



ESMC

Ecosystem Services
Market Consortium

Overview on Inventory Accounting in Scope 3

Ecosystem Services Market Consortium

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Introduction

As consumer demand, investors, and regulators put more pressure on companies to account for agricultural greenhouse gas (GHG) emissions, two main approaches have emerged: **inventory accounting** and **intervention accounting** (also referred to as project accounting). Companies use both approaches to measure and manage climate impact in their supply chains, but they serve different purposes.

In agriculture, these two GHG accounting systems complement each other, but they are fundamentally different and thus not easily additive. Inventory accounting estimates the total carbon footprint of commodities in a GHG program. This form of accounting provides the credibility and compliance needed for external corporate GHG reporting to international standards, such as [SBTi](#). Intervention accounting, on the other hand, highlights the impact of program actions, which can help account for the tangible change and return on investment (i.e. the estimated GHG impact given the cost) of adopting regenerative agriculture practices.

ESMC's initial protocol used only intervention accounting, but rather than selling carbon credits produced from this accounting to any company, ESCM's protocol focused on supporting companies in the agricultural supply chain. ESCM commoditized outcomes as Scope 3 outcomes rather than carbon credits to make this distinction clear and provided companies that purchase agricultural commodities with a market solution to reduce their GHG impact.

For the reasons discussed in more detail below, companies in the agriculture sector struggle to adapt these carbon credits/insets/outcomes to carbon intensity values for commodities (often referred to as Scope 3 emissions factors) to include within their GHG inventory. This creates a challenge for companies, since they are interested in and want to support program impact, but also need Scope 3 emissions factors (EF) to report clear progress towards voluntary GHG inventory reduction targets and regulatory GHG disclosure rules.

In short, companies need support with both inventory and intervention accounting.

Given this challenge, ESCM is shifting to focus on inventory-based GHG reporting to support companies with their inventory reporting needs. ESCM will now provide Scope 3 emissions factors from our programs to make it easier to support accurate and credible corporate inventory reporting. ESCM will also maintain the ability to provide insights on practice adoption via intervention accounting to demonstrate the full impact of continued investment efforts in agriculture.

Corporate Inventory Accounting in Agriculture

To understand the need for ESMC to make this transition, it may be helpful to first understand the use-case for inventory accounting in general.

Companies in the agricultural sector follow inventory accounting to understand and report the carbon footprint of the crops and ingredients they buy from farms. This informs their overall corporate carbon footprint, which is called a GHG inventory. Companies report this GHG inventory each year, and within it they organize their emissions by category and Scope:

- **Scope 1 emissions** are the direct emissions from emissions sources that a company owns or controls.
- **Scope 2 emissions** are associated with the energy consumption from equipment that a company owns or controls.
- **All other emissions are Scope 3 emissions**, which are upstream or downstream of the reporting company (see Figure 1 below for categories). For many companies, supply chain emissions on farm are categorized as upstream Scope 3 emissions.

A visual of this information is provided below (Figure 1).

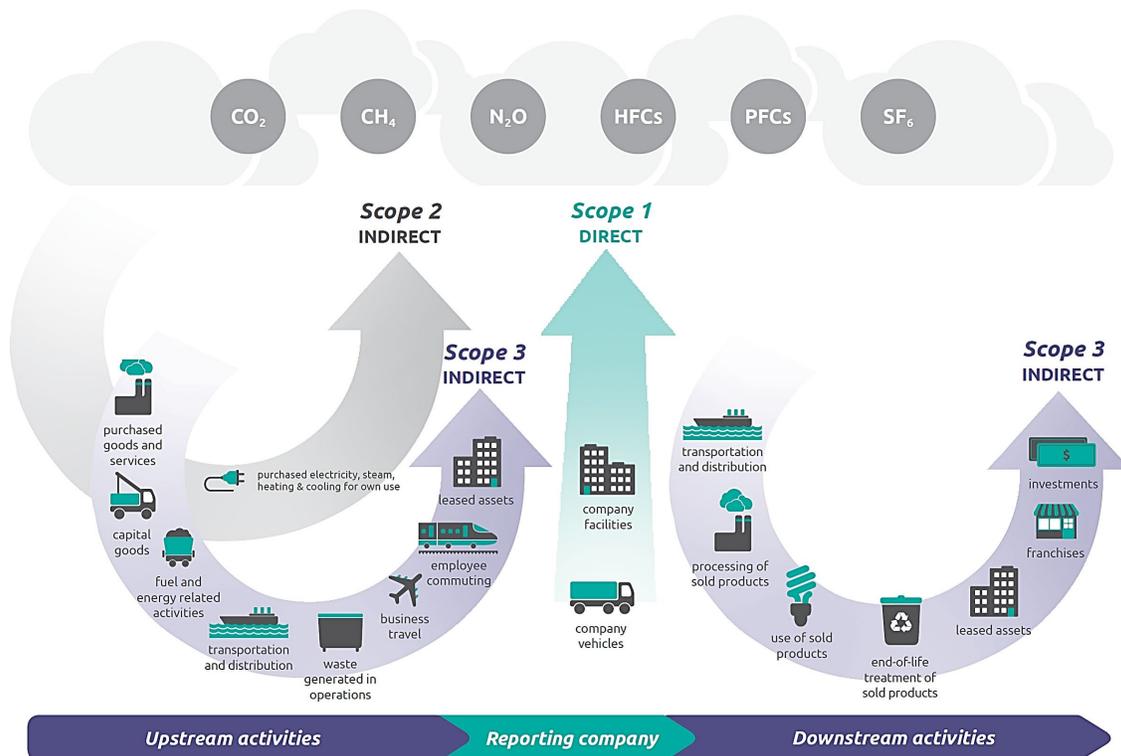


Figure 1: Emission categories and sources of each.
Source: Greenhouse Gas Protocol Scope 3 Standard, 2013

The corporate GHG inventory is what is often interpreted as (and evaluated by others, such as regulators in the EU and California) representing a company's climate impact. The inventory is evaluated over time to see if a company is making progress towards voluntary climate target bodies like the Science Based Target Initiative (SBTi). Given this, companies are very focused on measuring and reducing their GHG inventory each year in comparison with a historic “base year” to meet their SBTi goals (or to meet other targets). Many companies will have specific targets just for the Scope 3 portion of their GHG inventory that occurs on farm. For example, a company may have a target to reduce their GHG emissions by 50% by 2030; the 50% from a 2019 base year. Long term, companies often aspire to have a “net zero” inventory, where as much carbon is removed from the atmosphere by a company as they emit each year (illustrated by Figure 2 below from SBTi).

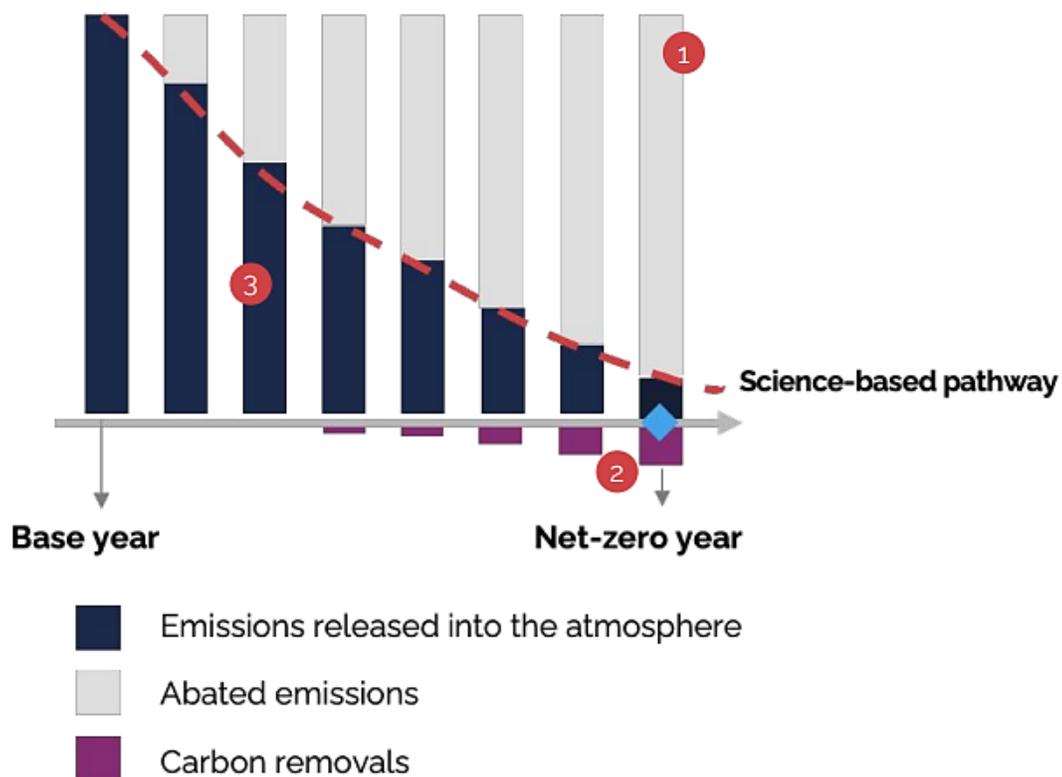


Figure 2: An illustrative net-zero pathway for a hypothetical company

Source: [SBTi Corporate Net-Zero Standard V2.0 Consultation Draft Explanatory Slides, 2025](#)

While it is critical for companies to meet these targets, annual Scope 3 GHG inventory accounting for food, fiber, or biofuel supply chains can be complex. This is because the supply chains themselves are complex, and there is often limited information about farms (or ranches) that produce commodities. When companies can make estimates, those that source agricultural commodities often find Scope 3 emissions on farm to make up a large portion (~70%) of their annual GHG inventory ([CDP 2022](#)).

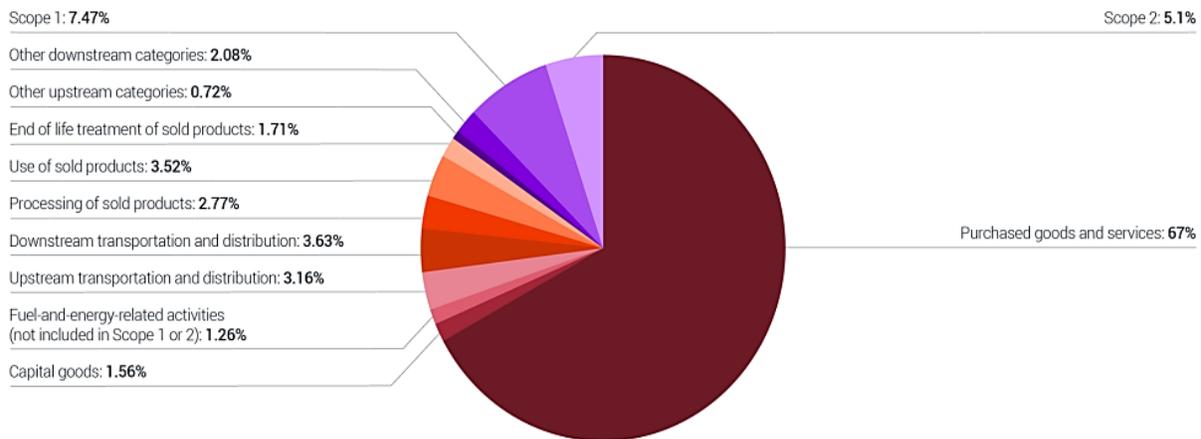


Figure 3: Scope 3 Categories as % Total Scope 1+2+3 Emissions – Food, Beverage & Tobacco Sector.

Source: [CDP Technical Note : Relevance of Scope 3 Categories by Sector \(2022\)](#).

In addition to this, the quantification of agricultural GHG emissions in corporate GHG accounting has not been standardized in recent years to a high level of detail. Overall, this additional complexity has resulted in uncertainty and has made it difficult to estimate and report GHG reductions trends using inventory accounting on an annual basis. On Jan 30, 2026, [Greenhouse Gas Protocol](#) (GHGP), which is the primary international standard for GHG inventory accounting, released the [Land Sector and Removals Standard](#) (LSRS) that revamps how companies can account for their Scope 3 emissions and removals on farm to help remedy this.

Although the GHG inventory accounting standards have been in a period of heavy development, this has not stopped companies from approaching carbon programs like ESMC looking for assistance in reaching their targets. This has resulted in programs like ESMC’s that develop formal protocols and processes to try and report on-farm emissions reductions. In past years, producing the required GHG reporting outcomes for inventory accounting has been challenging because ESMC, like most carbon programs in agriculture, used a GHG accounting system designed for projects and crediting, which is referred to as project or intervention accounting.

Intervention Accounting in Agriculture

When we use inventory accounting to estimate the carbon footprint of crops over time, there are multiple factors that may explain why values change each year, such as weather, yield, pests, or other factors. Intervention accounting is a GHG accounting system that focuses on controlling for this kind of variation to estimate just the GHG impact of project actions.

To do that, rather than rely on a comparison with a historic base year to demonstrate progress against the current year (i.e. comparing year 1 to year 2), a counterfactual baseline is used. A counterfactual baseline is a hypothetical scenario that represents what would have occurred if the project and regenerative practice did not happen (i.e. compare a field cover cropping to the same field without cover cropping).

This controls for natural variation like weather so we can better estimate the GHG emissions avoided, reduced, or removed that result when farmers adopt new practices—such as planting cover crops, using less fertilizer, or grazing animals differently. This is made clearer by Figure 4.

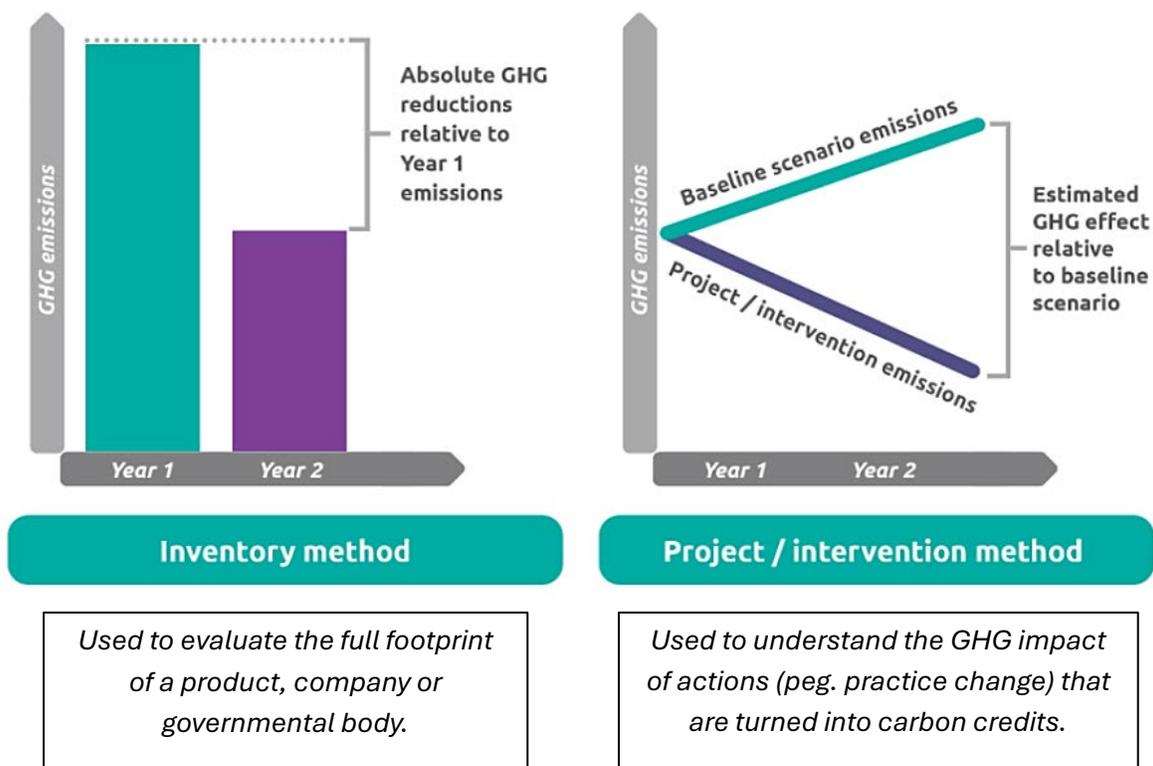


Figure 4: Project and Inventory Accounting.

Source: [Greenhouse Gas Protocol Inventory and Project Accounting Blog](#).

Intervention accounting protocols are often established by the voluntary (or regulatory) carbon market to standardize the process of defining a baseline and intervention scenario. These protocols can be followed to generate carbon credits that are listed on registries, which can be

marketed to *any* company (not just companies in the agriculture sector) to make claims associated with those purchases (i.e. “we are offsetting emissions from manufacturing/shipping our products by supporting regenerative agriculture”).

Given the focus of programs in agriculture is often to get new practices adopted, and that we saw an initial scaling of carbon credit programs in agriculture prior to Scope 3 reduction initiatives, it is not surprising that this is the GHG accounting focus of most programs in agriculture.

Why ESMC is Prioritizing Inventory Accounting

ESMC’s initial protocol focused on intervention accounting but rather than marketing the impact of practice adoption as carbon credits to any company, ESMC focused on just marketing this impact to companies in the agricultural sector. To make this distinction clear, these outcomes were called Scope 3 impact units.

Some industry practitioners define the process of purchasing impact units to reduce the emissions in their GHG inventory as insetting. The theory that supports insetting in agriculture suggests that as more credits/impact units/insets are purchased, more practices are adopted, and thus we should see a measurable decrease in the carbon footprint of crops in the GHG inventory of a company. A key factor here is that companies have the ability to measure this decrease in the carbon footprint of crops over time.

In practice there are key challenges when using only intervention accounting to achieve annual reductions in a GHG inventory:

- **Mismatch in GHG Accounting Systems** – Inventory accounting helps us understand the actual emissions it takes to produce commodities. Intervention accounting uses a hypothetical baseline scenario (emissions that *would have* happened) if practices were not adopted to help us understand the impact of a change. The latter results in some avoided emissions that are relevant to consider when evaluating the impact of a potential intervention (see Figure 5 for a visualization), which are not relevant for GHG inventories (which are based on actual emissions). In addition, with intervention accounting we may influence emissions outside the boundary of a GHG inventory of a company or evaluate multiple years where inventory accounting just evaluates a single year, resulting in mismatch of general quantification boundaries. Overall, these factors can make it challenging to integrate outcomes from these two accounting systems.

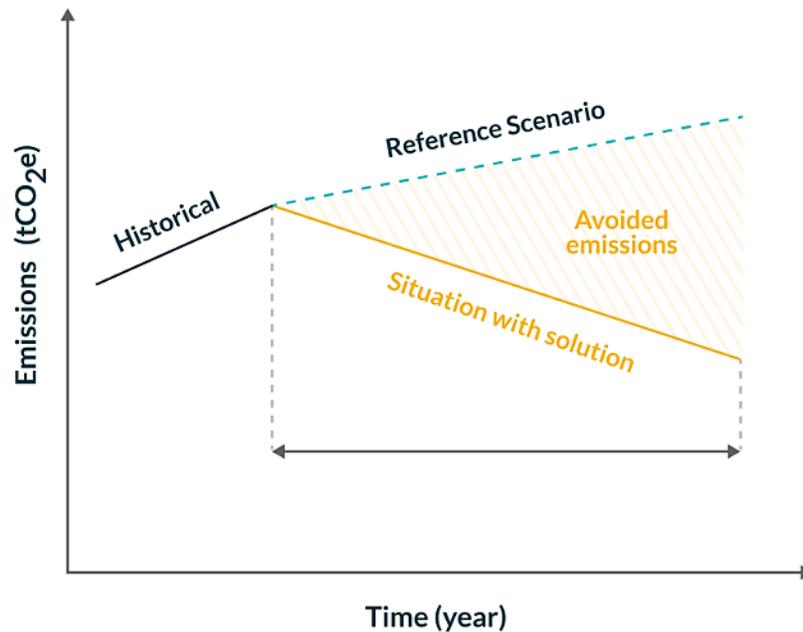


Figure 5: A conceptual figure on how avoided emissions are estimated using intervention accounting.

Source: [VCI - Inventory and project GHG accounting – What is the difference?](#)

- Providing Transparency into Regional Carbon Intensity** – Although carbon intensity can vary depending on geography due to practices, yield, weather, or soil, companies often do not have granular data to understand these differences. Companies complete GHG inventories from a top-down perspective by looking at all the commodities they source across many geographies and using country-scale databases to report carbon intensity. These are coarse, high-level estimates. Very detailed models are often not practical at this scale, and primary data from farms is scarce to inform these estimates. Given this, corporates often do not have access to more granular regional carbon intensity values. From the project perspective, we often use detailed models and a large amount of on-farm data to estimate carbon intensity from the bottom up. If a project provides emissions factors instead of credits, this enables companies to better understand regional carbon intensity, the impact of practices in those regions, and how that relates back to their targets.
- Additionality** – Intervention accounting protocols (in particular those used to generate carbon credits) require additionality. Additionality demonstrates that an action taken in the program (adoption of a regenerative practice) is the result of the program itself. This is important when making claims associated with purchasing carbon credits, but not a requirement from an inventory accounting perspective. In an inventory accounting approach, a program can incentivize the continued production of low-carbon commodities in a value chain. For example, a company may want to provide incentives to early adopters of practices to prevent them from reverting to historic practices (like conventional tillage),

which may result in increased soil carbon emissions in their supply chain. A shift to an inventory-accounting framework allows EMSC to enable these types of actions.

Note that these challenges do not mean that one accounting system is better than the other, or that the systems should change; rather, these accounting systems help us to answer different questions. Rather than trying to relate their outcomes, these systems can be used in concert to better understand both the impact of practices and how the carbon footprints of agricultural commodities are changing over time. This has been proposed by GHG accounting practitioners as best practices when it is possible ([Brander 2021](#)).

Given that ESMC operates in a geography where detailed modeling capabilities are available for both inventory and intervention accounting, rather than trying to blend these systems (i.e. explore solutions to adapt impact units into the emissions factors), ESMC has decided to keep these GHG accounting systems separate, and will prioritize providing inventory accounting outcomes (emissions factors), while maintaining the ability to model impact units to demonstrate the full scale of practice impact.

Summary

Relevance for ESMC and EcoHarvest Program

- Both inventory and intervention accounting are **types of GHG accounting frameworks** designed to help companies understand and manage their Scope 3 climate impact.
- They are **both voluntary (though inventory reporting is becoming a regulatory requirement in EU and CA), but widely used** to align with investor expectations, ESG disclosures, and climate commitments (e.g. SBTi FLAG).
- Both are used by: **Corporates** (e.g., food companies), **MRV providers**, **sustainability consultants**, and **value chain partners**.
- ESMC has utilized intervention accounting for all projects to date, but will now prioritize using inventory accounting:
 - Starting in 2025, ESMC will utilize inventory accounting in order to meet customer demand and ensure that corporates can meet their SBTi commitments.
 - ESMC will still provide the option to utilize intervention accounting on request.

Overview of main differences between inventory and intervention accounting methods:

	Inventory	Intervention
Focus	What is emitted	What emissions change resulting from an action
Temporal Scope	Annual Snapshot	Mostly annual, but can use multi-year or dynamic modeling
Outcomes	Emissions footprint, carbon intensity	Changes in emissions (absolute, relative, or cumulative impact)
Quantification Outcomes	Volume of emissions per volume of good (e.g. kgCO ₂ e/bushel or tonne CO ₂ e/tonne crop)	Tonnes CO ₂ e (removals, reductions)
Baseline	Historical or current emissions	Counterfactual (what would have happened)
Attribution: assigning the result of an intervention to a specific actor (e.g. buyer, corporate)	Not required	Required (proof of causality)
Additionality: proof that outcome would not have occurred without the intervention	Not required	Required
Traceability	Moderate, unless reporting removals, then field-level	High, intervention-specific data and evidence needed

How will this impact the ESMC Program?

Transition to Inventory Accounting:

- Practice changes will not be a requirement at enrollment, which means early adopters can engage and the corporate will capture the benefits of their lower emissions management
 - *ESMC will better capture the impact of early adopters, many of whom are those self-selecting into programs like ESMC*
- An inventory focus presents a picture of the emissions associated with the production of the crop, not a comparison of how one producer managed their fields over time
 - *This will allow corporates to include emissions factors in their reporting and make claims against SBTi commitments*
- Practice change adoption and consistent management of that on every field is hard to achieve in agriculture because management is nuanced and may change due to factors beyond one's control (rain, drought, etc.)
 - *Inventory accounting does not focus solely on this metric and will allow ESMC to see the impact of the program more broadly*

Producer Eligibility:

- Additionality not required (adoption of a new practice change at enrollment is no) longer a requirement
- Early adopters (producers who have been utilizing regen practices historically) are eligible as additionality not required
- Producer only included if corporate sources from and/or owns and operates producer land

Producer Payments:

- ESMC will financially incentivize the adoption of new practices and the maintenance of existing practices to ensure long term soil health and drive reductions in emissions over time
- Producers will be paid for practices, regardless of the emission factor generated
 - This allows producers to focus on what matters – the adoption of new practices and getting support to continue improving soil health
 - This will incentivize action on the ground without the risk that payment is tied solely to emissions factors
 - Payments will be [made annually for practices adopted/maintained](#) as verified by data and satellites

Data Requirements:

- Historical data burden will be lower
 - Base year will be set by a corporate and remain fixed as that one year (v. requirement of minimum 3-year complete historical data under intervention approach)

[Further details and FAQs for producers and project partners can be found here.](#)

Summary of Changes to ESMC Program and Approach to Inventory Accounting:

Change Factor	What is it?	Impacts on EcoHarvest Program
Additionality	Additionality (newly adopting a practice for the first time) is not required in an inventory accounting approach.	Early adopters can be included , but their conservation practices need to be maintained while in EcoHarvest.
Intervention Baseline to Inventory Base Year	Inventory accounting utilizes a fixed base year (typically determined by corporate utilizing EFs generated).	Lower historical data requirements (1 YR v. 3-5 YRS). ESMC will leverage primary and secondary data from the supply shed in order to generate baseline for each crop grown in the baseline year selected.
Producer Payments	Producer Practice Payments made annually. Enrollment Bonus made one time at enrollment.	Pay-for-practice model rather than an outcomes-based model . Outcome based payments are hard for producers to predict and are perceived as higher risk. Outcomes will vary year to year regardless of management because of soil/weather and producers need security. Enrollment Bonus remains unchanged.
Outcomes	Inventory Accounting generates outcomes called improved emission factors. EFs are reported in volume of carbon/volume of crop.	Reporting will change to reflect improved EFs v. tonnes CO ₂ e removed/reduced.
Conservation Practices	Eligible practices for which EcoHarvest will pay producers for adopting or maintaining.	Practices remain the same: tillage reduction, cover cropping and nutrient management. Will provide details to partners on what is most impactful to driving emissions.
Reporting on fields outside of a project, but in a corporate supply shed	Not all fields that a corporate sources from may be in an EcoHarvest program, but they need to know the emissions of the commodity from the entire sourcing region.	At the end of the growing season, an emissions factor is estimated for the “project sourcing fields” and an emissions factor is reported for the amount of commodity sourced from those project fields. For any other commodity sourced outside project sourcing farms and within the general sourcing region, a separate EF is reported for the amount of remaining commodity sourced from non-project fields. This EF can be calculated through various databases or via modeling.