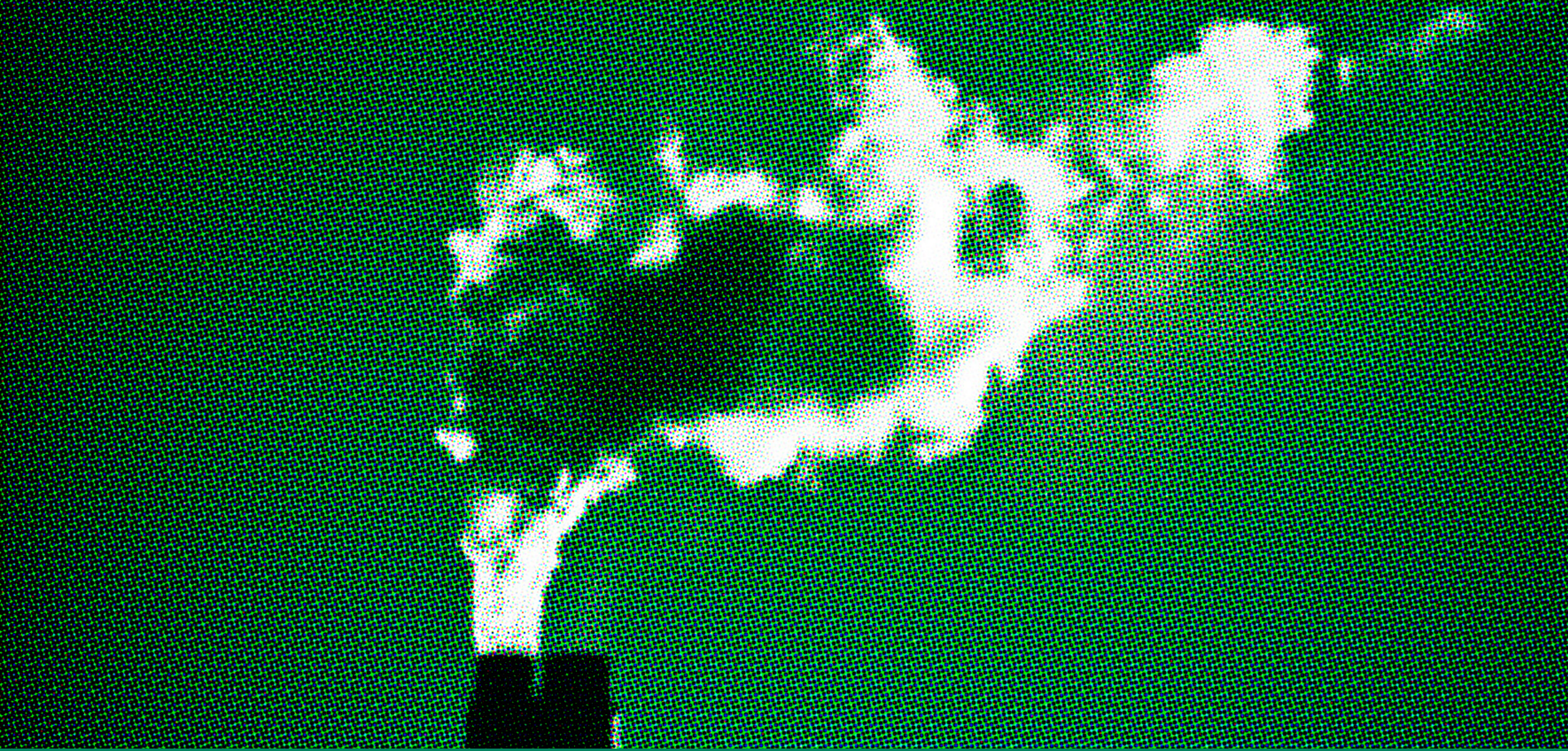


Measuring Greenhouse Gas Emissions in Medicinal Herb Supply Chains

A Sustainable Herbs Initiative-led industry collaboration mapping Scope 3 emissions from farm to factory gate

By Ann Armbrecht, PhD
Founder and Director, Sustainable Herbs Initiative

This article summarizes findings and lessons from a Sustainable Herbs Initiative (SHI)-led collaboration in which seven herbal products companies worked together to better understand greenhouse gas (GHG) emissions in medicinal herb supply chains. This collaboration is the first known effort in the herbal products sector to jointly generate supplier-specific emissions factor data for GHG accounting.

The project focused on Scope 3 emissions — those generated outside a company's own facilities — and developed a structured approach for collecting supplier-specific data "from farm to factory gate." Working with suppliers and consultants, participating companies identified major emission sources, highlighted methodological challenges unique to botanicals, and generated practical recommendations for reducing emissions and engaging suppliers. Together, these findings provide a foundation for more consistent emissions accounting and reduction strategies in the herbal products industry.

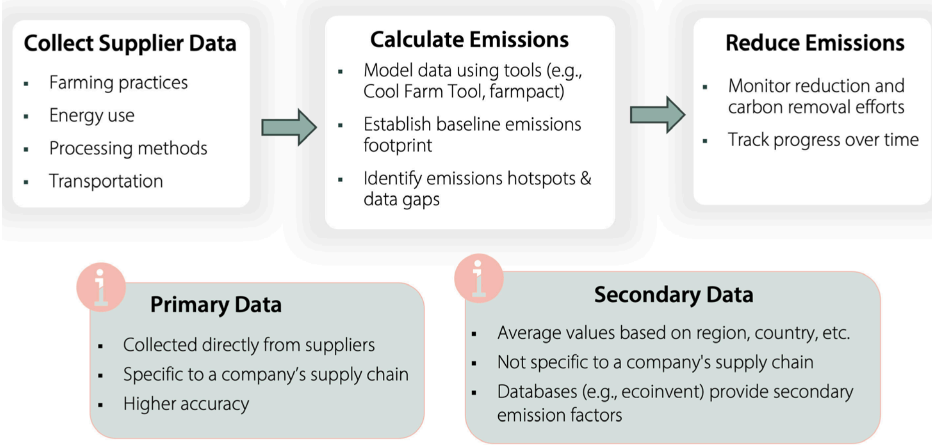
"The SHI Scope 3 Emissions Working Group is part of the early cohort of companies that are trying to tackle this complex and immensely challenging climate action topic."

—Eric Kowalewski, Sustainable (Munich, Germany)

Introduction

Scope 3 emissions are greenhouse gas (GHG) emissions that occur outside of a company's direct operations but within its value chain. These arise from activities ranging from sourcing raw materials to how consumers use and dispose of products. They are distinct from Scope 1 (direct company emissions) and Scope 2 (emissions from purchased energy). Robust Scope 3 emissions data are essential for informed decisions that support measurable reductions in the environmental impacts of botanical cultivation, harvesting, and processing — informing both strategic sustainability efforts and operational practices.

Figure 1. Using Supplier-Specific Data to Reduce Scope 3 Emissions



At present, companies typically estimate Scope 3 emissions for botanical ingredients using established databases containing secondary data or by commissioning Life Cycle Assessments (LCAs) that collect primary data from suppliers. Both approaches have limitations.

Databases compile general emissions estimates from various published sources (e.g., scientific literature, government reports, and industry studies), producing standardized values — called "emissions factors" — used to estimate emissions for a given ingredient rather than measure them directly. However, these estimates are often unreliable for botanicals, which have diverse and often fragmented supply chains. For example, two companies sourcing ginger (*Zingiber officinale*, Zingiberaceae) rhizome from different regions may have vastly different real-world emissions, yet both would find the same average "ginger" value in the database.

Individual LCAs offer greater precision, but commissioning a consulting firm to measure Scope 3 emissions typically costs around $10,000 per species, and analyses should be updated every 3–5 years to remain accurate as supply chain conditions change. For companies that source numerous botanicals, this approach can quickly become cost-prohibitive. However, LCAs enable companies to establish an accurate baseline of current emissions, identify specific measures to reduce emissions, and track progress over time (see Figure 1).

In June 2022, after a Sustainable Herbs Program* webinar on the carbon footprint of tea (*Camellia sinensis*, Theaceae),[1] representatives from seven herb companies formed the Scope 3 Emissions Working Group under what is now the Sustainable Herbs Initiative (SHI). The participating companies were Traditional Medicinals (Rohnert Park, California), The Synergy Company/Pure Synergy (Moab, Utah), Yogi (Eugene, Oregon), Banyan Botanicals (Ashland, Oregon), Nature's Sunshine (Lehi, Utah), Pacific Botanicals (Grants Pass, Oregon), and Pukka Herbs (Bristol, UK). The goal was to collaboratively map Scope 3 emissions of botanicals, reducing individual company costs while building a shared database of primary emissions data that could benefit the broader herb industry. After a year of planning, the working group hired the German consultancy firm Sustainable to guide it through the process of mapping emissions for 21 commercially traded medicinal botanicals (three per company).

This project's significance extends beyond the data collected. Measuring Scope 3 emissions requires detailed visibility into supply chains — a level of transparency that many companies claim but few actually have. By investing in emissions measurement, the participating companies acknowledged responsibility for the environmental impacts of their purchasing decisions and recognized that understanding those impacts is a necessary first step toward meaningful emissions reduction. Although the project focused on GHG emissions, the working group also discussed how sourcing practices affect social, ecological, and economic conditions across the value network.

This case study describes the project's methodology and outcomes, offering lessons on both Scope 3 emissions measurement and pre-competitive industry collaboration.

* From 2018 until June 2024, the Sustainable Herbs Program (SHP) operated as a program of the nonprofit American Botanical Council, after which it became the independent Sustainable Herbs Initiative (SHI). The seven companies participating in the Scope 3 Emissions Working Group were SHP underwriters during much of the research period and remained involved after the transition. For simplicity, this article refers to the initiative as SHI throughout.

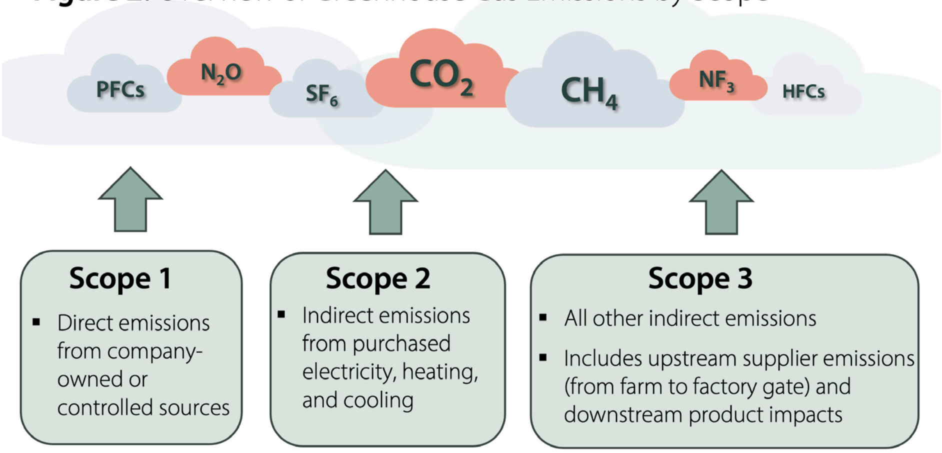
Measuring Scope 3 emissions requires detailed visibility into supply chains — a level of transparency that many companies claim but few actually have.

Project Goals

The Scope 3 Emissions Working Group initiated its collaborative research project with these objectives:

- Measure GHG emissions associated with specific botanicals used by SHI member companies and create a shared database accessible to all participants.
- Reduce the burden on suppliers by limiting duplicate requests for emissions data.
- Develop an accessible, scalable, and standardized model for measuring herbal emissions across the industry, improving the feasibility of continued progress on identifying and implementing Scope 3 emissions-reduction projects.
- Identify emissions hotspots and mitigation opportunities that could be pursued individually or collectively.
- Increase the working group's capacity to understand and carry out this work in the future without the assistance and cost of external consultants, if possible.
- Identify general best practices to reduce emissions for small- and medium-sized companies.

Figure 2. Overview of Greenhouse Gas Emissions by Scope



Outcomes

The working group completed the project in July 2025 and achieved these outcomes:

Emissions data for 17 botanicals across 18 sourcing networks. The group collected primary emissions data for 17 botanical species from 18 distinct sourcing networks (ginger was measured from two different sources). Originally, the group selected 21 herbs (three per company), but Pukka Herbs chose not to participate in data collection, reducing the final number to 18 networks. These data establish a baseline for ongoing work with participating suppliers and form the foundation for a shared database of primary botanical emissions data. SHI members have begun Phase 2 of this project, during which new SHI members will gain access to the existing database and contribute data on additional botanicals.

Training materials and capacity building. SHI now has emissions-mapping training materials from Sustainable, including project framing documents, user guides, and recorded training sessions. These resources are available to new working group members and are expected to improve future data-collection efforts.

Supplier engagement best practices. The working group created a document outlining best practices for collaborating with suppliers on emissions data collection, including templates and recommendations to help suppliers track relevant information throughout the year.

Foundation for emissions reduction. The baseline emissions data provide participating companies with the information needed to identify emissions hotspots and develop targeted strategies for emissions reductions.

Pre-competitive collaboration model. The project generated practical insights into structuring and managing pre-competitive collaborations at this scale, including lessons related to data-sharing protocols, decision-making processes, and supplier capacity building.

Industry visibility. Through both passive and active efforts, the working group has brought increased visibility to the promise of pre-competitive collaboration in the natural products industry, particularly regarding value chain impacts and supplier relationships.

As Leah Greiner, former senior analyst of sustainability and social impact at Traditional Medicinals, said: "It was a pilot [program]. It wasn't going to be perfect, but perfection shouldn't get in the way of progress."

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Project Methodology

To generate supplier-specific emissions data for the selected botanicals, the working group developed a structured process that included establishing a collaboration model, selecting appropriate tools, and outlining a step-by-step approach to data collection and validation.

Definitions

The Greenhouse Gas Protocol is a widely used global standard for accounting and reporting GHG emissions. It provides a framework for evaluating the environmental impacts of supply chain activities, from farm to factory gate and from product consumption to end-of-life treatment of packaging materials (see Figure 2).[2]

Under the GHG Protocol framework:

- Scope 1 refers to direct emissions from a company's owned or controlled assets.
- Scope 2 includes indirect emissions from a company's consumption of purchased electricity, heating, and cooling.
- Scope 3 encompasses all other indirect emissions that occur throughout a company's value chain. Typically, these represent the largest share of total emissions for consumer packaged goods (CPG) companies.

Working Group Structure

The participating companies ranged in size from under $50 million to more than $400 million in annual revenue. The group met for one year to discuss shared objectives. During that time, the seven companies that decided to move forward with the collaboration drafted and signed a memorandum of understanding (MOU) outlining the terms of their proposed work together. This included outlining privacy policies for data-sharing, compliance with antitrust laws, and agreements on how the group would publicly communicate about the project.

The members then collectively drafted a request for proposals, which was sent to seven consulting firms. The working group interviewed two firms and hired Sustainable because it brought the most hands-on experience in working with botanical ingredient suppliers to map Scope 3 emissions. In addition, its proposal emphasized capacity building for the Scope 3 group members so that, in the future, they could map such data themselves without relying on external consultants. The working group also liked the idea of using this as a pilot project that could be extended to other SHI members interested in using the training materials.

Each company contributed between $10,000 and $20,000 to the project, depending on its capacity. A key strength of the collaboration was the group's willingness to accommodate members with different financial capacities, which was due largely to the rapport and trust built with each other.

A few aspects of this structure stand out as being particularly instructive. First, SHI (then at the American Botanical Council and now at the Sustainable Food Lab) served as a nonprofit hub for the project. As a third party, SHI made it easier for companies that otherwise compete in the marketplace to collaborate on an initiative for a larger purpose. SHI also provided continuity amid personnel changes at participating companies, as well as credibility with Sustainable, company decision-makers, and participating suppliers.

Second, about two-thirds of the working group members had previously participated in SHI virtual Learning Labs focused on the principles and practices of Theory U and the Presencing Institute. As a result, the participants were accustomed to digging beneath the surface to discuss deeper challenges and issues, and this approach carried over into their interactions in this working group.

Project Phases

The project was divided into three phases:

Phase 1: Evaluate existing company emissions data. Several participating companies had pre-existing primary emissions data for some botanical ingredients, and Sustainable evaluated these data to assess their credibility and usefulness. Overall, the data received low scores, which was a surprise. The scores were low for several reasons, including limited transparency into how the data were collected, poor documentation of the process, incomplete coverage of emission sources, unclear assumptions, and outdated data. Ideally, data should be updated regularly (e.g., every 3–5 years).

Phase 2: Establish a scalable and generalizable process. Based on the initial review, the working group focused on establishing a standardized process that could be applied consistently across companies, suppliers, and botanical species.

Phase 3: Expand the shared database. Using the agreed-upon process, the group then collected new emissions data, discussed the findings, and explored possible actions.

Selected Species

Concurrently, working group members narrowed their list of plants to include in the project. Each company selected ingredients that were higher-volume and higher-impact for their company. Because different plant parts (roots, leaves, flowers, etc.) are associated with different growing and processing practices, each with different implications for emissions, the group included a range of plant types. Species were selected from different regions of the world, and companies also considered which suppliers would be willing and able to participate in the data collection. Fourteen of the species were cultivated, and three were wild-harvested. We chose this balance because cultivated species generally have higher emissions than wild-harvested species. In addition, because the primary source of emissions for wild-harvested species is transportation to and from collection sites — and because many are aggregated from individual harvesters —transportation data can be difficult to collect. Black cohosh, pau d'arco, and sarsaparilla were the three wild-harvested species selected.

Table 1. Species Selected for SHI's Scope 3 Emissions Project

Common Name	Scientific Name (Family)
Amla/Amalaki	*Phyllanthus emblica* syn. *Emblica officinalis* (Phyllanthaceae)
Ashwagandha	*Withania somnifera* (Solanaceae)
Bacopa	*Bacopa monnieri* (Plantaginaceae)
Beetroot	*Beta vulgaris* (Amaranthaceae)
Black cohosh	*Actaea racemosa*, formerly *Cimicifuga racemosa* (Ranunculaceae)
Camu camu	*Myrciaria dubia* (Myrtaceae)
Echinacea	*Echinacea purpurea* (Asteraceae)
English lavender	*Lavandula angustifolia* (Lamiaceae)
Eucalyptus	*Eucalyptus globulus* (Myrtaceae)
Ginger	*Zingiber officinale* (Zingiberaceae)
Lemon balm	*Melissa officinalis* (Lamiaceae)
Pau d'arco	*Handroanthus impetiginosus* syn. *Tabebuia impetiginosa* (Bignoniaceae)
Raspberry leaves	*Rubus idaeus* (Rosaceae)
Sargassum horneri	*Sargassum horneri* (Sargassaceae)
Sarsaparilla	*Smilax ornata*, sometimes cited as *S. regelii* (Smilacaceae)
Turmeric	*Curcuma longa* (Zingiberaceae)
West Indian lemongrass	*Cymbopogon citratus* (Poaceae)

Software

The Cool Farm Tool is a widely used, science-based GHG calculator that helps farmers understand the sources of emissions on their farms and identify reduction opportunities, including potential carbon sequestration options — all while enhancing soil health, water quality, biodiversity, and farm economics. The tool was originally designed to generate emissions factors for large-scale commodity crops such as rice, corn, soy, and potatoes.[3]

Sustainable has also developed its own tool, farmpact, which is built on the Cool Farm Tool. Because farmpact incorporates processing data and allows greater flexibility to account for the diversity of farming practices for herbs, the group selected that tool for gathering emissions data.[4]

Sustainable also created training materials and led participants through training sessions and a pilot exercise mapping three species, providing the tools needed to work directly with suppliers to map emissions. The training session included a detailed explanation of sources of emissions, how to work with suppliers to gather data, and how to enter this information into the farmpact tool.

The group's proposal included five "high-touch" emissions calculations, meaning participants received a high level of guidance from Sustainable. The remaining calculations were considered "low-touch," with Sustainable answering questions in a group setting. High-touch calculations required more direct involvement from Sustainable due to their complexity, the number of growers and processors involved, language barriers, and limited experience and confidence among companies or their suppliers. Low-touch calculations reflected simpler ingredient lifecycles, fewer actors, or greater data availability and analytical experience. Regardless of complexity, each calculation required close communication between a participating company and its supplier.

After completing the training, individuals from each company then worked with their respective suppliers to gather the required data.

Data Collection Process

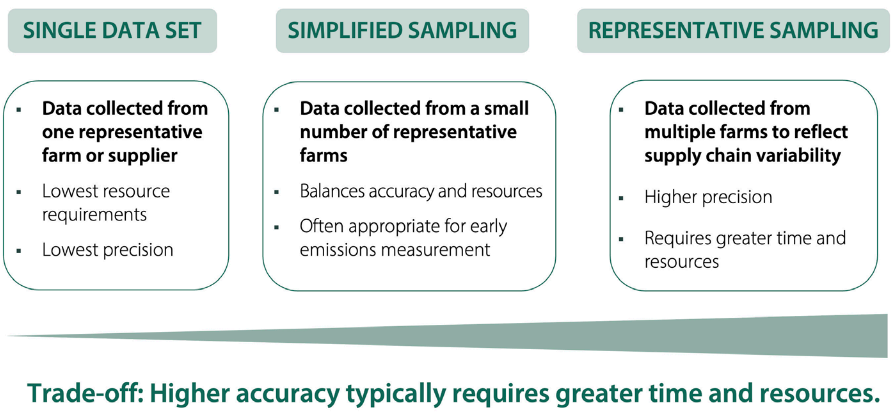
During the training sessions, Sustainable outlined a six-step process for emissions data collection: mapping the supply chain, determining scope and boundaries, collecting data, validating data, documenting methods, and creating an emission factor framework.

Mapping the supply chain

Once an ingredient was selected, the first step was to map the supply chain for that ingredient by identifying tier 1 and tier 2 suppliers, amounts of herbs sourced, farming practices, and locations. Suppliers then grouped farms into smaller, more homogeneous sets so that data could be collected from representative farms within each group and used to estimate emissions across the larger supply network.

This mapping was key to the second step: determining how many farms to include and selecting the most suitable sampling approach. Farms were grouped by shared characteristics such as level of mechanization; farming practices (organic or conventional); land-use changes within the past 20 years; soil and crop management practices (fertilization,

Figure 3. Sampling Approaches for Estimating Supplier Emissions



tillage, cover crops, use of harvest residues); region; and yield per area. Sustainable recommended this simplified sampling approach for first-time emission factor calculations to balance accuracy and resources.

When sourcing from fewer than 10 farms, Sustainable recommended collecting data from all farms. However, most suppliers source from multiple farms, so it is rarely financially feasible to collect data from each individual farm. Instead, suppliers should select a suitable sampling approach based on a clear understanding of their supply network (see Figure 3).

Determining scope and boundaries

The group set the scope for data collection from farm to factory gate, focusing on both farming and processing practices. On-farm emissions data included farm location; type of farming system (e.g., agroforestry, monoculture, or polyculture); composting practices; irrigation; crop residues; crop area and yield; soil characteristics; fuel use; co-products, etc. Processing data included energy use, drying practices, packaging, transportation, waste, etc. This did not include transportation beyond the processing center.

Collecting data

The next stage involved collecting the emissions data and entering it into the farmpact tool. Ideally, agronomists working with the suppliers would enter data from farmers directly into farmpact. Because this stage is critical to data quality, it was important to document the source of the information entered, including whether it was based on farmer interviews or assumptions.

Though this process may sound straightforward, gathering the data proved challenging. Agronomists often work with numerous farms and supply networks, which can complicate coordination efforts. Many farmers, however, do not have formal training or experience in detailed data collection and analytics and typically do not track this level of detail. As a result, in most cases, entering the data required significant effort. Consequently, for some farms and suppliers, the project provided hands-on technical training that may add value to their business operations over time.

Given the distance between farms, limited resources, heavy workloads, and language barriers, it was often difficult to get this information directly from the farms. More pragmatically, the suppliers generally relied on assumptions about farming practices, and the farms and farmers were not directly involved.

Validating data

This step involved identifying outliers or errors in the collected data. When possible, this validation was conducted in collaboration with agronomists.

Documenting methods

Because the accuracy and usefulness of the final emissions data depend on transparency, the group documented all dates, records, and communications made during data collection and emission factor calculation.

Creating emission factor framework

Once the emissions had been calculated for all the selected species, the Sustainable team shared the results with the working group and prepared the final report. Phase 2 of the project will continue this work, involving original Scope 3 member companies and several new SHI members.

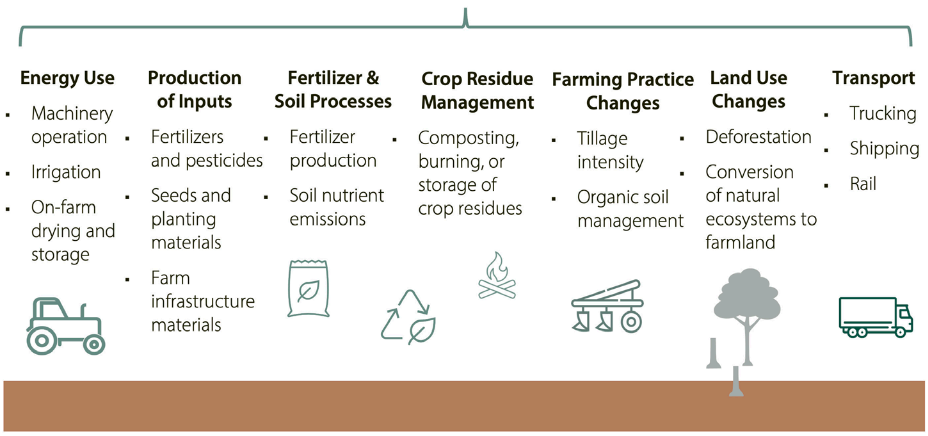
Emission Sources and Reduction Strategies

The group gained valuable insights from this collaboration about ingredient-specific emissions, mapping those emissions, working with suppliers both on this project and in general, and the value and challenges of collaboration. This knowledge will inform the important work of reducing emissions and support future efforts.

A primary outcome of the project was the creation of a solid foundation for this work moving forward. The results provide a baseline that will become increasingly meaningful as member companies continue to gather emissions data. Having gone through the process, participating companies and suppliers will be better equipped to collect data in the future.

West Indian lemongrass *Cymbopogon citratus*
Photo by Steven Foster ©2026 ABC

Figure 4. Greenhouse Gas Emission Sources in Agriculture



The group calculated emissions for 17 botanicals. Most quality scores were 3 (good) or 4 (very good), and emissions factors for most species were within a normal range.

For each species, the project analysis included a breakdown of emissions hotspots and identified key factors that may contribute to those higher levels, such as recent land-use changes, fertilizer production, transportation, and packaging.

The following sections describe key agricultural and processing emission sources and outline practical approaches to reduce emissions.

Agricultural Emission Sources

Production of inputs

Figure 4 shows examples of some agricultural inputs measured in the Cool Farm Tool and farmpact, including pesticides and fertilizers. Other inputs, such as seeds/seedlings, tarps, and greenhouses, are not included in the Cool Farm Tool because their associated emissions are relatively small or spread over many years. Thus, they are not considered material drivers of farm emissions.

Fertilizer production and application

Emissions from fertilizers occur at two stages: during production and application. For mineral (inorganic) fertilizers, emissions are produced in the factory (especially for nitrogen-based fertilizers), as well as during mining and extraction (e.g., of potassium and agricultural lime). For organic fertilizers, emissions occur during compost production. For this project, only certified organic species were selected, so only organic fertilizers were used.

Additional emissions occur during application, when carbon dioxide (CO_2) and nitrous oxide (N_2O) are produced. Organic composting methods can also generate significant amounts of methane (CH_4), a particularly potent GHG, and composting was often one of the largest sources of emissions per species.

Crop residues

Emissions generated from crop residues (e.g., stems, leaves, and other plant material remaining after the harvested portion of the crop is removed) depend on the amount and type of residue and what is done with it. For example, emissions vary depending on whether crop residue is removed from the field and sold for other uses; left on the field and incorporated into the soil; burned in the field; used in aerated or non-aerated compost; or left in piles or pits.

On-farm energy use

On-farm energy use includes field operations, irrigation, on-farm processing (e.g., drying and packing), and transportation from fields to the processing center. Emissions depend on the energy source, energy consumption, hours of machine use, machine type, irrigation method, and amount of water used. Fuel type (e.g., wood, straw, biogas, bioethanol, biodiesel, natural gas, oil, diesel, gasoline, kerosene, propane, coal, etc.) also affects the amount and type of GHGs generated.

Land-use change

Land-use change includes historical deforestation. If trees were cleared to create farmland within a certain time period (typically 20 years), the associated carbon emissions are factored into the overall agricultural emissions for crops produced on that land.

Reduction Strategies for On-Farm Emissions

The largest contributors to on-farm emissions identified in this project included compost production, transportation, processing, and packaging. The following sections include details about these sources and steps to reduce emissions.

Composting

In organic farming, composting is a significant source of emissions, which may be surprising or counterintuitive. The composting process itself can generate GHGs, particularly methane. These emissions can also be difficult to measure because composting practices are complex and vary widely, and most emissions data tools do not account for these nuances.

However, focusing on high emissions from composting is an example of "carbon tunnel vision." It ignores the broader holistic benefits of organic and regenerative farming practices for soil health, biodiversity, water use and quality, and other environmental outcomes. Overall, it is often more effective to focus on reducing processing emissions from fuel use, which are more straightforward to address.

However, there are still best practices to improve composting and additional approaches for reducing on-farm emissions. Recommendations include:

- Avoid overusing compost.
- Turn compost regularly to allow oxygen in; otherwise, the biological materials begin to decompose anaerobically, releasing methane.
- Monitor emissions by measuring methane; this may be the next step once a supplier has baseline data for composting emissions.
- Support improvements in data collection tools to better capture complex composting practices.

Carbon sinks

Carbon sinks are reservoirs that store carbon. Certain farming practices can enhance these sinks, helping to reduce emissions. Recommendations include:

- Use agroforestry practices (e.g., add hedgerows, border trees, alley cropping, etc.).
- Apply biochar, a charcoal-like soil amendment made from plant material.
- Use cover cropping and green manures (i.e., cover crops deliberately grown to be cut and incorporated back into the soil to supply nutrients and organic matter).
- Leave crop residues on the field and incorporate them into the soil.
- Limit soil disturbances (e.g., land-use change, intensive tillage, and exposure to sun, air, and rain), which accelerate the decomposition of stored carbon and increase carbon dioxide emissions.

Wild harvesting

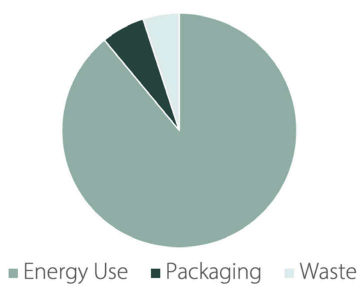
The biggest sources of emissions for wild-harvested species are transportation to and from collection areas and drying practices. Best practices for addressing these include minimizing driving and using alternative drying methods.

Processing

Herb processing often relies heavily on fossil fuels. One of the most impactful steps herb businesses can take is to invest in zero-emissions herb drying or implement more efficient drying practices (see Figure 5).

Figure 5. Using Emissions Data to Identify Hotspots and Guide Reduction Strategies

Example: Processing Emissions Hotspots



Hotspot-Targeted Reduction Strategies

ENERGY USE

- Improve equipment efficiency
- Transition to renewable energy
- Optimize drying and processing operations

PACKAGING

- Reduce packaging volume
- Use lower-impact packaging materials

WASTE

- Reuse residues (compost, feed, biochar)
- Improve processing efficiency

Project Insights and Lessons

Measuring Botanical Emissions

A key finding of the project was that collecting emissions data for botanicals is a process in itself. Although the final emissions numbers may appear static, herb suppliers are dealing with real crops affected by real-world conditions. Emissions vary not only across farms and regions but also from year to year, driven by changes in weather, fertilizer needs, the length of the growing season, and other factors.

Compared with large-scale commodity crops, collecting emissions data for botanicals is especially challenging due to the diversity of herbs. Herbs are grown using various production systems around the world, sometimes on a small scale, where farmers use traditional practices that do not easily fit into a data-collection system designed for large-scale commodity crops. In addition, drying and processing emissions are influenced by the plant part used (e.g., root, leaf, flower, etc.) and by geography. This localized diversity made it challenging for suppliers to enter the data directly into farmpact, which necessarily relies on generalized practices.

One practical takeaway from this project is to begin with a clear understanding of the supplier's context. Before contacting suppliers, the group mapped each supplier's supply chain for a given species. This straightforward outline was primarily used to determine the sampling approach, after which suppliers entered data directly into the farmpact tool. In the future, the group recommends beginning with a conversation with the supplier about how the species is grown, the practices and inputs used, and any challenges involved. With a clearer sense of the context, company staff can better interpret the information and enter the data into farmpact accurately.

Insights from Project Participants

"The data collection process helped me become a better data analyst and interpreter. And it helped me learn to not just take things at face value."

—Leah Greiner, former senior analyst of sustainability and social impact at Traditional Medicinals

"I learned a great deal about the complexity of our ingredient value chains, from cultivation to harvesting to initial processing and extraction. Collecting the data for a carbon footprint calculation opened a window into so much more. Open, trusting, and transparent information sharing with suppliers has the potential to transform one's understanding of the many steps required for bringing a medicinal herb to our consumers!"

—Zacharia Levine, head of organizational stewardship at The Synergy Company/Pure Synergy

Relationships with Suppliers

Another key lesson from the project is how critical it is to have open, trusting, reciprocal relationships with suppliers. These relationships made it easier to ask suppliers to do the heavy lifting required. They also made it easier to have the back-and-forth exchange of information that was essential for interpreting the data for farmpact and for verifying the accuracy of the information shared.

Companies that had established long-term trust-based relationships with their suppliers often found them to be eager and willing partners in this measurement effort. Those who had visited the farms and suppliers were also better able to give context to the information shared.

Companies without those deeper relationships had more difficulty putting the data in context and interpreting the information, especially when sourcing teams had access to the data but the sustainability staff responsible for data collection did not. These staff were also less comfortable going back to suppliers with additional questions than those with stronger relationships.

Relationships that suppliers have with the farmers and wild harvesters in their network also played an important role. It was important that suppliers worked with their farmers and did not burden them with excessive data requests.

Some suppliers were unwilling to participate because they lacked the necessary data or, more often, because they were reluctant to share it so transparently. They were concerned that if a company sourced from two suppliers and one came back with lower emissions, the buyer might switch their purchasing to the supplier with lower emissions. Strong relationships with suppliers helped them trust that the data would not be used against them if they had higher-than-expected emission results. These relationships also made suppliers more willing to share data and be transparent about the data's accuracy.

These insights were echoed in perspectives shared by project participants. Overall, the group benefited from the long-term relationships that Traditional Medicinals had established with three of the participating suppliers, as well as from relationships developed through SHI with two other suppliers.

Taylor Clayton, former senior manager of sustainability, health, and safety at Traditional Medicinals, noted that suppliers were willing to take on the extra work required for this project because the relationships the company has built over the years are not purely transactional. Botanicals take time to grow, and strong relationships take time to develop. "When its suppliers are in a pinch, Traditional Medicinals tries to meet them where they are. They try not to haggle over prices," Clayton said. He added that those suppliers were more willing to participate because of the extra value that Traditional Medicinals has brought to them.

Zacharia Levine, head of organizational stewardship at The Synergy Company, who led the company's data collection effort, emphasized the importance of openness, trust, and straightforward communication with suppliers. For The Synergy Company, sharing emissions data significantly increased mutual understanding between buyer and supplier. Conversations about farm inputs, for example, easily turned into discussions of climate adaptation challenges, geopolitics, or shipping logistics. In all cases, the carbon footprint measurement process improved the group's ability to identify and implement mutually beneficial improvements.

Best practices include:

- Invest in long-term relationships with suppliers, which can pay off in many more ways than simply receiving raw materials.
- Begin with suppliers who can provide the required data and with whom the company already has good relationships, rather than bringing in suppliers for whom participation would be more difficult or demanding.
- Conduct site visits. Not only do they strengthen relationships, but they also provide visual context for interpreting data such as Scope 3 emissions, improving the overall quality of the data.
- Develop a business case highlighting the value of site visits and developing and deepening supplier relationships.
- Include sustainability staff in conversations, site visits, and meetings with sourcing teams and suppliers so they can build their own relationships with suppliers. This makes it easier to ask follow-up questions and enter data accurately.

Data Collection and Suppliers

Data collection proved to be difficult for some suppliers, even though the group's intention had been to minimize the burden. The surveys required a large amount of granular information, much of which suppliers do not record or track in the way that farmpact requires. Asking these questions of suppliers was also new for many in the working group. There was a steep learning curve for everyone involved, which Sustainable assured us is typical in the first year of a project like this. Mapping emissions tends to become much easier in subsequent years, both because the tool is more familiar and suppliers are more consistently tracking relevant information.

The quality of the data was directly influenced by suppliers' knowledge of their farmers and collectors, as well as the presence of agronomists on the team. Data collection was much more difficult when suppliers did not source directly from farms, and complexity increased with each successive supplier tier. Historically, many of these companies had not engaged in direct supplier relationships, data collection, or resource monitoring.

Based on these challenges, the group identified several recommendations for improving future data-collection efforts:

Avoid tight timelines. The group hoped to request data during slower periods for suppliers, but because of delays, requests were made during busy periods, creating additional delays. There were also challenges from competing demands and unanticipated conflicts, making it difficult to meet tight timelines. Future efforts should map out the times of year when suppliers are better able to provide the requested data and identify shorter-term, smaller-scale projects where delays are less likely.

Focus on supplier capacity building. Nate Brennan, former senior supply chain manager at Pacific Botanicals, noted that it is helpful to think of this process more as a capacity-building exercise than a measurement exercise. The group produced a guidance document that outlines best practices and data-collection templates to help farmers and suppliers know what to track throughout the year. The goals of this document are to make it easier to share emissions-related information with customers when asked; to explain sources of emissions so farmers and suppliers understand how farm-level practices impact downstream emissions reporting and supply chain impacts on the buyer's end; and to help suppliers better understand the data so they can reduce their emissions and improve farming practices.

Build capacity within the supply and brand network. Consultants at Sustainable have found that the mapping exercise itself is often the best form of training. As part of Phase 2, the project will involve learners and leaders — some companies will take the lead in data collection and analysis, while others participate and learn from the process.

Working Group Collaboration

The fact that this project took place at all reflects the trust and transparency among the individuals involved and the companies they work for. This represents a shift in an industry often known for secrecy and is a testament to the quality of the relationships formed through SHI's virtual and in-person gatherings. From the outset, the project benefited from strong enthusiasm and a shared willingness among participants to trust one another and the process. Many of the Scope 3 participants had been meeting for more than a year through the SHI monthly meetings and Learning Labs and had become friends.

This enthusiasm and goodwill helped the group complete the process, despite some challenges. It also meant they overlooked some key guardrails that the group now recommends establishing for future collaborations.

The project benefited from strong enthusiasm and a shared willingness among participants to trust one another and the process.

The following practices highlight what worked well within the working group:

- The group defined a clear structure for managing funds, set up contracts, and abided by those agreements.
- Participants signed an MOU and non-disclosure agreements (NDAs) in advance and respected what information could be shared and how the project could be discussed publicly.
- Companies understood that financial contributions were based on capacity, and many were generous.
- Most participants remained engaged throughout the project, even though it took longer than anticipated.

Work contribution. Companies and individuals came into the project with different resources and skills. Because these differences were not discussed openly at the outset, there was no system in place when certain people took on more of the workload while others did not fully participate. Some really invested in the training and did their homework, while others did not. Yet the overall project timeline was only as fast as the group could move, so these differing capacities slowed progress. This is a key issue to address at the outset of Phase 2.

Employee turnover. The project took a year longer than planned. In that time, five group members either left their company, the industry, or the project altogether, or left their company but remained involved in the project in a different capacity. Fortunately, those who stayed involved remained committed and engaged. This is an important issue to consider, as the loss of trained staff represents a significant setback for participating companies.

Organizational and approval delays. Because this was an innovative and experimental effort, the group was willing to move forward in the face of uncertainty and unanswered questions. However, participants were working within companies with their own commercial and legal interests. Some delays arose when group members required approval from executives and legal experts outside the working group, who needed to follow standardized approval processes and carefully balance collaboration with competition. These delays could be addressed up front in future initiatives.

Recommendations for future collaborations include:

- Establish clear guidelines around who has access to emissions data and how that information will be managed. This was not an issue in Phase 1 but is important to keep in mind for Phase 2.
- Define roles and responsibilities, along with a process for addressing situations in which people are unable to keep their commitments, so that the burden does not fall on others in the group.
- Involve at least two people per company in the work and meetings. This helps distribute the workload and provides continuity in case of staff turnover.
- Have shorter, time-bound projects (up to three months), with one or two companies leading. Other companies can join or support the work without delaying the process.
- Although the group established guidelines for public relations, future collaborations should be specific about what can be shared, what requires approval, whose names can be used, and the final approval process for public communications related to the initiative.
- Be clear about companies' specific goals and make sure they resonate with everyone involved. One option is to have a few companies take the lead, with others participating more as observers in an engaged training role.

Working with Sustainable

Sustainable did an excellent job of bringing the group into the emissions-mapping process and providing transparency about the sources driving emissions. Greiner noted that this contrasts with other consulting firms that do not share these details. Without insight into the causes of emissions, companies cannot clearly identify potential action steps. For example, Greiner added that Traditional Medicinals now has a clearer understanding of the differences in emissions between ginger grown in a monoculture and ginger grown in a polyculture, leading to different action items.

"It was more challenging to work with a group of companies where individuals came with different skills and knowledge, but it was much more valuable," said Eric Kowalewski, senior consultant with Sustainable. He added that the process helped build a team of sustainability leaders in the participating companies who now have a stronger foundation for climate change mitigation. Overall, he noted that the project is contributing to collective knowledge at a time when action is critical.

Next Steps

Based on the emissions data collected so far, the working group will:

- Identify opportunities to implement improved drying and processing practices to reduce emissions in cost-effective ways.
- Identify the steps suppliers can take that will have the greatest impact on emissions, based on region or species. While it is helpful for suppliers to understand this process, most do not have the time or resources to invest in this type of detailed emissions measurement.
- Create a shared database (for brands, suppliers, and farmers) with a curated list of measures that can have

Sarsaparilla *Smilax ornata*
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> the biggest impact on emissions, including descriptions of recommended actions to improve practices and, where possible, supporting images.

The group began Phase 2 of this project in January 2026 with several returning and new companies. Returning companies include The Synergy Company, Traditional Medicinals, Yogi, and Pacific Botanicals. ES Botanical Consulting is also participating in Phase 2, with Erin Smith continuing her involvement from Phase 1, when she was at Banyan Botanicals. New companies include Asheville Tea Company (Asheville, North Carolina), Blue Sky Botanics (Ross-on-Wye, England), Harmonic Arts (Cumberland, British Columbia), Oshala Farm (Grants Pass, Oregon), and Verdure Sciences (Noblesville, Indiana).

In 2026, the group will continue to generate emissions data for botanicals for use among group members, help expand primary emissions data for the botanical industry as a whole, and identify projects to reduce emissions, either individually or jointly.

Levine, who is co-leading Phase 2 of SHI's Scope 3 Emissions Working Group, said:

> Rather than thinking in terms of discrete phases, our vision is to build a long-term, evolving partnership — one that continuously improves and expands. This means deepening the scope of technical analysis and advisory work, scaling inset projects, and engaging more companies over time. If we succeed in doing this for emissions and environmental impact, then perhaps it can also serve as a replicable model for exploring other technical areas of interest within SHI, such as sourcing, quality systems, and logistics. All the while, we'll work to create and preserve the conditions needed for a partnership to grow organically and deliver lasting impact. These are the same conditions we talk about all the time within SHI: trust, transparency, reciprocity, and mutual benefit.

Conclusion

As the director of SHI, I was only indirectly involved in working with suppliers and entering data into farmpact. Even so, from the beginning, I was struck by the incredible level of detail required to generate emissions data, from irrigation sources to crop residue and compost management. For those unfamiliar with these types of tools, this project also highlights the challenges suppliers face when entering the data, as well as why this level of detail is essential for long-term emissions tracking.

To me, the most important part of this initiative is that it illustrates companies' recognizing and taking responsibility for their actions in source communities. Carbon emissions are just one impact. There are others: impacts on biodiversity, economic resilience, and more. In addition to the data gathered, this project is a model for corporate accountability.

Moving forward, SHI will create a platform for collective learning and knowledge sharing to make it easier for people who are new to the subject to get on track. This will lead to more widespread integration of emissions (and sustainability) data into the botanical industry.

Finally, while there is a lot of talk about the value of precompetitive collaboration, it was extremely valuable to carry out a two-year collaborative project. We gained concrete insights into the challenges of these collaborations and ways to help navigate them in the future. HG

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Lavender *Lavandula angustifolia*
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