingly, any reference to DCF soy in this report implies verification of the DCF attribute at the farm of origin.

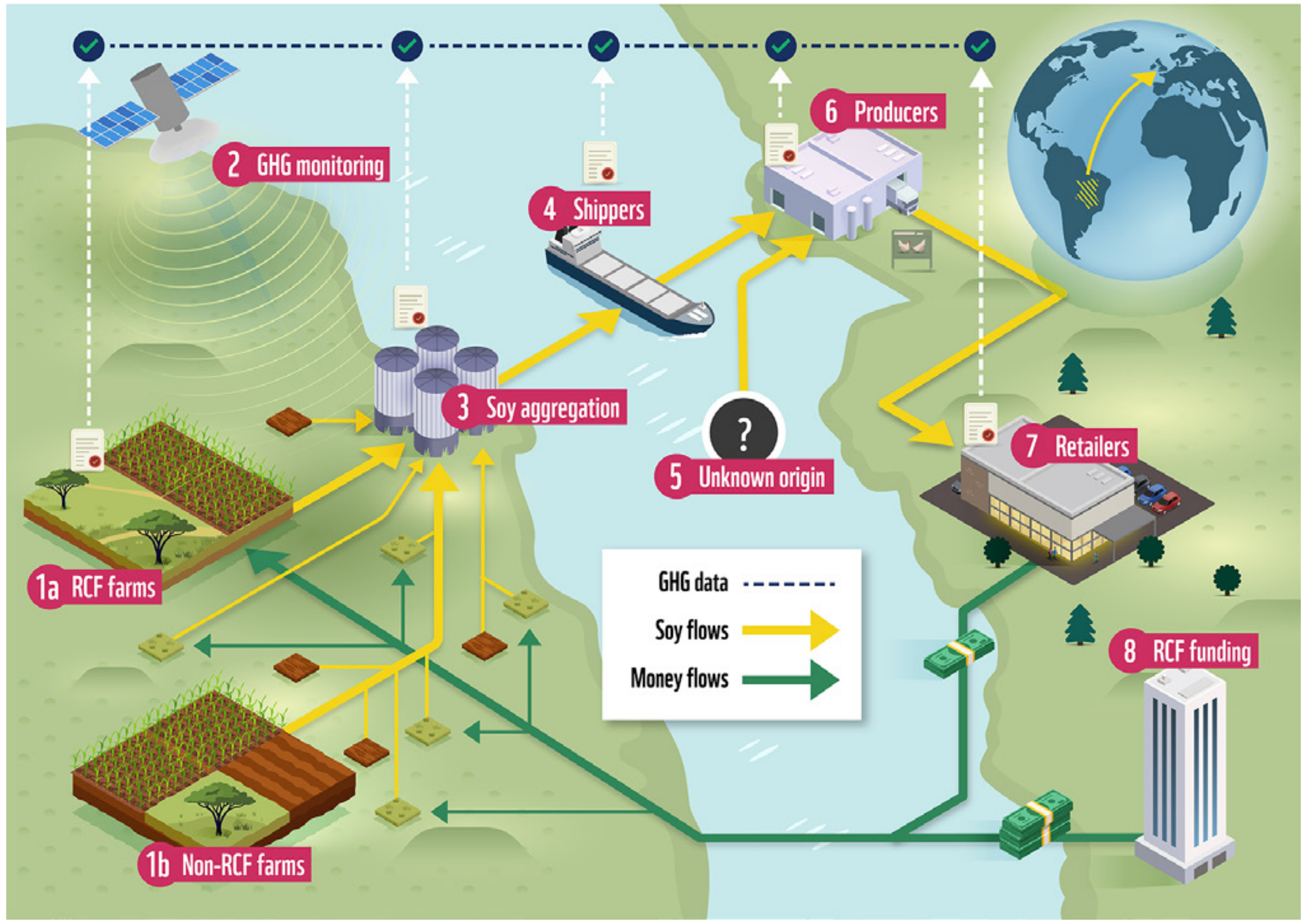
MONITORING, REPORTING AND VERIFICATION NEEDS

Monitoring, reporting and verification (MRV) is vital for demonstrating that interventions deliver measurable climate benefits, but accounting requirements can, in some cases, constrain the impact claimability of landscape-level investments in sustainable soy production. Land use change is the most material source of emissions in Cerrado soy systems and the primary driver of differences in soy carbon footprints. Programmes that limit conversion can therefore deliver substantial reductions in emissions and critically, can be measured using MRV tools that use remote sensing approaches that place a lower burden on producers. In contrast, requirements for monitoring land management emissions and removals are technically demanding, costly to implement, and particularly for soil organic carbon, are not fully covered by available MRV tools. MRV programmes should therefore prioritise the most material greenhouse gas outcomes, which for soy in the Cerrado are typically associated with land use change, whilst taking a proportionate approach to other sources of emissions and removals.

THE RESPONSIBLE COMMODITIES FACILITY AS A PRACTICAL CASE STUDY

The Responsible Commodities Facility (RCF) provides a practical illustration of how investment in a sustainable soy financing scheme might be linked to a scope 3 inventory claim aligned with GHG accounting standards. It demonstrates that blended finance can support a

RCF Chain of Custody model (full details in section 4)



Source: 3Keel

shift towards DCF soy production and materially reduce emissions primarily through lower embedded land use change. In collaboration with supply chain companies, the RCF has developed a pilot CoC approach where digital certificates reflecting verified soy production from farms engaged with the RCF are transferred with the soy as it moves through the supply chain. This strengthens physical connectivity between farms and downstream actors and aims to provide a level of traceability sufficient to meet the requirements of the GHG accounting standards. The case study highlights the need for supply chain actors to collaborate and test approaches that strengthen visibility within complex supply chains.

CONCLUSIONS AND RECOMMENDATIONS

There is significant potential for credible GHG inventory reporting within supply chains to unlock private finance for sustainable soy production in the Cerrado. This report sets out practical steps that organisations can take to build traceability and design credible MRV programmes with the following overarching recommendations:

Prioritise monitoring of the most material sources of emissions. For most soy produced in the Cerrado this is land use change. MRV tools that use remote sensing approaches to monitor emissions from land use change can be more cost effective, and place less of a burden on farmers for primary data collection. Companies should ensure that MRV programmes monitor emissions from land use change and use MRV tools that are able to efficiently and accurately measure these. This way, the drive for DCF commodities can also accelerate the shift to soy production aligned with our global climate goals.

Collectively pilot traceability approaches seeking to demonstrate and strengthen physical connectivity. Companies should collaborate across the supply chain to jointly test approaches that aim to demonstrate physical traceability, either through implementing mass balance CoCs that align with the LSRS requirements, or through other credible traceability systems that can evidence sufficient physical connectivity. When engaging in pilots, companies should demonstrate the actions they are taking to maintain and strengthen physical connectivity and should be transparent in the claims they make from such initiatives.

Transparently report additional landscape outcomes outside of the GHG inventory. In line with LSRS principles, companies should claim only those outcomes that are permitted to be included within the physical GHG inventory. Outcomes that are not currently eligible for inclusion, such as avoided conversion or conservation beyond accounting limits, should be reported transparently through complementary disclosures. This approach preserves accounting integrity while recognising the broader impact of value-chain investments.

1. INTRODUCTION

The Brazilian Cerrado is a globally important agricultural region and one of the most threatened ecosystems in the world. It produces nearly half of Brazil's soy and plays a central role in global commodity markets, yet more than half of its native vegetation has already been cleared, much of it legally. Remaining areas of native vegetation continue to face pressure from agricultural expansion, and producers often lack the financial incentives or resources required to conserve vegetation beyond legal requirements or to adopt lower-emission farming practices. As a result, the Cerrado faces an ongoing challenge with insufficient investment to support the transition to sustainable, deforestation and conversion free (DCF), soy production. At the same time, companies that source from the Cerrado are increasingly setting science-based climate targets, including Forest, Land and Agriculture (FLAG) targets, which commit them to using the land in a climate positive way. For many food and beverage companies, scope 3 emissions represent more than 90% of their total emissions, and FLAG emissions make up a substantial share of this and must now be managed separately from other fossil fuel-based emissions[1].

Improving land management within sourcing regions has emerged as a central part of corporate climate strategies. Many organisations are investing in regenerative agriculture, agroforestry, and other landscape-level activities to deliver measurable outcomes at the production stage. These interventions, often referred to as insetting or Within Value Chain Mitigation (WVCM), are gaining prominence as companies seek to demonstrate progress towards FLAG targets, improve the resilience of their supply chains, and deliver a wide range of environmental and social co-benefits.

For companies to include outcomes from investments in their agricultural supply chain within their scope 3 inventories, they must be able to demonstrate a clear link between the intervention and their value chain. The LSRS sets out the conditions under which organisations can claim emissions reductions or removals from activities within their supply chains. These requirements include establishing traceability to the relevant production landscape and ensuring robust monitoring, reporting

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DEFINING WITHIN VALUE CHAIN MITIGATION

WVCM refers to interventions within a company's value chain[2] that are designed to deliver greenhouse gas (GHG) emission reductions and/or carbon storage, and at the same time create positive impacts and improve the resilience of communities, landscapes and ecosystems[3].

WVCM focuses on on-farm and landscape-level activities such as regenerative agriculture, agroforestry, and improved soil or livestock management. These interventions aim to deliver measurable, farm-level outcomes that contribute directly to progress against science-based targets.

Two key documents currently define the rules for WVCM and determine which activities can count towards corporate targets. The GHG Protocol's Land Sector and Removals Standard (LSRS) and the Science Based Targets initiative (SBTi) Forest, Land and Agriculture (FLAG) Guidance set out complementary principles for land-sector accounting.

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[1] CDP (2024). Scope 3 Upstream: Big Challenges, Simple Remedies. Link.

[2] Establishing a demonstrable link between the intervention and the company's value chain, through traceability to the relevant production landscape, is essential to distinguish WVCM from offsetting. Projects that do not meet these traceability and accounting requirements cannot currently be classified as WVCM and therefore cannot be counted towards a company's SBTi FLAG targets.

[3] 3Keel (2025). Addressing agricultural scope 3 emissions: Best-practice principles for Within Value Chain Mitigation. Link.

and verification (MRV). In indirect, fragmented supply chains such as soy in the Cerrado, these conditions can be difficult to meet and as a result, it is not yet well understood how projects within sourcing landscapes that deliver real climate, biodiversity, and community benefits can be recognised in corporate GHG inventories, creating a barrier to further investment.

1.1 PURPOSE OF THIS WORK

This report examines what alignment of Within Value Chain Mitigation (WVCM) accounting with the Land Sector and Removals Standard (LSRS) means in practice for agricultural and landscape-level interventions, focussing on soy production within the Cerrado. It aims to:

- Clarify the requirements for high-integrity accounting of land-sector emissions and removals within value chain interventions
- Illustrate these requirements in the context of the Cerrado
- Identify where full alignment is not currently achievable and outline potential solutions
- Support companies to understand how WVCM, in combination with blended finance, can contribute to credible progress towards FLAG targets and enable greater investment in sustainable production landscapes

1.2 APPLICATION THROUGH THE RESPONSIBLE COMMODITIES FACILITY

To understand how the findings of this report can be practically applied, the Responsible Commodities Facility (RCF), an ongoing initiative involved in conversion free soy production in the Cerrado, is used throughout as a case study to test the application of the LSRS in real soy supply chains. The RCF is an impact fund that provides financial incentives in the form of low-interest credit lines and mobilises green bond capital to incentivise farmers in the Brazilian Cerrado to adopt DCF soybean production. Participating farmers commit to planting soy only on previously cleared land, foregoing their legal right to clear remaining native vegetation.

To date, the RCF has received investment from UK retailers Tesco, Sainsbury's and Waitrose as catalytic investors, who have played a crucial role in creating this blended finance instrument, along with Rabobank, Santander, AGRI3 Fund, IDB Invest and the Mobilizing Finance for Forests fund (MFF) managed by FMO. The fund currently stands at $60M. The initiative has already produced over 180,000 tonnes of verified deforestation and conversion free soy and conserved 90,000 ha of native vegetation, around 29,000 ha of which are in excess of legal obligations.

Without better understanding of LSRS applicability to commoditised supply chains such as soy production in the Cerrado, companies still face uncertainty about how to translate such outcomes into reductions in their scope 3 GHG inventory. This uncertainty has become a barrier to further private investment from value chain companies.

In 2026, the RCF will pilot a new approach seeking to demonstrate alignment with LSRS requirements and establish physical traceability from participating farms through to downstream funders. This approach aims to maintain a verifiable link between soy produced on RCF farms and specific buyers, even as volumes move through a complex, multi-actor supply chain. Throughout this report, this pilot is used to explore how approaches to making LSRS aligned GHG inventory claims can work in the Cerrado, providing a real-world case study highlighting the opportunities and limitations of applying LSRS requirements in indirect, multi-actor supply chains.

1.3 STAKEHOLDER ENGAGEMENT

To understand how LSRS requirements apply in the Cerrado, we conducted extensive engagement with stakeholders across the supply chain, including NGOs, technical assistance organisations, MRV providers, traders, feed manufacturers, livestock producers, food manufacturers, retailers, and funders involved in the RCF. Their insights have informed the analysis throughout the report.

2. TRACEABILITY AND ITS ROLE IN CREDIBLE VALUE CHAIN REPORTING


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Traceability underpins credible climate claims in agricultural and commodity supply chains. Traceability is the ability to follow a product from the farms or landscapes where it was produced through defined stages of the supply chain, ensuring that any reported GHG reductions or removals can be legitimately attributed to a company's scope 3 inventory. Under the LSRS, companies may only account for emissions reductions or removals within their value chain if they can demonstrate a physical link between the intervention and the purchased goods. Projects that occur within, or near, a sourcing region but cannot be traced to the actual supply base cannot be counted toward corporate GHG inventories and are classed as beyond value chain mitigation.

To account for the impacts of WVCM investments, companies must define a clear spatial boundary for each intervention (for example, a farm, group of farms, or sourcing region) and demonstrate physical traceability between their products and that boundary using an accepted chain-of-custody (CoC) model. A CoC model is a forward-looking system that defines how materials and their associated characteristics are controlled, transferred, and verified between entities in a supply chain.[4]

In practice, many companies can identify the sourcing regions or supplier networks from which they buy commodities, but may not be able to demonstrate traceability to these sourcing regions or farms using an accepted CoC to provide the physical links needed to make claims. While such projects may still deliver relevant sustainability benefits, they fall outside the definition of physical traceability required for inventory accounting. As a result, companies operating in highly aggregated or indirect commodity supply chains sometimes invest in interventions that support improvements within their sourcing landscapes but cannot recognise these outcomes in their climate reporting because physical traceability cannot be demonstrated.

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[4] Value Change Initiative & ISEAL, 2025. Physical traceability in Greenhouse Gas accounting. Link.

2.1 LSRS REQUIREMENTS FOR TRACEABILITY

The LSRS requires organisations to demonstrate a connection between the value chain intervention and the products sourced through an accepted CoC model. It distinguishes between physical and impact traceability:

- **Physical traceability** is when a company has the ability to identify, track, and collect information on **activities** (e.g., activity data or GHG emission or removals factors) related to material flows of **goods and services** in its value chain, across its upstream and downstream processes and products.
- **Impact traceability** is when a company has the ability to identify, track, and collect information on the **GHG emission or removal impacts of projects or interventions** in the value chain of goods and services purchased or sold by the company, including upstream and downstream processes and products.[5]

Currently under the LSRS, only **physical traceability is accepted** for accounting for the impacts of value chain interventions within the GHG inventory. Impact-based models, such as certificate-based or credit-based systems, may be used for other voluntary claims but cannot contribute to a change in the GHG inventory. The key distinction between physical and impact traceability lies in the nature of the information being tracked. Physical traceability records data on the movement of materials and the associated activity data and emission or removal factors linked to those physical flows. In contrast, impact traceability focuses solely on tracking the quantified GHG emission reductions or removals achieved by a project or intervention, without directly linking those impacts to specific material flows.

The Value Change Initiative (VCI)'s *Physical Traceability in Greenhouse Gas Accounting* guidance provides further examples and case studies illustrating how different traceability approaches can be implemented in practice and where they are most applicable[6].

EXPECTED UPDATES TO KEY STANDARDS

Currently, progress towards a company's climate target is predominantly measured by changes within the GHG inventory, which requires the establishment of physical traceability to value chain interventions. In the future, it is expected that companies will have more flexibility to use additional mechanisms to evidence progress.

The SBTi Corporate Net Zero Standard 2.0 is expected to be released later in 2026[7], which will be one of the key standards governing how companies set and make progress towards their climate targets. Within the draft standard published in September 2025, the SBTi have expanded both the types of targets companies can set (e.g. alignment targets) and the selection of instruments and approaches that can contribute towards a company's near-term scope 3 target. One of the additions is to permit commodity certificates that may only maintain impact traceability. Under the LSRS, if a company is only able to demonstrate traceability of impact rather than physical traceability, this would not be sufficient to contribute to a change within the GHG inventory. When the finalised Corporate Net Zero Standard 2.0 is published, it is therefore likely some interventions that cannot be included within a company's GHG inventory will be permitted to count towards a target.

It is anticipated that the GHG Protocol will release further guidance on how companies can account for and report on mitigation activities that do not have physical traceability, including the use of market instruments. They have signalled the need for an additional Standard in a draft White Paper released in December 2025, laying out the key principles, concepts, and options for reporting the impacts of Actions and Market Instruments (AMI)[8]. Further guidance is however not expected until 2027.

The focus of this report is on interventions that contribute towards the physical GHG inventory, and as such require full physical traceability, rather than interventions that may be contribute towards a climate target but only maintain impact traceability.

2.1.1 PROVING PHYSICAL TRACEABILITY

To demonstrate physical traceability to the project area, an accepted CoC model can be implemented through recognised certification schemes or independently audited internal traceability systems. A range of different CoC models exist, each using different systems for the tracking and monitoring of materials within supply chains. ISEAL discuss three different categories of CoC model within their guidance[9]:

1. **Physical relationship** - CoC models that provide evidence of a physical relationship, which means that the specified characteristics are physically present in the material throughout the supply chain. These CoC models include identity preserved, segregated, and controlled blending systems, and are always acceptable for proving physical traceability.
2. **Physical connectivity** - CoC models which track a connection between the material and the specified characteristics, but whilst the specified characteristics may be present in the material, the model does not guarantee this. These CoC models therefore do not maintain a physical relationship and the likelihood that the specified characteristic is found within the material will vary. These CoC models include variants of mass balance systems and can, in some circumstances, prove physical traceability. This is not a given in all mass balance systems.
3. **Administrative relationship** - CoC models that provide evidence of an administrative relationship, where the specified characteristics do not need to follow the material but the relevant units of production must be tracked through an administrative document flow. Book and claims models fall into this category. These models are not acceptable for proving physical traceability.

In mass balance systems the mixing of certified input materials with non-certified materials is permitted but there is no requirement to track the known percentage of material with the specified characteristic. To have connectivity that is sufficiently strong for proving physical traceability, an acceptable mass balance model must meet all of the following conditions:

- The reconciliation period, or the timeframe in which the inputs and output of materials within the system must be balanced, must be defined and is recommended to be no more than 12 months; and
- Transfer boundaries must be restricted, meaning that any mixing and reconciliation of volumes occurs only within a clearly defined and geographically constrained area (such as a batch, site, multi-site, or group), and only where all facilities are located within the same sourcing region and within the same country.
- Proportional allocation must be used to assign the specified characteristics to a volume of outputs.

The requirement for restricted transfer boundaries applies specifically to the transfer boundary at which physical mixing or mass balance reconciliation is taking place, rather than across the whole supply chain. If mixing or reconciliation occurs across facilities located in more than one country, this becomes a multi-country transfer boundary, which breaks the physical link to the sourcing area. In such cases, the system no longer qualifies as physical traceability under the LSRS. It is distinct from a supply chain that simply operates across several countries; the restriction applies specifically to where mass balance allocation is performed, not to the full commercial pathway of the commodity.

Figure 1 illustrates how different CoC models demonstrate varying degrees of physical traceability. Mass balance represents a continuum, ranging from a strong physical relationship at site level to no direct physical relationship when reconciliation occurs across wider spatial boundaries. When using mass balance CoC to evidence physical traceability, organisations should demonstrate what steps they have taken to maintain physical connectivity and demonstrate alignment with the LSRS.

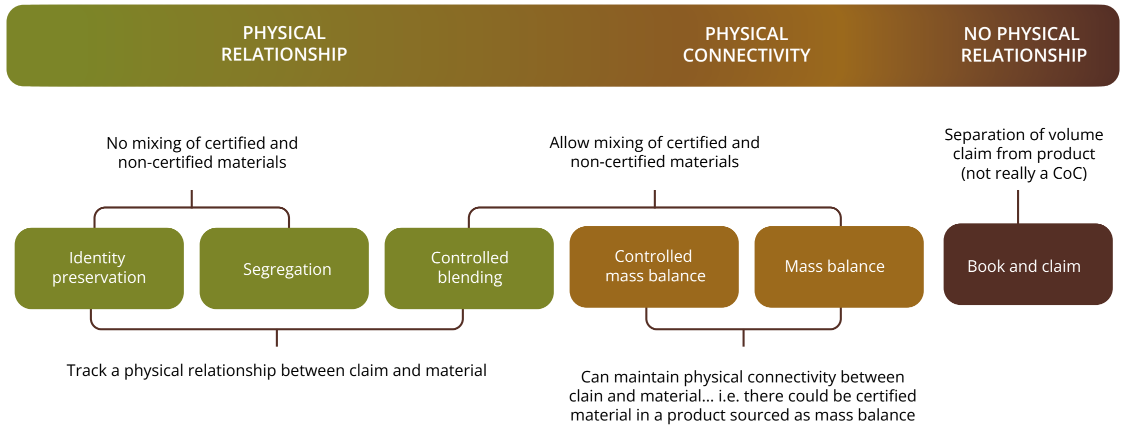

Figure 1. Physical relationship and physical connectivity across different Chain of Custody (CoC) models. IP = Identity Preserved; SEG = Segregated; CB = Controlled Blending; B&C = Book and Claim

Source: Chain of custody models and definitions. A reference document for sustainability system stakeholders. Adapted from VCI, 2025, ISEAL, 2025. V2.0 | July 2025. Adapted by Jambo Studio

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[5] Value Change Initiative, 2025. Glossary. Link.

[6] Value Change Initiative & ISEAL, 2025. Physical traceability in Greenhouse Gas accounting. Link.

[7] SBTi (2025). SBTi Corporate Net-Zero Standard Version 2.0. Link

[8] GHG Protocol (2025). Actions and Market Instruments Phase 1 Progress update, working draft version 2.1. Link

[9] ISEAL, 2025. Link

ALIGNMENT BETWEEN TRACEABILITY REQUIREMENTS FOR DCF AND GREENHOUSE GAS ACCOUNTING

It is important to note that the LSRS requirements for demonstrating physical traceability are designed specifically for GHG inventory accounting and are not intended to ensure plot level traceability of DCF sourcing to the final customer. While certain mass balance models can qualify for GHG accounting when mixing and reconciliation occur within clearly defined, in-country transfer boundaries, these models do not necessarily provide the level of control required for plot-level DCF claims by companies at the end of a value chain, aligned with the Accountability Framework Initiative, or for EUDR compliance. DCF sourcing claims requires systems that prevent non-compliant material from entering the defined boundary and evidence of plot level verification checks. This can be achieved through tightly controlled, closed boundary systems where only material that meets minimum standards is allowed.

CoC models can be used to evidence traceability needed for different environmental claims, but the same CoC model may not always be sufficient for each claim. Whilst those CoC models that maintain a physical relationship can be used to evidence physical traceability across DCF and GHG inventory accounting, those that maintain only physical connectivity must meet further conditions to be sufficient. Models that only maintain impact traceability cannot evidence sufficient traceability for either DCF claims or for reporting within the physical GHG inventory, but in upcoming years may be sufficient to contribute towards a company's climate target. These differences are outlined in the table below and exemplifies the complexity in the landscape of environmental claims and reporting.

WWF together with WRI, TNC and Imaflora have developed and published guidelines for minimum monitoring requirements for DCF soy in Brazil[10], to ensure that soy reaching the first point of aggregation is DCF-verified. This creates a potential pathway for a chain of custody approach that meets both GHG inventory accounting and DCF requirements. A controlled mass balance model, in which only DCF volumes are permitted to enter the system, could enable both lower emissions claims and DCF claims by ensuring that no non-compliant material is mixed into the mass balance. In contrast, broader or compensatory mass balance approaches, including cross country or global systems, cannot ensure this level of control. These additional safeguards go beyond what is required for GHG inventory accounting but are essential for delivering robust DCF outcomes.

TRACEABILITY SUFFICIENT FOR CLAIM	DCF PRODUCTS	PHYSICAL GHG INVENTORY	SBTI TARGET
IDENTITY PRESERVED	Yes	Yes	Yes
SEGREGATION	Yes	Yes	Yes
CONTROLLED BLENDING	No	% compliant	% compliant
CONTROLLED MASS BALANCE	Yes, only if origin-verified DCF soy enters the mass balance system	Yes, if safeguards are met as outlined in Requirement 8 in LSRS	Yes, when aligning with activity pool-based approaches and safeguards have been met
MASS BALANCE	No	Yes, if safeguards are met as outlined in Requirement 8 in LSRS	Yes, when aligning with activity pool-based approaches and safeguards have been met
BOOK & CLAIM	No	No	Under certain circumstances*

** As expected based on the updated draft Corporate Net Zero Standard V2.0*

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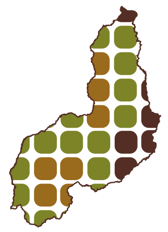
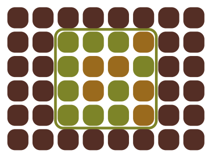
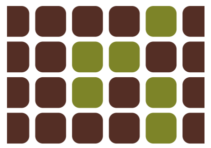
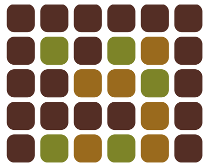
[10] See WWF's Minimum Monitoring Criteria for Deforestation and Conversion-free (DCF) Products for guidance on providing DCF origin of materials entering the mass balance model.

2.1.2 SPATIAL BOUNDARIES AND SCALE OF ACCOUNTING

The LSRS links the spatial boundary for inventory accounting directly to the level of physical traceability a company has to the lands where its products are produced. Where traceability is only to a jurisdiction or sourcing region, the spatial boundary for accounting must be defined at this same scale. Where the CoC enables traceability to a defined group of supplying farms, the spatial boundary can be narrowed accordingly. At jurisdiction or sourcing region level, companies must include all attributable productive land within that boundary, meaning that programme impacts are averaged across a much wider land base. By contrast, where the spatial boundary is limited to a group of farms or an individual farm, companies can attribute changes in emissions and removals directly to those units, avoiding dilution across non-participating land. Stronger CoC arrangements therefore enable more specific and less diluted claims but require more demanding traceability and data systems.

Figure 2. Spatial boundaries in GHG accounting (adapted from LSRS).

Source: Land Sector and Removals Standard (LSRS). Adapted by Jambo Studio.

SPATIAL BOUNDARY	DESCRIPTION
GLOBAL 	A spatial boundary representing all lands globally where biogenic products or raw materials are sourced from.
JURISDICTION 	A predefined, spatially explicit area based on a political boundary where biogenic products or raw materials are sourced from. This includes political boundaries based on a subnational jurisdiction (e.g. state or province), country or political region (e.g. the European Union) of origin.
SOURCING REGION 	A predefined, spatially explicit land area that supplies a given raw material to the first point of aggregation or first processing facility in the value chain. Sourcing region boundaries may be defined relative to the tier of the value chain that is inclusive of multiple first points of aggregation or first processing facilities with overlapping areas that supply harvested raw materials.
LAND MANAGEMENT UNIT (LMU) 	A predefined, spatially explicit land area of a given land use, managed according to a clear set of objectives according to a single land management plan to produce a given raw material or set of raw materials. An LMU may represent spatially explicit areas such as a famr, field, or plot.
HARVESTED AREA 	Spatially explicit area of productive agricultural land that was harvested at a given time to produce the relevant raw material.

🟩 Attributable productive lands

🟧 Lands not attributable to the product

🟫 Lands outside the scope 3 spatial boundary

2.2 PRACTICAL CHALLENGES IN MEETING LSRS TRACEABILITY REQUIREMENTS IN THE CERRADO

Meeting the LSRS traceability requirements is particularly difficult for soft commodities such as soy and cocoa, which move through long, multi-tiered and fluid supply chains involving traders, processors and manufacturers. In these supply chains, physical segregation is practically challenging or costly because of the scale at which volumes are aggregated, stored and traded, making physical traceability difficult to achieve. The challenges set out below reflect themes consistently raised through stakeholder engagement and are common across bulk commodity systems rather than specific to the RCF or any individual programme.

1. **Challenges with maintaining segregated supply chains.** For soy produced in the Brazilian Cerrado, traceability to the farm can generally be maintained through the early stages of the supply chain. Traders often have strong traceability systems and can link volumes back to farms or groups of farms at initial aggregation points. However, once these volumes are moved between facilities, the scale of aggregation at silos and export terminals makes maintaining identity preserved or segregated supply nearly impossible without dedicated infrastructure, costly logistics, or premium markets that rarely exist at scale. The main bottleneck typically occurs between crushing plants and ports, where segregation is lost despite suppliers being able to trace volumes transactionally to the farm level. As a result, most supply chains cannot maintain the level of segregation required for the strongest forms of LSRS physical traceability.

2. **Mismatch between mass balance requirements and supply chain realities.** The LSRS allows mass balance to demonstrate physical traceability only where mixing and reconciliation occur within a single sourcing region, within the same country, and within a defined reconciliation period. These conditions require tight definition of the system boundary and consistent volume tracking across all actors in the chain. The guidance from VCI and ISEAL notes that while physical mixing is permitted, physical traceability becomes weaker as mass balance spans multiple sites or larger geographies and would not meet LSRS expectations unless the sourcing region and transfer boundary are clearly justified[11]. These requirements are challenging to meet in Brazil's soy sector. Soybeans and soy meal move through extensive multi state logistics networks, large aggregation hubs and shared storage facilities, where volumes from many farms and multiple sourcing regions are routinely handled together. Procurement areas for major crushers shift seasonally and often span wide catchments, making it difficult to maintain a stable and well-defined system boundary. Although this aggregation is normal in commercial soy flows, it presents challenges when designing a mass balance system that maintains the physical traceability required for LSRS compliant accounting. Without collaboration between supply chain actors on mechanisms that improve connectivity, physical traceability may be lost as material moves beyond early supply chain stages.

> SOURCING REGIONS IN THE CERRADO CAN BE VERY LARGE, AND WITHOUT TRACEABILITY TO A DEFINED GROUP OF FARMS, COMPANIES MUST INCLUDE ALL FARMS IN THE REGION WHEN CALCULATING EMISSIONS AND REMOVALS

3. **Defining and maintaining spatial boundaries for accounting.** The LSRS requires companies to account for all attributable productive land within the defined spatial boundary supported by their chain of custody system. In open commodity markets, defining this boundary is difficult because farmers sell to multiple buyers and processors source from wide and variable catchments. Sourcing regions in the Cerrado can be very large, and without traceability to a defined group of farms, companies must include all farms in the region when calculating emissions and removals. This immediately dilutes the impact of targeted interventions. Spatial boundaries are also difficult to maintain over time, as farmer selling patterns and trader procurement areas shift from year to year. These complexities are amplified in programmes involving multiple funders, each with different levels of visibility into the supply base and exemplifies the challenges of applying the LSRS in dynamic supply chains.

4. **Challenges with embedded soy and livestock systems.** Traceability becomes significantly more complex once soy is processed into meal and incorporated into animal feed. Multiple transformation steps occur between soybeans, meal, compound feed and livestock products, each involving mixing of ingredients from diverse origins. Accurate accounting requires reliable conversion factors to estimate the volume of soy embedded in the final product, but these are not always available or consistently applied. Feed manufacturers typically operate aggregated, multi origin supply chains, and livestock producers have limited visibility of the soy content or origin in purchased feed. These mixing points and data gaps make it difficult to maintain the physical traceability required for LSRS compliant reporting, even when strong traceability exists upstream.

2.3 PRACTICAL PATHWAYS FOR COMPANIES INVESTING IN SUSTAINABLE SOY PRODUCTION IN THE CERRADO

While the LSRS sets strict requirements for physical traceability, companies can still take practical steps to support credible mitigation in the Cerrado and iteratively improve physical connectivity over time. Stakeholder engagement highlighted that early action remains key and that progress can be made by strengthening traceability where feasible, reducing loss of information along the chain and supporting approaches that link interventions to sourcing regions.

Table 1: Practical recommendations for organisations investing in sustainable soy production in the Cerrado.

CHALLENGE	PRACTICAL WAYS FORWARD
LOSS OF SEGREGATION	• Strengthen other CoC approaches that still meet LSRS criteria, such as site or group-level controlled mass balance within sourcing regions and countries. • Explore using CoC approaches that align with LSRS requirements and that only permit mixing of DCF soy, enabling both verified DCF claims and GHG inventory claims. These systems can block non-compliant soy from entering the supply chain, as evidenced by the Amazon Soy Moratorium
MASS BALANCE MISALIGNED WITH REAL COMMODITY FLOWS	• Collaborate with suppliers, traders, and other downstream companies and implement certification or digital traceability tools to improve visibility and traceability across multi-tier supply chains. • Work with suppliers to reduce onward mixing beyond the sourcing region where possible and support documentation of physical flows. • Explore alternative VCI aligned traceability methods such as Proof of Sourcing, or other backwards traceability systems that enables companies to establish a credible link to their sourcing regions, where conventional CoC breaks down.[12]
SPATIAL BOUNDARIES DILUTE IMPACT	• Strengthen traceability within sourcing regions to enable finer boundaries over time. Support farm-level traceability pilots building connections within those supply chain stages prior to export. • Explore the use of stratified emission factors, or emission factors[13] that represent a subset of farms within a sourcing region, which allow more representative accounting within sourcing regions when farm-level boundaries cannot be met
SHIFTING SUPPLY CHAINS	• Invest in landscape or jurisdictional programmes that can maintain long term relationships with farmers even when procurement patterns shift. This provides continuity where commercial linkages change, improves the likelihood of future traceability and provides long term incentives for DCF production and the protection of native vegetation.
EMBEDDED SOY IN LIVESTOCK PRODUCTS	• Improve data availability by supporting development of consistent conversion factors. • Work with feed manufacturers as the key traceability point and advocate for clear disclosure of soy content and origin, or the consistent application of area-level sourcing requirements.

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[11] Value Change Initiative & ISEAL, 2025. Physical traceability in Greenhouse Gas accounting. Link

[12] Value Change Initiative, ISEAL (2025). Physical traceability in Greenhouse Gas accounting. Link

[13] Value Change Initiative (2024). Accounting and reporting Scope 3 Interventions in the Food and Agriculture Sector. Link

2.3.2 LOOKING FORWARD

There is, however, growing recognition that current traceability rules do not fully reflect the realities of complex commodity supply chains. The GHG Protocol, SBTi and VCI are each exploring ways to improve how regional traceability, landscape level outcomes and impact based accounting could be recognised in future guidance. While these approaches are still under development, they signal a shift toward more practical methods for linking value chain investments with reported outcomes.

Companies investing in the Cerrado can help shape this direction of travel by:

- **Participating in consultations and pilots** led by the GHG Protocol, SBTi and VCI to ensure that future standards reflect both what is possible and what is operationally practical.
- **Providing evidence from real-life funded programmes** which are testing solutions to these challenges, and supporting the development of sourcing region and impact-based accounting approaches.
- **Collaborating with peers and industry groups** to advocate for pragmatic, high integrity methods that enable recognition of landscape level results.

These actions will help ensure that emerging frameworks evolve in ways that support credible reporting while better accommodating the structure of real-world commodity systems.

2.4 APPLYING LSRS TRACEABILITY REQUIREMENTS THROUGH THE RCF

In 2026, the Responsible Commodities Facility will pilot a new approach to demonstrate physical traceability from participating farms through to downstream funders. To strengthen connectivity in line with LSRS expectations, the RCF is partnering with FoodChain ID to implement a Traceability Certificates of Compliance (TCC) model. This approach aims to maintain a verifiable link between soy produced on RCF farms and specific buyers, even as volumes move through a complex, multi-actor supply chain.

HOW THE TCC MODEL WORKS

TCCs are generated when soy from an RCF farm is first delivered to a cooperative or trader. Each certificate reflects verified production from that farm. As soy moves through the supply chain, these digital certificates are transferred alongside physical deliveries to participating actors. A TCC is transferred when the next buyer makes a verified purchase from the certificate holder, with the certificate volume matching the purchased volume. Conversion factors allocate RCF tonnage proportionally across co-products (for example soy meal and soy oil) in line with ISEAL guidance, and the system allows non-proportional attribution within product groups to direct TCCs to buyers linked to RCF funders.

ASSESSMENT AGAINST LSRS TRACEABILITY REQUIREMENTS

- **Spatial boundary:** Because the TCC model maintains traceability to individual RCF farms, the spatial boundary for GHG accounting can be set at farm level for any organisation purchasing TCC-traced volumes. This meets the LSRS requirement to define a boundary that matches the level of traceability that can be demonstrated. The model does not require accounting for emissions or removals from non-RCF farms, avoiding dilution effects associated with region-level boundaries.
- **Chain of custody:** The TCC model operates as a multi site-level mass balance system, with reconciliation performed within a defined transfer boundary (the Cerrado). This structure is permissible under the LSRS, provided that mixing and reconciliation occur only within a single sourcing region and country. Upstream of export, this condition is met. However, once soy enters international logistics and is transformed into livestock feed and poultry products, mixing occurs across multiple sites and countries. This weakens physical connectivity between RCF soy and final products. As a result, whilst the TCC model strengthens physical connectivity through early supply chain stages, full alignment with LSRS traceability requirements across the entire chain needs to be tested through piloting.

IMPLICATIONS

The TCC model may represent a significant advance in establishing physical connectivity in an indirect commodity system and create a traceable allocation pathway that reflects real purchase volumes and limits overclaiming. However, there is real uncertainty about whether it meets the traceability expectations of the LSRS. This uncertainty arises from two sources.

1. There is limited visibility of how mass balance material is mixed further downstream in the supply chain. Without a clearer understanding of when and where onward aggregation occurs, it is not possible to determine with confidence whether the physical flow of material remains sufficiently connected to meet the LSRS's requirements for demonstrating a credible value chain link.
2. Even with fuller visibility of the supply chain, there is ambiguity within the LSRS regarding the point at which mass balance mixing becomes inconsistent with its traceability expectations``

The pilot being run in 2026 will provide evidence on where physical connectivity breaks down, where supply chain collaboration is needed to prevent further onward mixing, or if alternative traceability systems are needed in the future.

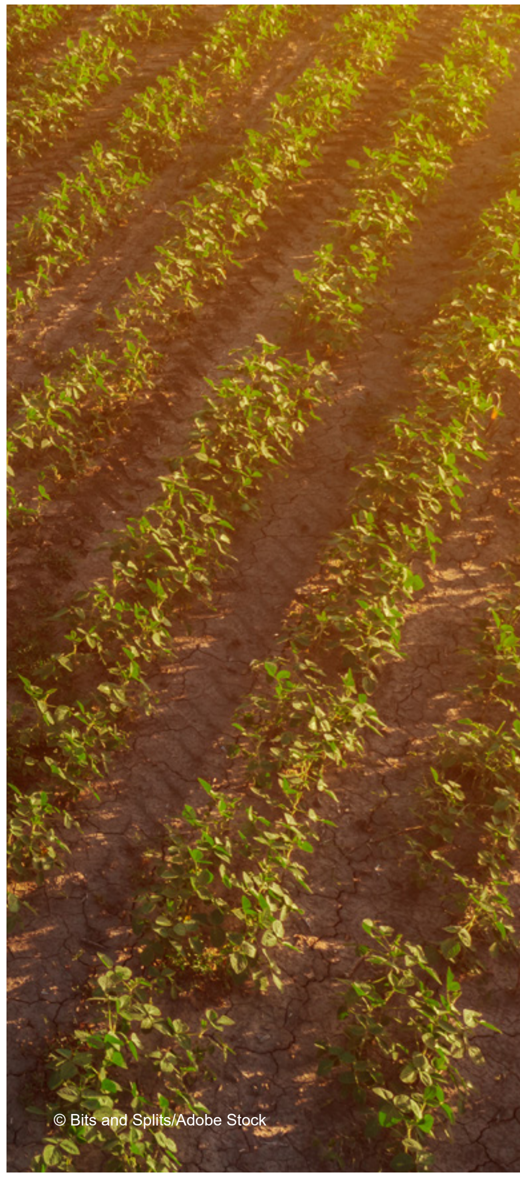
3. MONITORING, REPORTING, AND VERIFICATION

Alongside defining the spatial boundary for carbon accounting and establishing traceability to that boundary, organisations need to collect data that demonstrate the outcomes of the value chain investment. This process, known as monitoring, reporting and verification (MRV), ensures that interventions deliver measurable climate benefits and that results are reported accurately and without double counting. The LSRS outlines how organisations should account for emissions and removals within land-based sectors and therefore shapes how MRV systems must be designed and implemented for compliant land-based carbon accounting. MRV provides the evidence that claimed outcomes are actually occurring on the ground, confirming whether interventions are achieving the intended impact within the defined traceability boundaries.

MRV is often one of the most complex aspects of implementing credible value chain projects. It can be difficult to determine which data are required, how to meet LSRS standards, and what tools or methods can address common data and verification gaps. Gaps or inadequacy of an MRV system will limit the ability of companies to confidently make public claims to investors, shareholders, and customers regarding the impact of their investments. This section explains the expectations for project-level data collection and verification, outlines how MRV supports inventory GHG accounting, and provides guidance on assessing whether project MRV systems are robust and aligned with the LSRS.

3.1 LSRS REQUIREMENTS FOR MRV

The LSRS sets out best practice for accounting for land-based emissions that companies are seeking to reduce, and ensuring that any reported removals are credible. Achieving this credibility depends on the effectiveness of both MRV tools (e.g. farm carbon calculators) and the implementation partners of WVCM interventions.[14] Several complementary publications bring the LSRS requirements to life in practical terms including from WBCSD[15] [16] and 3Keel[17]. In this report, the requirements for LSRS alignment in MRV are discussed at a high level, focusing on the core implications for tools and implementation partners. Because the LSRS is written primarily for reporting organisations, its application to project-level contexts is not always straightforward. To help bridge this gap, this report introduces a tool assessment framework for evaluating the alignment of MRV tools with the LSRS. The framework, designed as a practical resource for project developers and implementers, is provided in Appendix 1.



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[14] An implementation partner refers to a third party organisation working with a reporting organisation to develop and manage a value chain intervention (as organisations will rarely have capacity and expertise to implement projects independently). Implementation partners could be suppliers, non-government organisations, or dedicated project developers.

[15] WBCSD (2025). Scope 3 Data and MRV Guidance for Agriculture and Food. Link.

[16] WBCSD (2025). Measurement, Reporting & Verification (MRV) in Brazil. Link.

[17] 3Keel (2025). Addressing Agricultural Scope 3 Emissions: Best-Practice Principles for Within Value Chain Mitigation. Link.

Table 2: Summary of LSRS requirements.

LSRS FOCUS AREA	TOOL REQUIREMENTS	IMPLEMENTATION PARTNER ACTIONS
INVENTORY ACCOUNTING	The tool should be able to convert farm-level emissions and removals data into product-level carbon footprints for key crops or livestock products, following a cradle-to-farm-gate boundary, to support integration into company or value chain GHG inventories.	No implementation partner support required.
EMPIRICAL DATA FOR REMOVALS	If removals are reported, the tool must apply Tier 2/3 methods using empirical data (e.g. soil sampling or biomass data such as age, height, and species) for calibration and require re-measurement at least every five years.	The implementation partner should support the collection of empirical data at least every 5 years.
MANAGING REPORTING OF REMOVALS	No additional requirements for tools beyond those already outlined for data collection and calibration.	Implementation partners must implement ongoing monitoring systems along with having a mitigation plan in place to ensure that reported removals are maintained and not reversed. Where removals occur on adjacent or proximate lands, implementation partners must verify that these areas meet the LSRS's spatial and safeguard requirements before including them in reported outcomes.
LAND USE CHANGE (LUC) EMISSIONS	The tool must implement LUC accounting for farmland converted within the last 20 years, using linear discounting and including all relevant carbon pools (biomass, soil organic carbon, dead organic matter) and non-CO_2 gases.	The programme should support data collection or explore remote sensing approaches that do not require on-farm data collection.
COVERAGE OF KEY LAND MANAGEMENT EMISSIONS	The tool should cover all material on-farm sources within the boundary: enteric and manure CH_4; soil and manure N_2O; CO_2 from on-farm energy, lime and urea; CO_2 from organic soils; crop-residue burning; and embedded upstream inputs (fertiliser, pesticide, herbicide, feed, purchased livestock).	The programme should support comprehensive data collection or explore alternative approaches that do not require on-farm data collection for land management emissions.
TRANSPARENCY & TRACEABILITY	The tool must store farm or field-level identifiers to enable reporting at the chosen spatial boundary. When modelling the impact of interventions, results must be directly linked to the defined spatial boundary. Tool methods, emission factors, and updates should also be clearly documented and publicly accessible.	The tool must store farm or field-level identifiers to enable reporting at the chosen spatial boundary. When modelling the impact of interventions, results must be directly linked to the defined spatial boundary. Tool methods, emission factors, and updates should also be clearly documented and publicly accessible.
AVOIDING DOUBLE COUNTING	Where removals relate to crop rotations or agroforestry, the tool should include a transparent, consistent allocation method to prevent overstating or double counting benefits.	The programme should ensure outcomes are allocated appropriately to funders, using data on volumes purchased or supported.

3.2 PRACTICAL CHALLENGES IN MEETING LSRS MRV REQUIREMENTS IN THE CERRADO

Aligning MRV systems with the LSRS presents practical challenges for many agricultural and land-based programmes. MRV is fundamental to demonstrating that interventions deliver measurable and verifiable GHG outcomes, yet most existing frameworks and tools are still evolving to meet the full set of requirements. Stakeholder engagement confirmed that these difficulties are common across land based initiatives and not specific to any single programme. As a result, companies investing in the Cerrado may encounter constraints when seeking to account for all scope 3 emissions and removals in line with the guidance.

1. Monitoring soil organic carbon (SOC). The monitoring of soil organic carbon (SOC) removals represents one of the most technically and financially demanding aspects of LSRS alignment. This is extremely relevant in the case of conversion of degraded pastures into soy production, where significant amounts of carbon are captured in soil that was previously emitting GHG. The guidance requires projects to use empirical data and undertake direct soil sampling, which is both time-consuming and costly. Collecting reliable SOC data also presents logistical barriers. Sampling protocols must follow rigorous scientific methods, yet the availability of laboratory services, consistent sampling grids, and georeferenced data is not yet consistent across the whole of the Cerrado. Without this infrastructure, SOC measurements are often inconsistent or incomplete, weakening the robustness of reported removals. To maintain permanence, SOC measurement also requires ongoing monitoring and reporting of any reversals, as stored carbon can be quickly lost if soils are disturbed. Maintaining long-term monitoring relationships with farmers is particularly challenging in commoditised supply chains such as soy in the Cerrado, where supply chains shift frequently and visibility of individual farms diminishes over time.

2. Land use change (LUC) methodologies and avoided deforestation. The treatment of LUC emissions varies widely between MRV tools, creating misalignment. While some tools apply the required 20-year accounting window for carbon stock changes, others do not. A key challenge is the mismatch between certification cut-off dates and carbon accounting timeframes. Even when companies purchase verified DCF soy, the 20-year window under the LSRS may still include historic emissions from land conversion if the cut-off date is within this window, meaning such purchases cannot automatically be assumed to have zero LUC emissions. In Brazil, the national Forest Code allows a certain level of legal deforestation (for example, maintaining 20% of native vegetation in the Cerrado to as much as 80% in the Amazon). This creates tension between domestic regulation and international standards. The LSRS does not permit the inclusion of avoided deforestation in inventory accounting. Programmes preventing new clearance therefore cannot claim avoided emissions towards corporate targets. There are currently few formal mechanisms for reporting these outcomes outside of the GHG inventory which means these outcomes can go potentially unmeasured or reported. Given that maintaining existing ecosystems is fundamental to reducing emissions in soy production, the absence of recognised reporting mechanisms presents a barrier to investment in those programmes focused on achieving this aim.

3. Access to primary data. There are barriers to collecting primary farm-level data, which is critical for credible MRV. Farmers can be reluctant to share data without financial incentives and assurances on data governance, as data collection requires time and effort and may involve sensitive business information. Others lack the necessary records on management practices, fertiliser use, or land cover, including historical data needed for LUC accounting. For small and medium-sized producers, the situation may be compounded by limited record-keeping capacity, data governance and digital infrastructure. In some cases, farms outsource operations such as land preparation or pesticide application, and the relevant data are not easily available. The LSRS, however, expects primary data for certain categories of emissions and removals, creating a gap between the guidance and what can realistically be obtained in regions like the Cerrado, where farms are widely dispersed and field-level data collection is logistically complex.

4. Cost of MRV implementation. The financial and logistical demands of aligning with the LSRS is one of the greatest barriers to adoption. Comprehensive MRV requires field visits, data collection, and independent verification, which can be prohibitively expensive given the barriers to access and large distances between farms in the Cerrado. Visiting large numbers of farms can take months and divert funds from project implementation to compliance. MRV tools themselves are costly, and many companies and suppliers remain unwilling or unable to absorb the additional expense of collecting and verifying the detailed data required for scope 3 accounting.

5. Tool limitations and lack of local adaptation. Few existing MRV tools designed for soy or other commodities in the Cerrado are fully aligned with the LSRS. Many global tools have been developed for temperate contexts and are not well adapted to Brazilian soils, climatic conditions, or management practices. This lack of regional calibration leads to high uncertainty in emission estimates. These gaps reflect not only tool design issues but also a broader absence of Cerrado-specific datasets and emission factors. Without accurate regional data, tools struggle to generate results that meet the precision expected under the LSRS.

6. Limit on proximate and adjacent non-productive lands. Under the LSRS, there is a remaining unresolved approach to the extent to which organisations can report removals occurring on non-productive areas of farms. The LSRS outlines several safeguards, including location limits, and states that in future versions of the standard, safeguards on size thresholds and distance thresholds may be included. However, under the current standard, these guidelines are left undetermined, and the standard states that reporting of removals occurring on non-productive areas of the farm cannot currently be implemented. Brazil's Forest Code requires that Cerrado farmers preserve 20 to 35% of their land as native vegetation. The lack of clarity in the LSRS surrounding accounting for removals on proximate and adjacent lands means that farmers and projects face uncertainty on how to report these removals. This disconnect also limits recognition of conservation actions that exceed legal baselines. This lack of formal recognition can discourage participation in sustainability programmes and reduces the incentive for maintaining native vegetation. The implications are particularly relevant for initiatives such as the RCF, whose model is based on incentivising soy expansion only onto previously cleared land while rewarding the maintenance of

native vegetation for farmers who go beyond legal requirements. There are currently few formal mechanisms for reporting these outcomes outside of the GHG inventory, meaning these outcomes can go unreported. This remaining uncertainty within the LSRS is also problematic on farms implementing silvopasture and edge-of field treatments as these activities have high technical potential for implementation towards corporate FLAG targets.

3.3 PRACTICAL SOLUTIONS TO MRV CHALLENGES

Although full alignment with the LSRS can be demanding, companies can take practical steps to strengthen MRV systems and support credible reporting of climate outcomes in the Cerrado.

Table 3: Practical recommendations for organisations investing in sustainable soy production in the Cerrado.

CHALLENGE	PRACTICAL WAYS FORWARD
MONITORING SOIL ORGANIC CARBON (SOC)	• Combine direct sampling with credible modelling to reduce cost. • Develop shared sampling grids and laboratory capacity across multiple projects. • Work with cooperatives or local service providers to streamline field campaigns and reduce travel requirements. • Focus landscape management practices on those where there is evidence of sustained increases in SOC, alongside wider soil health and ecosystem benefits, whilst methods for monitoring SOC improve.
LAND USE CHANGE (LUC) AND AVOIDED DEFORESTATION	• Use remote sensing solutions that can access historical land-use data and can account for the emissions associated with previous land-use change events, which for soy, is typically the single largest source of emissions. • Companies investing in programmes that maintain natural ecosystems (avoided deforestation) should monitor and report the impacts in their sustainability disclosures, even if it is not claimable within their GHG inventory. • Contribute evidence to sector-wide efforts to harmonise cut-off dates and accounting windows
ACCESS TO PRIMARY DATA	• Focus on-farm data collection where it is required (for example for reporting removals) and explore remote sensing approaches where allowed, for example for LUC or land management emissions. • Reduce burden by compensating farmers for time spent on reporting and by simplifying data collection through digital tools and remote sensing where appropriate. • Ensure any MRV programme follows a broader data governance framework ensuring efficiency, security, and compliance with standards. • Ensure high integrity data governance by anonymising or aggregating sensitive farm data before sharing with downstream actors. • Build trust with producers by designing programmes that include training to help producers identify, collect and store required data, and work through cooperatives to coordinate regional data gathering.
COST OF MRV IMPLEMENTATION	• Pool verification efforts across projects, leverage existing datasets produced in academia and public agencies, and co-invest in shared regional datasets. • Explore simplified field protocols and remote sensing to reduce costs. • Partner with local MRV providers and cooperatives to support efficient data collection and farmer training.
TOOL LIMITATIONS AND LACK OF LOCAL ADAPTATION	• Co-invest in adapting MRV tools to Cerrado soils and production systems. • Encourage collaboration between tool developers, research institutions and framework owners to improve model accuracy and regional calibration. • Advocate for clearer contextual guidance from the GHG Protocol where methodologies remain difficult to apply in Brazil. • Prioritise tools that meet LSRS requirements but offer flexibility for complex commodity systems, and support MRV models that incorporate co-benefits such as biodiversity and water outcomes.
LIMITS ON PROXIMATE AND ADJACENT NON-PRODUCTIVE LANDS	• Use a conservative approach to quantify carbon outcomes on non-productive farm areas, aligning with the draft LSRS safeguarding requirements. Transparently report removals through GHG inventory or wider nature or landscape disclosures, alongside disclosure of the methodologies used. • Highlight to standard setters the disincentive caused by the lack of clarity on how to report removals on non-productive farmland for investment in action above and beyond Brazilian conservation requirements such as the Forest Code.

Strengthening MRV in the Cerrado will require a balanced approach that focuses primary data collection where it is most needed, improves the practicality of monitoring across large and variable landscapes and invests in better tools and regional datasets. This is particularly relevant for emissions arising from land use change, typically the most significant source of emissions, but can be monitored using approaches that place less of a burden on the producer.

While full LSRS alignment remains challenging in complex commodity systems, companies can still make meaningful progress by supporting targeted improvements in data quality, lowering the burden on farmers, and working collectively to advance methods that are more suited to tropical production contexts. These efforts not only enhance the credibility of reported climate outcomes but also help build the foundations for more robust and scalable MRV systems in the future.

3.4 APPLYING LSRS MRV REQUIREMENTS THROUGH THE RCF USING THE ASSESSMENT FRAMEWORK

To assess the ability of programmes such as the RCF to meet LSRS requirements for MRV, the developed assessment framework was applied to five tools used for greenhouse gas accounting in Brazilian soy systems. The tools were assessed before the final LSRS was published and therefore they were assessed against the draft Land Sector & Removals Guidance (LSRG), rather than the final LSRS[18]. Tools were selected based on their relevance to soy, applicability to Brazil, availability of methodological information and representation of different modelling approaches. A summary of the assessment is shown in Figure 3[19].

The assessment shows that no single tool satisfies all technical and practical requirements for full alignment. Tools differ in their treatment of LUC, land management emissions and soil carbon, reflecting their purpose, datasets and modelling priorities. Tools with strong LUC components, such as Satelligence, provide high confidence in detecting deforestation and land cover change but offer limited insights into management emissions or farmer-level practices. Tools such as Footprint Pro Carbono and the Cool Farm Tool are more accessible and provide stronger coverage of land management emissions but rely heavily on farmer self-reporting, which reduces confidence in LUC estimates. Some tools, like Agro New Life, perform well across several categories but still face challenges with LUC accounting.

This diversity means that tool selection should be based on the priorities of the programme. Tools focused on precision tend to be more technically robust but require detailed input data and expert support. User-friendly tools reduce complexity but may rely on methodological simplifications that are not fully consistent with LSRS expectations for inventory accounting.

IMPLICATIONS FOR THE RCF

Given that the RCF currently focuses on reducing deforestation and conserving native vegetation, tools with strong LUC monitoring capabilities are the most relevant in the near term. These tools rely primarily on remote sensing and geospatial datasets, reducing the need for frequent farm visits and limiting the burden placed on farmers. As the programme expands to include interventions targeting land management emissions or removals, a combined tool approach may be needed to capture a broader set of outcomes. This could involve pairing a LUC-focused tool with a management or soil carbon module that meets minimum LSRS requirements.

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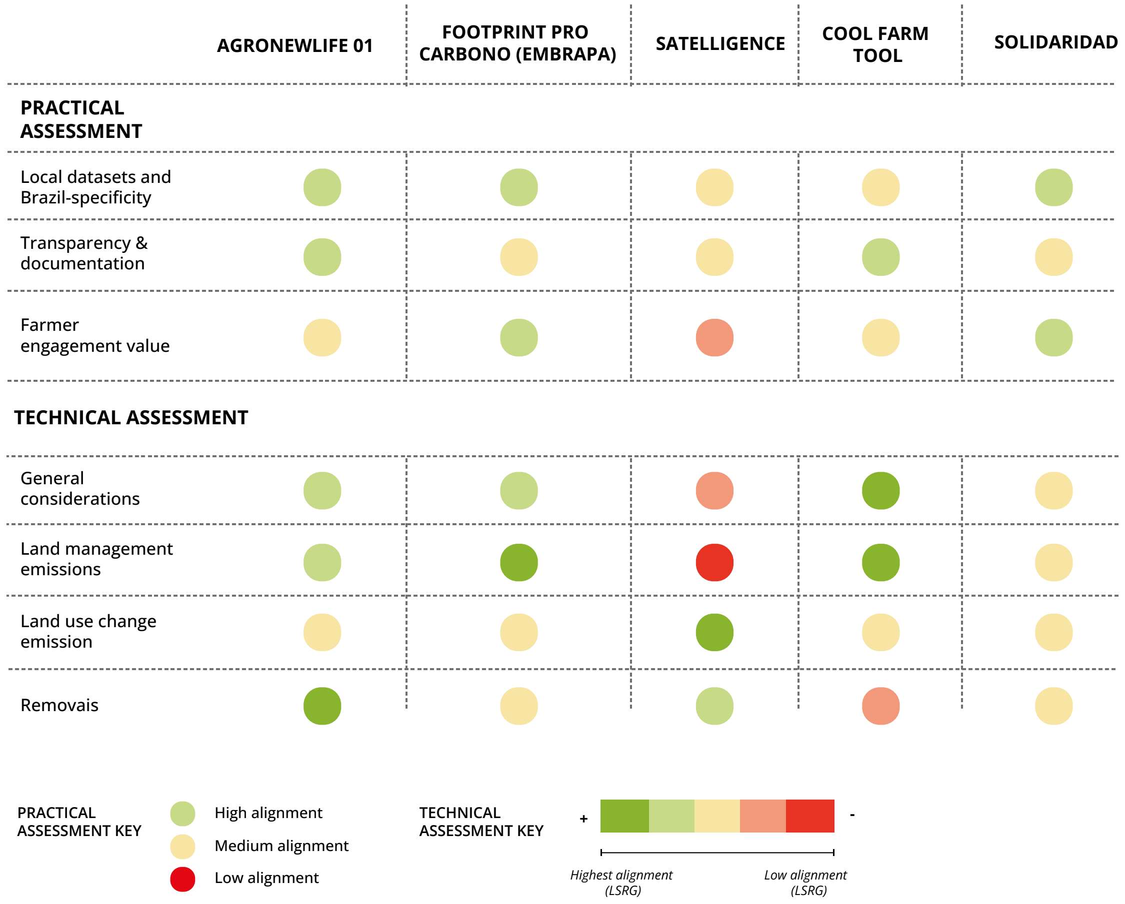
[18] GHG Protocol (2022). Land Sector and Removals Guidance. Part 1 and Part 2

[19] This assessment is not intended to recommend any single tool but provides an illustration of the priorities and use-cases of different tools. It is based on both publicly available information and in some cases, through direct engagement with the tool providers.

Figure 3. Summary of practical and technical assessments of five Brazil-based tools for greenhouse gas emission calculations in soy systems.



	AGRONEWLIFE 01	FOOTPRINT PRO CARBONO (EMBRAPA)	SATELLIGENCE	COOL FARM TOOL	SOLIDARIDAD
PRACTICAL ASSESSMENT					
Local datasets and Brazil-specificity	🟢	🟢	🟡	🟡	🟢
Transparency & documentation	🟢	🟡	🟡	🟢	🟡
Farmer engagement value	🟡	🟢	🟠	🟡	🟢
TECHNICAL ASSESSMENT					
General considerations	🟢	🟢	🟠	🟩	🟡
Land management emissions	🟢	🟩	🔴	🟩	🟡
Land use change emission	🟡	🟡	🟩	🟡	🟡
Removais	🟩	🟡	🟢	🟠	🟡

PRACTICAL ASSESSMENT KEY
🟢 High alignment
🟡 Medium alignment
🔴 Low alignment

TECHNICAL ASSESSMENT KEY
+ 🟩 🟢 🟡 🟠 🔴 -
Highest alignment (LSRG) *Low alignment (LSRG)*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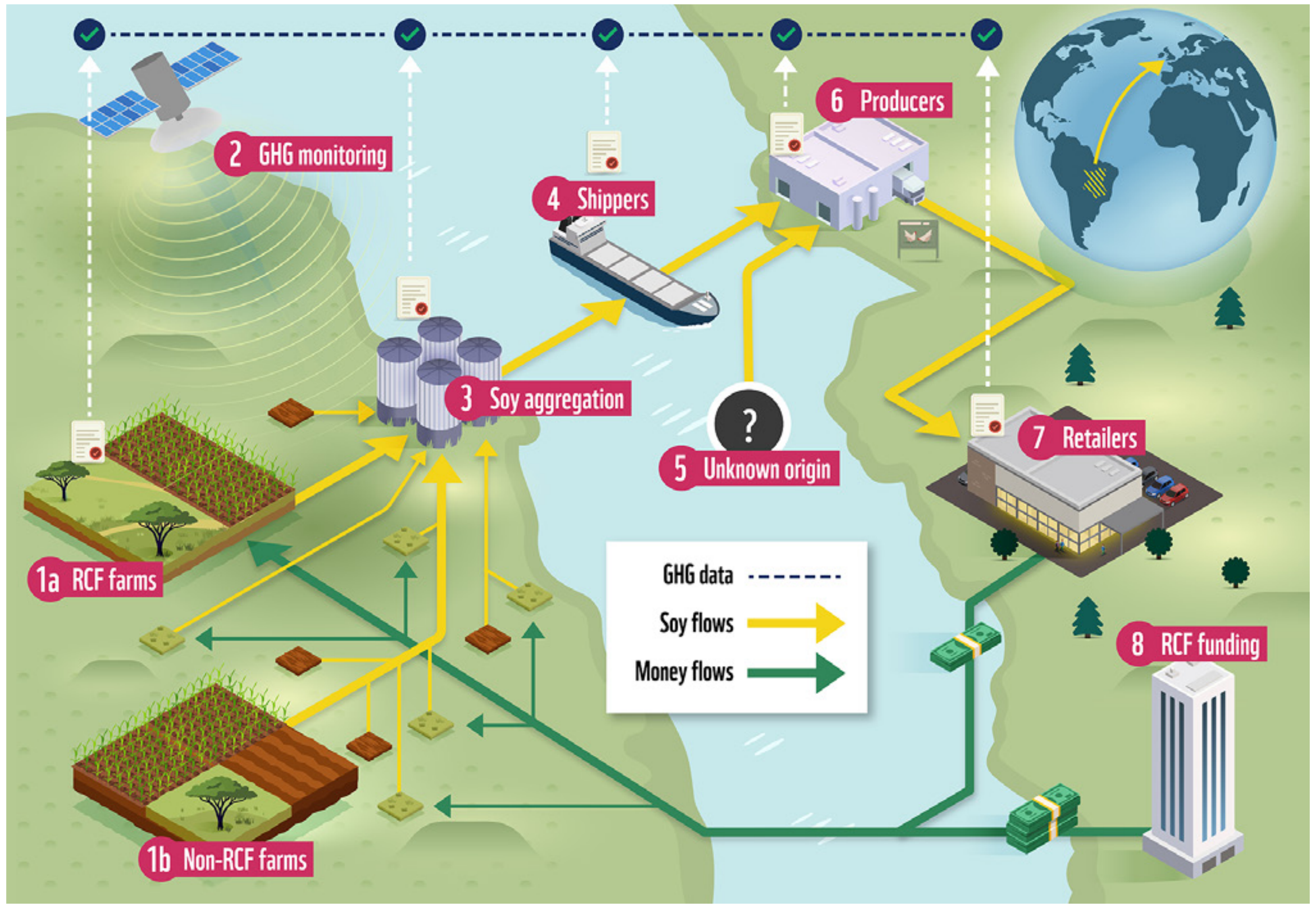
4. CASE STUDY: SCOPE 3 CLAIMS FROM THE RCF

Overview of RCF Chain of Custody Model



Source: 3Keel

1A/B: RCF VS NON-RCF FARMS

RCF farms commit to maintenance of native vegetation on-farm in excess of legal minimums (20% of farm area in the Cerrado), forgoing their legal right to deforest this excessvegetation. RCF farms therefore have more standing vegetation on farm (35-50%) than non-RCF farms and commit to deforestation and conversion free (DCF) production of soy going forwards.

2: GHG MONITORING

Remote sensing methodologies are used to calculate the carbon footprint, primarily through sensing of native vegetation on-farm. In comparison to Brazil-average soy, RCF soy has a lower emissions factor due to lower embedded land use change emissions from DCF production standards.

3: SOY AGGREGATION

Soy produced on RCF farms is transported and aggregated with non-RCF soy in silos. Here, a mass balance chain of custody is established to track the flow of the RCF soy through the supply chain to UK retailers, in line with LSRS requirements for physical traceability.

4, 5 & 6: SHIPPERS & PRODUCERS

As the RCF soy flows along the supply chain through shipping and producers,volumes of RCF soy delivered from supplier to customer are tracked with Traceability Certificates of Compliance, maintaining the mass balance chain of custody. As RCF soy flows down the supply chain, it may be mixed with soy of unknown origin, which weakens physical connectivity.

7: RETAILER SCOPE 3 CLAIMS

At the end of each year, UK retailers will receive the volumes of RCF soy that they can credibly claim to have been transferred through their supply chains, as tracked and verified through the Traceability Certificates of Compliance. For these volumes, each RCF funder can apply the lower RCF emission factor within their physical greenhouse gas inventory to claim lower scope 3 emissions.

8: RCF FUNDING

RCF raises capital through a blended finance model backed by major UK retailers, including Tesco, Sainsbury's, and Waitroses and international banks. From the fund, RCF provides low-interest credit to farmers who commit to zero deforestation and the protection of native vegetation.

4.1 CLIMATE IMPACT OF THE RCF

The RCF provides an example of how a landscape programme can materially shift the emissions intensity of a commodity through financial incentives and verified land-use criteria. Using farm-level information supplied through the programme (including historical deforestation data), we modelled how land use history, native vegetation on non-productive areas of the farm and potential land management transitions affect the cradle-to-farm-gate greenhouse gas footprint of soy produced on RCF farms.[20]

The table below summarises the results. These values reflect the combined effect of (1) lower historical conversion on RCF farms, (2) verified deforestation- and conversion-free production since 2020, (3) the presence of extensive native vegetation, and (4) potential future improvements if farmers adopt regenerative land management practices, including regenerative agriculture and restoration of degraded pasture. The impact of RCF is modelled in comparison to a national average Brazilian soy footprint from 2023.

SCENARIO	DESCRIPTION		EMISSION FACTOR (T CO_2E PER T SOY)
TYPICAL BRAZILIAN SOY	National-average cradle-to-farm-gate footprint (2023 baseline)		1.37
RCF: REDUCED LAND USE CHANGE	Reflects lower embedded LUC emissions due to limited historical conversion on RCF farms		0.88
RCF: NET FOOTPRINT INCLUDING NATIVE VEGETATION REMOVALS	Includes aboveground biomass removals from proximate and adjacent non-productive lands Size threshold of 10% of the size of the productive land and applying a 20% buffer[21]		0.87
RCF + REGENERATIVE MANAGEMENT	Transition from conventional agriculture to regenerative crop production	20% soy area	0.75
		100% soy area	0.28
RCF + REGENERATIVE SOY ON RESTORED DEGRADED PASTURE	Transition from degraded pasture to regenerative crop	20% soy area	0.81
		100% soy area	0.54

Taken together, these results show that landscape programmes can significantly reduce embedded emissions, but also highlight how accounting rules shape the degree to which those benefits appear in product footprints:

- Most of the reduction comes from lower **land use change emissions**, as RCF farms have had no conversion since 2020 and retain more native vegetation than required by the Forest Code. This results in a much lower embedded land use change footprint than typical soy in the region.
- RCF farms also **sequester carbon** in their native vegetation, but only a small share of these removals can be included in product footprints due to unresolved uncertainty within the LSRS around size and distance thresholds that cap eligible adjacent or proximate areas.
- There is additional potential for **further reductions** if farmers transition parts of their land to regenerative agriculture from conventional agriculture or restored degraded pasture, which increases soil carbon and reduces land management emissions such as fertiliser, liming and diesel use.

4.2 HOW RCF CARBON CLAIMS MOVE THROUGH THE SUPPLY CHAIN

The RCF will use Traceability Certificates of Compliance (TCCs) to allocate soy volumes produced on participating farms to specific downstream buyers. Each TCC records the quantity of RCF soy entering the chain and the associated cradle-to-farm-gate emission factor. TCCs are transferred only along defined RCF supply chains, with volumes reconciled over a 12-month period to prevent overclaiming. For this case study, the RCF emission factor of 0.88 tCO2e per t of soy has been used (with no proximate and adjacent non-productive lands removals reported due to unresolved uncertainty in the LSRS). The RCF has mapped several end-to-end chains of custody, which link participating farms to UK retailer funders, one of which is demonstrated below:

RCF Farms > Trader > Shipper > Poultry Producer > Supermarkets

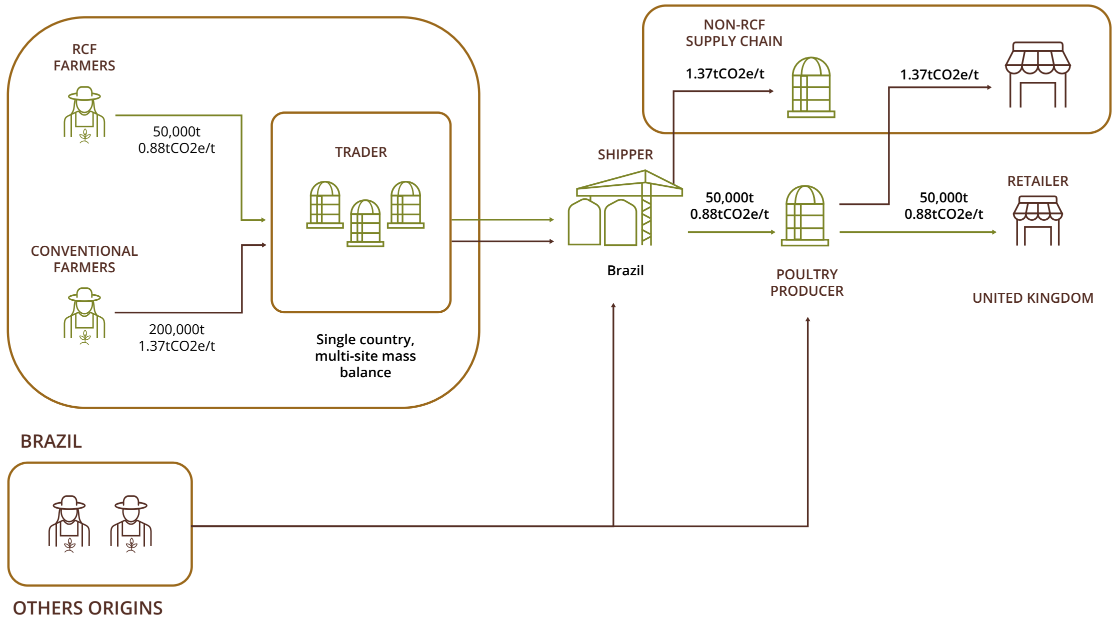


Figure 4: Carbon claims from RCF. The green arrows refer to volumes sold and recorded via the TCCs, but does not necessarily constitute physical traceability.

Source: Chain of custody models and definitions. A reference document for sustainability system stakeholders. V2.0 | July 2025. Adapted by Jambo Studio.

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[20] Emission factors used are drawn from secondary data from the Orbae platform, and publications by Satelligence and Footprint Pro Carbono, which were fed into an Excel model created by 3Keel to calculate the change in emission factor.

[21] Removals from proximate and adjacent non-productive lands were capped at 10% of the area of the productive land as, although the LSRS does not define a specific size threshold, it recommends a conservative approach. A 20% buffer has been added to all removals calculations to reflect the potential for reversals of removals over time.

TCCs are passed only along this defined RCF chain of custody. A multi-site mass balance model is established at the first point of aggregation (e.g. trader). Downstream actors must hold proof of purchase for RCF-linked soy, and may apply the RCF emission factor only to the smaller of: (a) the RCF volume passed to them through TCCs, or (b) their own soy purchase volumes. This ensures that claims remain conservative and tied to physical volumes produced on RCF farms.

All allocations are finalised after a 12-month reconciliation period, when total RCF production and the distribution of volumes across each node in the chain are confirmed. This prevents overclaiming and ensures that each organisation applies the RCF emission factor only to the share of its sourcing that is genuinely linked to the programme. Where multiple funders appear in the same chain, LSRS allocation rules indicate that RCF volumes should be divided according to the physical volume each funder purchases. Actors outside the RCF chain of custody cannot apply the RCF emission factor.

It is important to note that the emission factor shown in the diagram applies only to cradle-to-farm-gate soy production. At each subsequent processing stage, a new emission factor would normally be calculated to reflect feed formulation, processing, logistics, and/or animal production emissions.

At each node, supply chain actors receive a documented volume of RCF-linked soy to which they may apply the RCF emission factor, while all remaining volumes retain a conventional factor. In practice, this allows proportionate carbon claims: traders apply the RCF factor to a share of outgoing soy; shippers apply it to a corresponding share of exports; poultry producers apply a blended factor to feed and allocate embedded soy emissions into poultry products; and retailers claim that a quantifiable proportion of soy embedded in purchased meat originates from RCF farms. Claims remain strictly limited to TCC-backed volumes to ensure transparency and consistency.

4.3 HOW DOES THE LSRS IMPACT RCF CARBON CLAIMS?

The RCF CoC operates a multi-site mass balance model across the value chain, covering soy sourced from both RCF and non-RCF farms. Farm-level traceability is maintained to the trader, where the first mass balance boundary is established. As soy moves through shipping and poultry production, the RCF-linked material is increasingly mixed with soy from additional origins, including potentially from non-Brazilian sources. The soy is also transformed into feed and then poultry, introducing additional complexity. Physical connectivity therefore weakens after the first aggregation point and this model falls within an uncertain space under the LSRS, where the level of mixing may be inconsistent with its traceability expectations. The pilot of this model in 2026 will capture additional detail on the RCF supply chain, including ongoing mixing, allowing a full assessment of how the CoC aligns with the LSRS and inform how connectivity within this model can be improved to improve alignment.

From an MRV perspective, the efforts should be focussed on towards monitoring the emissions associated with LUC, the most significant source of emissions in soy production in the Cerrado. As such, tools that rely primarily on remote sensing and geospatial datasets should be used, which would have the secondary benefit of reducing the need for frequent farm visits and limiting the burden placed on farmers. The RCF emission factor (0.88 tCO$_2$e per t) also does not capture the full climate benefits generated on farms. The LSRS restriction on implementation of accounting on non-productive lands restricts the share of native vegetation removals that can be included, and avoided deforestation cannot be incorporated into product footprints. If all removals from native vegetation were included, the emission factor would fall to approximately 0.73 tCO$_2$e per tonne of soybeans. This gap highlights how accounting boundaries limit the visibility of landscape-level mitigation benefits.

Moving forward the RCF is exploring alternative models that could support stronger alignment with the LSRS:

METHODOLOGY	CURRENT ALIGNMENT	FUTURE PRIORITIES
TRACEABILITY	Alignment remains uncertain due to supply chain complexity. TCCs maintain physical connectivity, but dilution and cross-country mixing during shipping and poultry production may fall short of LSRS traceability requirements.	Strengthen the TCC system; assess options to reduce mixing at shipping and feed production; explore partial segregation; and proceed transparently where structural constraints prevent full compliance. This will require a deep level of cooperation between traders and downstream companies to address these points.
MRV	MRV focuses on measuring LUC emissions, but does not currently capture full impact on land management emissions and removals.	Expanding into regenerative agriculture or pasture restoration would require additional data, including soil carbon measurement and land management emissions tracking, to ensure full LSRS alignment across accounting categories.

4.4 KEY FINDINGS AND IMPLICATIONS

This case study demonstrates both the potential and the practical constraints of linking high-integrity landscape initiatives to corporate scope 3 reporting:

RCF soy has a substantially lower emissions intensity, driven mainly by reduced embedded land use change. Future regenerative transitions could increase these gains, although current LSRS rules constrain how much of this improvement can be shown in product footprints.

The TCC system enables proportionate use of the RCF emission factor, but physical traceability weakens after the first aggregation point due to mixing and multiple transformation steps. This reflects structural limitations of bulk commodity systems rather than shortcomings of the programme.

There is a clear need for pragmatic pathways that allow companies to recognise the climate impact of the programmes they support. Continued testing, improved traceability infrastructure, and collaboration on accounting guidance will be essential.

The RCF shows that landscape initiatives can generate measurable climate benefits and provide mechanisms for allocating those benefits across a supply chain. The challenge is ensuring that evolving frameworks strike a balance between integrity, feasibility and the need to scale action urgently.

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5. FINANCING THE TRANSITION TO SUSTAINABLE SOY PRODUCTION


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5.1 BLENDED FINANCE AS A PATHWAY TO SCALE WVCM

Producers in the Cerrado face persistent financial barriers in shifting to more sustainable production systems. To make this transition, two types of financial support are particularly important:

- Incentives to conserve the native vegetation on land beyond legal requirements, and
- Long-term, affordable finance to adopt both more sustainable, nature positive, agricultural practices on existing productive land, or to recover degraded pastures for soy production.

Financing this transition is challenging where, early on, producers can face higher costs and greater risks whilst the finance that is needed to de-risk these commercial investments remains limited. Alongside this, there is significant demand from companies looking for credible ways to invest in mitigation activities that contribute towards their climate targets[22], with over 260 companies already setting SBTi FLAG targets. Blended finance can connect these two needs by creating structures through which corporate capital supports on-farm sustainability improvements while helping to mobilise additional finance.

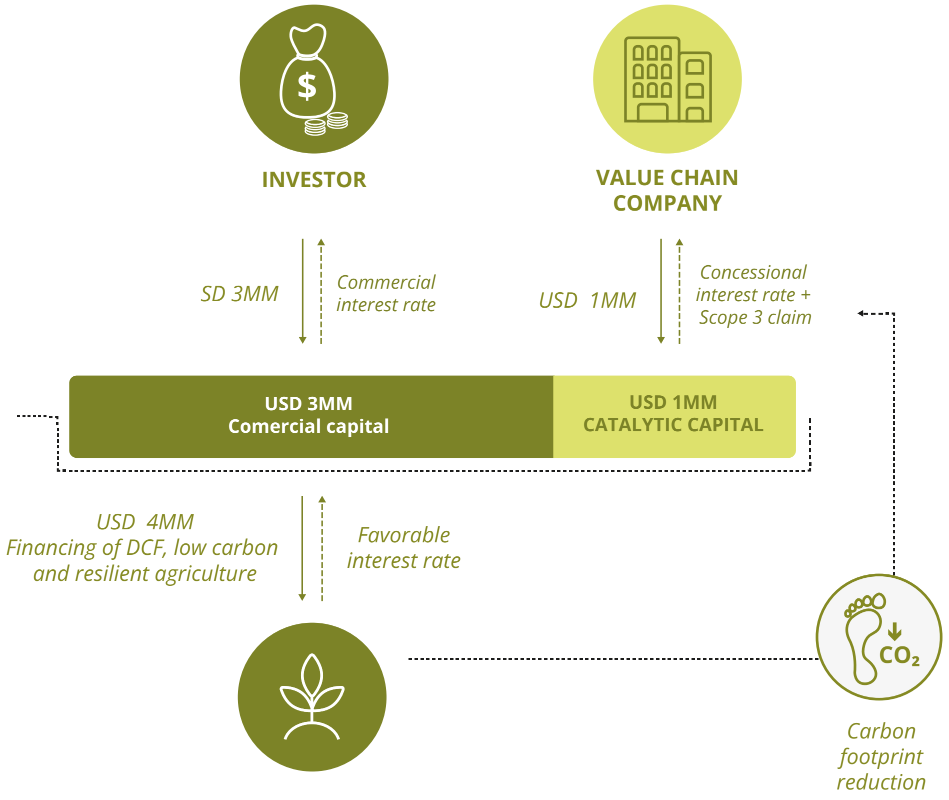
In blended finance models, supply chain companies can act as catalytic investors. Their participation reduces risk, improves lending terms for producers, and can attract several times their contribution in commercial capital. This leverage effect increases the scale of sustainable production activities that can be funded, bringing down the effective cost of mitigation outcomes for supply chain companies when compared with direct project funding. Because the overall climate impact increases with the total capital, the cost per tonne of emissions reduced or removed decreases as commercial investors enter alongside catalytic funders. Where LSRS requirements are met, outcomes funded by these blended finance models can support companies in claims towards their GHG inventory. Therefore, the ability to demonstrate progress towards their scope 3 targets strengthens the business case for catalytic investment helping to shift blended finance towards an integral part of corporate decarbonisation strategies. By providing catalytic investment and utilising blended finance models, companies can significantly reduce the cost of meeting their climate targets.

5.2 THE RCF BLENDED FINANCE MODEL

The RCF illustrates how blended finance can operate in practice in the Cerrado. By providing low-interest credit lines to farmers who commit to producing soy on previously cleared land and not to deforesting or converting lands beyond the minimum legal requirements, the RCF supports both improved land management and reduced pressure on remaining native vegetation. It also demonstrates how corporate capital can be used to unlock wider investment in sustainable production systems. As approaches to traceability and MRV continue to develop, blended finance mechanisms such as the RCF may play an increasingly important role in enabling companies to support and potentially claim outcomes from landscape-level interventions.

Figure 5: An illustrative example - with indicative values - of how blended finance models such as the RCF can provide favourable financing for farmers while enabling companies to support progress toward their decarbonisation goals.

Blended finance structured by financial player with local footprint, such as RCF



Source: Chain of custody models and definitions. A reference document for sustainability system stakeholders. V2.0 | July 2025. Adapted by Jambo Studio.

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[22] Science Based Targets initiative (2025). 260+ Companies, One Climate Goal: Forest, Land and Agriculture Targets in Action. Link

5.3 RECOMMENDATIONS FOR COMPANIES

Blended financial models can play a pivotal role in enabling producers to transition to more sustainable agricultural practices in key sourcing regions such as the Cerrado. By using finance from supply chain companies to catalyse investor finance, share risk and improve financing terms, companies can significantly expand the scale of value chain mitigation. Companies therefore should:

- **Direct investment into blended finance structures** that can lower the cost of capital for producers that are adopting more sustainable agricultural practices and conserving natural ecosystems within critical sourcing regions.
- **Partner with financial intermediaries**, such as the RCF, which are developing financial instruments that can link supply chain finance with corporate GHG inventories, helping demonstrate progress toward SBTi FLAG targets while supporting farmers on the ground.
- **Share insights from participation in pilot blended finance models** to help shape best practise, and support the development of credible approaches to funding WVCM at scale.

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6. CONCLUSIONS

6.1 KEY FINDINGS

The GHG Protocol's LSRS is the key standard that governs how organisations can claim emissions reductions or removals from activities within their supply chains, providing a robust benchmark for high-integrity land-sector greenhouse gas accounting. In practice, however, full alignment is challenging in highly aggregated commodity systems. This report highlights three core challenges that the sector must tackle:

1. **Complex and indirect supply chains constrain claimability, but programmes should still take steps to strengthen connectivity.** Multiple tiers of intermediaries make it difficult for companies to trace purchased volumes back to farm-level interventions, particularly beyond early aggregation points and through processing into feed and livestock products. This can prevent companies from recognising the benefits from investments in their sourcing landscapes within their GHG inventory. However, there are credible opportunities to strengthen physical connectivity in supply chains that companies should still prioritise (e.g. use of control of origin mass balance systems, collaborating across the supply chain, use of digital traceability tools).
2. **Current GHG accounting standards are too restrictive, where more flexibility could unlock scale.** The LSRS requirements for physical traceability, defined spatial boundaries, and MRV set a high-integrity bar but are currently difficult to meet in large-scale, multi-actor supply chains. The RCF case study illustrates that even when efforts are made to meet accounting rules, there is still uncertainty whether this is sufficient to report in the GHG inventory. More flexibility from key standards, such as enabling alternative models of MRV, recognising approaches that maintain only impact traceability, or permitting other credible methods of demonstrating physical traceability, could support more flexible, but still robust, approaches to reporting. In the near-term, pilot programmes are needed to collectively test these approaches and scale up best practice quickly.
3. **LSRS aligned MRV is challenging across all sources of GHG emissions and removals. Programmes should prioritise the most material contributors.** MRV is essential for credible accounting of programme impacts but collection of empirical primary data across all sources of emissions and removals can be costly and difficult to implement. MRV programmes should prioritise the most material sources of emissions, especially when this aligns with the goals of the initiative, while taking a proportional approach to other sources. For soy production in the Cerrado, emissions arising from land-use change are typically the largest source of emissions but can be measured effectively using remote sensing tools which place less of the burden for primary data collection on farmers.

6.2 RECOMMENDATIONS

- This report sets out practical steps that organisations can take to build traceability and design credible MRV programmes. Overarching recommendations from this study are provided for both companies and standards bodies.

6.2.1 RECOMMENDATIONS FOR COMPANIES

Prioritise monitoring of the most material sources of emissions. For soy from the Cerrado this typically means land use change. MRV tools that use remote sensing approaches to monitor emissions from land use change can be more cost effective, and place less of a burden on farmers for primary data collection. Companies should ensure that MRV programmes monitor emissions from land use change and use MRV tools that are able to efficiently and accurately measure these. This way, the drive for deforestation and conversion free commodities can also accelerate the shift to production aligned with our global climate goals.

Collectively pilot traceability approaches seeking to demonstrate and strengthen physical connectivity. Companies should collaborate across the supply chain to jointly test approaches that aim to demonstrate physical traceability, either through implementing mass balance CoCs that align with the LSRS requirements, or through other credible traceability systems that can evidence sufficient physical connectivity. When engaging in pilots, companies should demonstrate the actions they are taking to maintain and strengthen physical connectivity and should be transparent in the claims they make from such initiatives.

Transparently report additional landscape outcomes outside of the GHG inventory. In line with LSRS principles, companies should claim only those


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outcomes that are permitted to be included within the physical GHG inventory. Outcomes that are not currently eligible for inclusion, such as avoided conversion or conservation beyond accounting limits, should be reported transparently through complementary disclosures. This approach preserves accounting integrity while recognising the broader impact of value-chain investments.

6.2.2 RECOMMENDATIONS FOR STANDARDS

Proactively engage with initiatives that are piloting approaches for demonstrating physical traceability. This can help identify where requirements create unintended barriers, test how guidance is applied in real supply chains, and inform targeted clarifications or adjustments. This feedback loop is essential to ensure that standards remain credible whilst also being feasible at scale in complex commodity systems.

Provide clear guidance for how LSRS requirements on physical traceability can be met within complex commodity supply chains. It is not currently clear how mass balance supply chain models can meet the requirements for physical traceability in complex, soft commodity supply chains. Clarity is needed on how companies should approach the practical realities of transfer boundaries, reconciliation periods, and audit requirements within a mass balance system.

Establish clear pathways for the disclosure of GHG outcomes outside of the physical GHG inventory. Formal pathways for the reporting of outcomes that cannot contribute to changes in the physical GHG inventory are needed to provide clear incentives for these activities. There are currently few incentives for activities that can maintain only traceability of impact, or those programmes that avoid the conversion of native vegetation. Formal reporting pathways for these types of activities can incentivise investments in programmes that deliver positive outcomes for climate and nature but are not able to contribute towards a company's physical GHG inventory.

APPENDIX 1:

The assessment framework developed for the assessment of MRV tools is contained within this appendix, designed to be used to assess MRV tools intended for the measurement of GHG emissions different commodities.

TECHNICAL ASSESSMENT:

CATEGORY	LAND SECTOR AND REMOVALS GUIDANCE REQUIREMENT	PRACTICAL INTERPRETATION	ESSENTIAL / DESIRABLE	TOOL	
				RESULT	NOTES
	General considerations				
INVENTORY APPROACH	The tool should have the ability to convert farm-level emissions and removals data into product-level carbon footprints for key crops or livestock products, following a cradle-to-farm-gate boundary, to support feeding into company or value-chain GHG inventories.	Check whether the tool can allocate total farm emissions and removals across main products (e.g. soy, corn, beef) using transparent, consistent allocation methods, to create product-level footprints.	Essential		
ASSESSMENT BOUNDARY	Ensure the tool applies a single cradle-to-farm-gate boundary consistently across all land GHG categories (land use change, land management, removals, non-land) and across reporting years. Removals may only be reported for land included in the same boundary.	Check whether the tool clearly defines the farm boundary and applies a cradle-to-farm-gate accounting boundary. Does it exclude post-farm emissions?	Essential		
REPORTING OUTPUT	The tool must separate reporting by land GHG categories (land use change emissions, land management emissions, removals, non-land emissions).	Look for output tables that separate removals from emissions. Can you export these for reporting?	Essential		
REPORTING OUTPUT	The tool must enable disaggregated reporting by gas (CO_2/CH_4/N_2O).	Look for output tables that break down emissions by CO_2/CH_4/N_2O. Can you export these for reporting?	Desirable		
METHOD TRANSPARENCY	Methodology and assumptions must be transparently recorded.	Can you access a detailed methodology? Are data sources, model parameters, and emission factor databases clearly signposted?	Desirable		
METHOD VERSION CONTROL	The tool must document and manage updates to emission factors, model parameters, and calculation methods. Version control and change logs must be maintained so users can identify when methods change and recalculate historical data.	Does the tool have a clear process for updating methodology and recalculation of past footprints with updated methods? Can historic footprints be recalculated using updated methodologies easily?	Desirable		
	Emissions				

CATEGORY	LAND SECTOR AND REMOVALS GUIDANCE REQUIREMENT	PRACTICAL INTERPRETATION	ESSENTIAL / DESIRABLE	TOOL	
				RESULT	NOTES
Emissions					
EMISSION SOURCES	The tool should cover all material on-farm sources within the boundary: enteric and manure CH_4; soil and manure N_2O; CO_2 from on-farm energy; CO_2 from lime and urea; CO_2 from organic soils; crop residue burning; and embedded upstream inputs where applicable (fertiliser, pesticide, herbicide, feed, purchased livestock).	Does the tool cover all key sources listed in the LSRG (enteric, manure, soils, energy, inputs, etc.)? Are any excluded, and if so, is the exclusion justified?	Essential		
MODELLING METHODOLOGY	For material emission sources, the tool should support Tier 2/3 approaches and accept primary activity data, using local/region-specific EFs where available.	Does the tool let you input herd size, fertiliser use, and crop management data, rather than relying only on defaults? Does it use regional EFs where available?	Desirable		
LAND USE CHANGE METHODOLOGY	The tool must implement LUC accounting for farmland converted within the last 20 years, with linear or equal discounting, inclusion of relevant carbon pools (biomass, soil organic carbon, dead organic matter) and non-CO_2 gases.	Check if land-use change is captured for the last 20 years with discounting. Are biomass, soil organic carbon, and dead organic matter pools included, and non-CO_2 gases? If LUC is not relevant, is this flagged?	Essential		
Removals - note, reporting removals is optional					

CATEGORY	LAND SECTOR AND REMOVALS GUIDANCE REQUIREMENT	PRACTICAL INTERPRETATION	ESSENTIAL / DESIRABLE	TOOL	
				RESULT	NOTES
Removals - note, reporting removals is optional					
MODELLING METHODOLOGY	If removals are reported, the tool must apply Tier 2/3 methods using primary empirical data (e.g. soil or biomass sampling) for calibration and require re-measurement at least every 5 years.	Does the tool require soil sampling or biomass measurement for calibration? Can the tool be re-calibrated every 5 years with re-measured carbon stocks?	Essential		
UNCERTAINTY AND SIGNIFICANCE	The tool must calculate uncertainty with a stated confidence level. For removals, it must test statistical significance and support conservative (lower-bound) reporting when significance isn't achieved.	Does the tool output confidence intervals or ranges for removals? If removals are not significant, is there an option to report conservatively (lower bound)?	Desirable		
TRACEABILITY	The tool must store farm- or field-level identifiers to enable reporting at desired spatial boundary. When modelling impact of interventions, interventions need to be linked directly to the spatial boundary used.	Can results be linked back to a specific farm, field, or land management units?	Essential		

CATEGORY	LAND SECTOR AND REMOVALS GUIDANCE REQUIREMENT	PRACTICAL INTERPRETATION	ESSENTIAL / DESIRABLE	TOOL	
				RESULT	NOTES
Removals - note, reporting removals is optional					
ONGOING MONITORING AND REVERSALS	The tool should enable entry of future measurement rounds and provide functionality to record reversal events (e.g. disturbance, land-use change) that deduct carbon losses in the relevant reporting year	Does the tool support recording future measurements? If carbon is lost (fire, ploughing), is there a reversal function?	Essential		
ALLOCATION AND ATTRIBUTION	Where removals relate to rotations or agroforestry, the tool should provide a transparent, consistent allocation method so benefits are not overstated or double counted.	Does the tool explain how it shares removals across rotations or agroforestry systems? Is the method transparent, avoiding double counting?	Essential		

PRACTICAL SCREENING:

CATEGORY	WHAT TO ASSESS	RATING (H/M/L)	TOOL	
			RESULT	NOTES
COST & LISENCING	Is the tool affordable / scalable within your organisation's budget? Consider licensing fees for commercial use (many tools are free for farmers) and any ongoing costs.	H = very affordable/free; M = manageable cost; L = prohibitively expensive		
LOCAL DATASETS / RELEVANCE	Does the tool include national / regional emission factors, soils, climate, and farming practice datasets relevant to your geography?	H = localised datasets, regularly updated; M = some regional averages; L = global defaults only		
LANGUAGE	Is the tool available in relevant local languages?	H = relevant local languages; M = English only		
ACCESSIBILITY	Is the interface intuitive for non-experts?	H = easy user interface; M = usable but technical; L = highly technical		
FARMER DATA BURDEN	How much data entry is required from farmers? Is it realistic for farmers to complete the tool given farm record-keeping practices?	H = light (pulls from existing records, simple inputs); M = moderate (some manual data entry); L = heavy burden (requires detailed inputs not already being collected)		
SCALABILITY	Can the tool be used at scale across many farms/sourcing regions? Does it enable bulk data uploads (e.g. through APIs)?	H = scalable with bulk data upload; M = manual scaling; L = designed only for individual farms		
SUPPORT & TRAINING	What level of training materials, documentation, or farmer support exists?	H = strong support & training modules; M = basic user guides, limited support; L = little/no support		
TRANSPARENCY & DOCUMENTATION	Are methods, emission factors, and updates clearly documented and accessible?	H = full documentation; M = partial; L = "black box" methodology		
FARMER ENGAGEMENT VALUE	Does the tool give farmers useful feedback (e.g. benchmarking, practice change suggestions), or is it extractive data collection only?	H = strong farmer co-benefits; M = some benchmarking; L = no farmer value		

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