



The Guidebook for
**Resilient
Animal
Agriculture**

How to use this guide

This guidebook was developed by Environmental Defense Fund (EDF) to provide an easy to use, step-by-step guide for supply chain best practices for animal agriculture companies in four animal ag commodities — beef, dairy, pork and poultry.

This guidebook is broken down into two main parts.

Digital guide:

resilientanimalag.org

Part I

Part I gives you the information you need to build a sustainability framework for your company's supply chain. It will walk you through the steps of assessing your company's environmental footprint and setting goals for improvement. Furthermore, Part I lays out a roadmap for addressing the most pressing environmental impacts in your supply chain, implementing best practices to mitigate those impacts, and measuring and reporting publicly on your progress.



Part II

Part II provides guidance on how to implement your sustainability plan and take actionable steps toward company goals. This section includes step-by-step implementation guides for each major impact area, case studies and additional resources for you and your supply chain partners.



Foreword

by **Theresa Eberhardt**, Project Manager,
Resilient Food and Forests, EDF + Business

The growing number of announcements from major animal agriculture companies to reduce the environmental impacts of their global supply chains signals that sustainability is gaining traction in the industry, finally. Smithfield pledged to reduce its supply chain emissions 25% by 2025 and not long after, Danone committed to make its full value chain carbon neutral by 2050.

Part of this drive toward sustainability stems from climate change's pervasive impact on agriculture. Floods, for example, have been devastating larger and larger swaths of American farmland. The economic costs — from damage to facilities, disrupted operations and supply chains, and lost productivity — are already in the hundreds of millions of dollars and expected to reach trillions.

Protein companies that invest in the long-term health of their supply chains will find that sustainability builds resilience — and profits.

Add to that the devastating impacts of COVID-19 on farmers, families, workers and the economy, and the urgency of creating a more resilient animal agriculture industry becomes clear.

And yet, despite the risks and vulnerabilities, the vast majority of the animal agriculture industry lags far behind in terms of sustainability. Conversations about the impacts of global supply chains are long overdue.

As we start to look to rebuilding a better, more equitable economy after this global pandemic, all companies — whether in the pork, beef, poultry or alternative protein space — need to consider the impact their operations, and those of their suppliers, are having on the environment.

Foreword

Doing so opens up huge opportunities to create value for farmers, their businesses and the environment.

By investing in the sustainability of their supply chains, animal agriculture companies can make them more resilient to all kinds of disruptions.

In the highly weather-dependent food and agriculture sector, companies are facing risks in sourcing like never before. Companies investing in sustainability are building a more stable future for their business, and reducing risks.

Their stewardship will be further rewarded by an increasingly environmentally conscious pool of consumers, who want to buy products made in a sustainable way and support brands taking a stance on social movements — and the environment is their top concern.

Working together — across industries and supply chains — will be one critical piece to ensuring the industry rises to the challenge of building a resilient, prosperous and food-secure future.

It's not going to be easy, but there's a growing body of resources and best practices that companies, especially those new to the sustainability realm, can follow. Environmental Defense Fund's Guidebook for resilient animal agriculture can help companies get started. The guide lays out a blueprint for creating and implementing a sustainability plan, with case studies and additional resources for supply chain partners, to help ensure success.

Given that less than a decade remains for us to rein in our greenhouse gas (GHG) emissions to avoid the most severe impacts of climate change, the time for action is now.

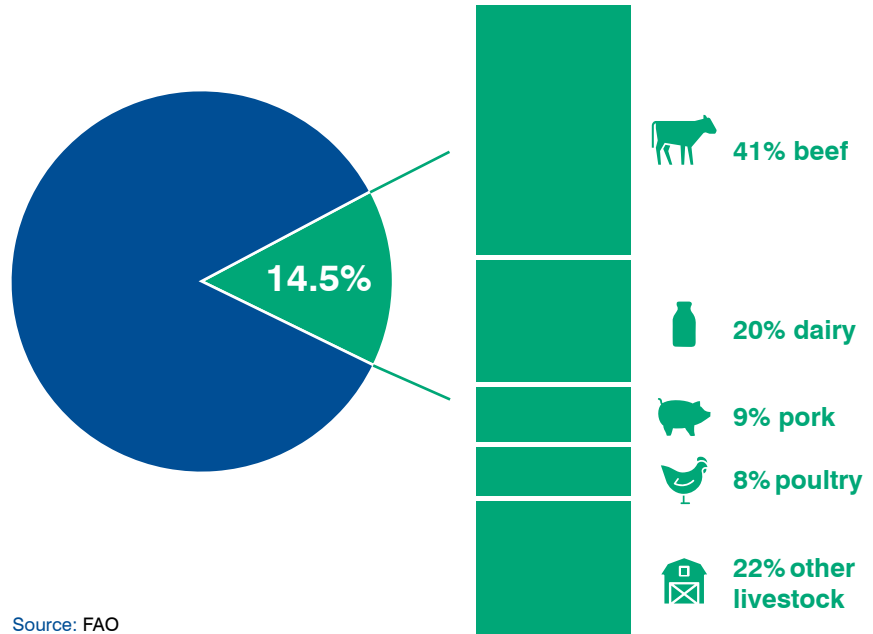
And the opportunity lies with you, as an important proportion of our emissions reductions can come from the animal agriculture sector. Bold leadership will be rewarded by cost savings, increased resilience and loyal customers.

Introduction

Livestock production accounts for an estimated 14.5% of global greenhouse gas (GHG) emissions, and beef, dairy, pork and poultry together make up the vast majority of those emissions. Based on these estimations, for over a 20-year period, 22.8% of total GHG emissions can be attributed to livestock production. These figures demonstrate animal agriculture's substantial climate impact, but also represent the opportunity for the industry to contribute to bringing GHG emissions within acceptable limits.

Companies that source and sell beef, dairy, pork and poultry can be part of the solution to ensure long-term supply of products, reduce the environmental and climate change impact of agriculture in supply chains, and help make farmers and other producers in protein supply chains more resilient.

Livestock production accounts for an estimated 14.5% of GHG emissions.



Source: [FAO](#)

For companies just getting started, understanding where and how to engage in the supply chain can be daunting.

This guidebook provides best practices for suppliers interested in implementing sustainability initiatives and an overview of the major environmental hot spots for the protein industry. The steps laid out in this guide will help you map and understand your own supply chain and impact areas, ensure internal alignment on goals and strategy, transparently engage and communicate with supply chain stakeholders, and continually look for collaborations to help push the entire industry forward.

Companies can tailor and prioritize specific practices recommended in this guidebook based on specific management practices, environmental hot spots and operations.



Whether you are a retailer, food service company or consumer goods producer, you play a critical role in the supply chain. Working together will be the key to ensuring the industry rises to the challenge of ensuring a resilient, prosperous and food-secure future.

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Part I

The Business Case for Resilient Animal Agriculture Supply Chains



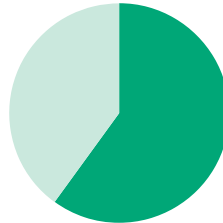
Global retail supply chains are responsible for 60% of GHG emissions, 80% of water use and 66% of tropical deforestation. Take a closer look and you'll find that animal agriculture contributes to all of these impacts. Climate change and population growth could further strain our natural systems and make it ever more challenging to grow abundant food. Conversely, sustainable agricultural supply chains can reduce emissions, improve water quality and support wildlife habitats while delivering safe food to our plates.

Forward-looking companies understand that a thriving business relies on a thriving planet, especially in the highly weather-dependent food and agriculture sector.

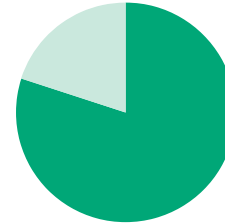
Global retail supply chains are responsible for:



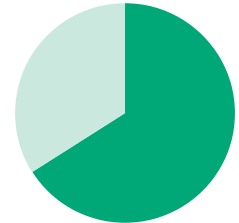
60%
of GHG
emissions



80%
of water
use



66%
of tropical
deforestation



Source: [Sustainability Consortium](#)

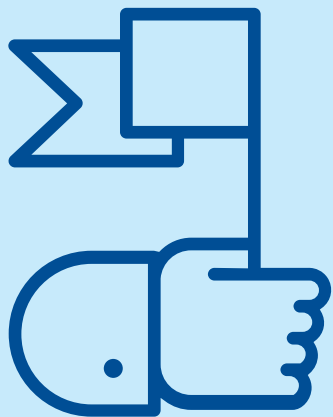
The business benefits of sustainable agriculture include:

- 1** Building a more resilient supply chain to better manage long-term risks and minimize the impacts of disruptions, such as the COVID-19 pandemic. Companies are facing risks in sourcing like never before, as climate change affects weather patterns, crop production and supply chain stability.
- 2** Increasing trust with producers, suppliers and consumers in a way that will help guarantee high-quality, consistent and safe production, and build consumer loyalty.
- 3** Creating a positive reputation for the company among consumers, investors and employees as one that is forward-thinking, innovative and invested in the wellbeing of its customers. Studies show that 71% of consumers think it's important for business to take a stance on social movements, and the environment is their top concern. (Source: [Clutch](#))
- 4** Catalyzing new business opportunities. Smithfield Foods' journey to reduce emissions from its agricultural supply chains helped launch Smithfield Renewables, a business unit dedicated to generating renewable energy on hog farms.
- 5** Capturing a growing market. Studies have shown a higher growth rate in sales in sustainable product categories. For example, in 2018, Unilever's Sustainable Living Brands grew 69% faster than the rest of the business. (Source: [Unilever](#))



What is Sustainability Leadership?

As you identify and address hot spots in your supply chain, new opportunities to reduce the impacts of your supply chain and lead your industry forward will present themselves. Based on years of industry experience, the steps below are intended to provide a blueprint for how to lead on sustainability in the animal agriculture sector.



- 1. Assessing your environmental footprint.**
- 2. Setting SMART, science-based goals for GHG emissions, biodiversity, water quality and water quantity.**
- 3. Aligning business operations and sustainability goals.**
- 4. Engaging your supply chain to encourage, promote and reward sustainability practices.**
- 5. Tracking and communicating progress publicly.**
- 6. Collaborating for scale and impact.**
- 7. Leading your industry forward on sustainability.**

Step 1. Assessing your environmental footprint

Assessing your footprint provides an opportunity to identify the biggest sources of emissions in your supply chain. Knowing and ranking the hot spots in your supply chain helps you understand where you can make the biggest impact, which opportunities are most cost-effective and which stakeholders are most important for you to engage to achieve your goals. If you aren't sure where to begin, the Implementation Guide in Part II can provide a helpful starting point in identifying where impacts are most likely to occur. You can continue to prioritize your impacts as you learn more from your stakeholders.

The first step to consider is mapping your company's supply chain using supplier surveys to understand current management practices. Supplier surveys will help identify which initiatives will deliver the most significant environmental and emissions reductions impact in a specific company's operational supply chain. In less integrated animal supply chains, purchasing records may need to be examined to locate sources and general locations of animals upstream of direct suppliers.



Step 2. Setting SMART, science-based goals

Effective goals should be based on the best available science and follow SMART principles to maximize impacts and ensure relevance over time. Science-based goals are ones that are specific to the individual company's GHG footprint, feasible from an implementation standpoint, and include the systems to credibly measure and report business and environmental impacts.



Additional Resources:

[Science Based Targets Initiative](#)

[World Business Council for Sustainable Development Target Setting Guidance](#)

SMART Goals should be:

- Specific** Define the goal as specifically as possible.
- Measurable** Provide a way to track and evaluate progress.
- Achievable** Craft challenging, but achievable goals.
- Relevant** Ensure that goals are relevant to your supply chain and impact areas.
- Time Bound** Include specific dates and timelines.

Step 3. Aligning business operations and sustainability goals

In order to reap the sustainability and business benefits, sustainability must be integrated into every aspect of your business. Doing so ensures that your supply chain is able to maximize opportunities while minimizing risks, and builds a positive reputation among consumers, investors, producers, suppliers and employees.

Crucial to the success of creating and implementing a sustainability plan will be gaining the buy-in from all stakeholders, from C-Suite executives to workers and customers. Identifying internal champions at multiple levels of the organization, gaining internal buy-in and structuring the organization to allow open communication and feedback, will help ensure your company meets its goals and can continually identify and drive greater improvements throughout its supply chain.

One way to do this is to create a cross-cutting sustainability leadership team made up of representatives from across the organization to build organizational support, provide space for feedback loops and give employees the opportunity to explore sustainability-based actions that drive business performance and long-term sustainability outcomes.



Step 4. Engaging your supply chain

Tackling sustainability in your supply chain will require buy-in from and partnership with your key stakeholders in order to set baselines on practices, collaborate on developing solutions and ensure engagement in making changes. The following steps outline how to build relationships to make implementation possible, and the following slides provide more detail for each of these steps.



Engage stakeholders

- ✔ Identify whom and how to engage.
- ✔ Engage early and often.
- ✔ Communicate the value of participating in sustainability initiatives.
- ✔ Understand how your company can support farmer transitions and reduce the risk they incur when adopting new conservation practices.



Track progress

- ✔ Develop mechanisms for supply chain partners (both direct suppliers and significant sources upstream of suppliers) to regularly provide quantitative and qualitative data while maintaining confidentiality.
- ✔ Publicly report progress toward overall goals.



Encourage continuous improvement

- ✔ Take time to revise and improve the plan annually for long-term continuous improvement.
- ✔ Hold regular check-ins with suppliers to encourage two-way feedback.

Step 4. Engaging your supply chain

✔ Identifying whom and how to engage

Understanding whom you need to engage and how to engage them effectively is key to building the trust you need in partnerships to formulate sound strategy and implement GHG reductions.

1. Mapping your supply chain
 - a. Identify key commodities, or highest impact commodities, in your supply chain and then work with the procurement team to identify the major suppliers for those commodities.
 - b. Engage suppliers to identify the general origin of key commodities. For many animal protein companies it may be impossible to know exact sourcing — go as far back as you can in the supply chain as this information will help guide your decision making as you begin implementation. This might include asking suppliers for information on their suppliers. If you are unable to identify direct farmers or suppliers, identify key points of aggregation (mills, processing plants) to better understand sourcing regions.



Additional Resources:

[Foods3 Food Supply Chain Mapping Tool](#)

[The Sustainability Consortium Commodity Mapping Tool](#)



**Engage
stakeholders**



**Track
progress**



**Encourage
continuous
improvement**

Step 4. Engaging your supply chain

✔ Communicating with supply chain partners

Creating a forum to learn from your implementation partners will educate you about their on-the-ground realities and enable you to craft initiatives with a higher chance of success and impact.

Actions to consider and questions to ask:

1. Identify leaders in your production supply chain: where is peer-to-peer learning happening? Reach out and facilitate collaboration with supply chain leaders to enhance your own knowledge of available resources and peer-to-peer learning.
2. Assess the local conditions in the growing region: what existing federal, state or university programs are working that you can leverage? Based on the region your growers are located in, create an accessible list of resources and practices that can be distributed to individual growers to encourage adoption.
3. Consider your community: how can you engage the community of growers across your supply chain to encourage best management practices to help reach goals? Reach out to growers to identify “pain points” they are facing and support them in those areas first, in order to gain trust before directly addressing best management practices.

4. Agriculture companies should engage independent growers and grain farmers to encourage the adoption of industry best management practices. These practices will vary based on individual farm conditions, but generally include conservation tillage practices, cover cropping, nutrient management, riparian buffer protections, farm equipment upgrades and maintenance, and renewable energy use. Engaging farmers directly, through grower groups such as National Corn Growers Association, or through support of agricultural advisers in the applicable region, is an ideal place to begin showing support and fostering engagement.

Where feasible, you should consider forums with independent farmers and ranchers where information can be shared through workshops and support can be provided to pilot new technologies. Any engagement must be met with open dialogue on what the value proposition is on the farm.



Additional Resources:

[Growing for the Future: Business lessons from ag retail's conservation leaders](#)

[Farm finance and conservation: How stewardship generates value for farmers, lenders, insurers and landowners](#)

Step 4. Engaging your supply chain

✔ Supporting farmer transitions

Given that many of the impacts from animal agriculture stem from on-farm practices, companies need to engage and support farmers to transition to more sustainable management practices over time. By communicating with farmers, you will learn the best ways to support them as they implement new practices and integrate conservation into farm management.

- Support farmer transitions to improved management practices. A few examples of how to do this include cost sharing to test new practices or precision agriculture equipment; identifying ways to work with local institutions on conservation financing options; and helping farmers manage risk by extending contracts to guarantee payment while farmers incorporate more sustainable practices.
- Support peer-to-peer learning and localized farmer networks to share information and aid growers in making the best decisions for their farms.



Case Study: Unilever Soy Farmer Supplier Engagement



Photo: John Rae

In 2015, Unilever began a pilot program working with soy farmers and soy oil suppliers to support the use of cover crops to promote healthy soils. The project brought together the expertise of multiple partners, including Practical Farmers of Iowa, suppliers, and the Conservation Technology Information Center. Through the program, farmers receive advice on cover crops and can qualify for cost share payments supported by the Iowa Department of Agriculture.



Source: [Unilever](#)

Step 4. Engaging your supply chain

✔ Encouraging continuous improvement

Transitions take time. Regularly reviewing data helps you identify opportunities to make adjustments and ensures you stay on track to meet your goals.

- Review the data from your supply chain in regular intervals and take time to revise your implementation plans annually for long-term continuous improvement.
- Hold regular check-ins with suppliers (both direct and upstream) to encourage two-way feedback and identify new opportunities for further partnership to address the environmental impacts of agriculture production.
- Benchmark suppliers against anonymized peers and share feedback from across your supply chain on what is working better to achieve the outcomes against a desired goal.
- Reward suppliers for improving over multiple years.



Step 5. Tracking and communicating progress publicly

New technologies and methodologies are making data collection, analysis and sharing simpler, faster and more effective. This provides key information to farmers and to stakeholders throughout the supply chain. Measuring and reporting will help you better tell the stories of your supply chain partners — like farmers — to consumers to consumers who are asking for more information about how their food is produced. Openly communicating about your progress toward goals, sharing lessons learned and acknowledging challenges, builds greater consumer trust and help bring the entire industry further along.

- Develop mechanisms for supply chain partners to regularly provide quantitative and qualitative data. Ensure data is aggregated and anonymized with strong privacy protections.
- Publicly report progress.
- Provide regular communication and feedback to supply chain partners.



Additional Resources:

[Field to Market](#)

[The Sustainability Consortium](#)

Step 6. Collaborating for scale and impact

Complex food supply chains include many different companies and farmers, and no single company can control everything occurring in that chain. Rather, companies must engage supply chain partners, non-profit organizations, grower groups and others to identify opportunities that benefit all parties and produce environmental benefits.



Case Study: Smithfield Foods' Success Through Collaboration



Smithfield Foods joined forces with the agricultural and scientific experts at EDF to put a fertilizer optimization plan in motion throughout its supply chain. Out of this collaboration, SmithfieldGro was born. Through this program, Smithfield helps farmers growing feed grains apply fertilizer more efficiently, maintain or increase crop yields and improve soil health — all while reducing water pollution and GHG emissions. Smithfield hired agronomists to work directly with local grain growers to assist them in improving their productivity, profitability and sustainability. The company also offers special promotions like technology trials, discounted cover crop seed and a contract winter wheat program. In 2018, Smithfield exceeded its grain sustainability goal by improving practices on over 500,000 acres.

In 2018, Smithfield made a commitment to reduce supply chain GHG emissions 25% by 2025, becoming the first major protein company to commit to reducing absolute emissions across its supply chain.



To learn more about EDF and Smithfield's partnership and lessons learned from over five years of working together, read [How EDF + Smithfield Foods creates environmental and business benefits through supply chain partnerships](#)

Step 7. Leading your industry forward on sustainability

✔ Policy opportunities

Climate change poses an unprecedented threat to companies' operations, supply chains, employees and communities. The economic costs of climate change — from damage to facilities, disrupted operations and supply chains, and lost productivity — are already in the hundreds of millions of dollars and expected to reach trillions. While voluntary actions to reduce emissions are important, only public policy can deliver reductions at the speed and scale needed to limit the worst impacts of climate change. That's why climate policy advocacy is an essential element of corporate sustainability leadership. The following are three essential actions to execute a science-based climate policy agenda:



ADVOCATE for policies consistent with achieving net-zero emissions by 2050.



ALIGN your trade associations' climate policy advocacy with the goal of net-zero emissions by 2050.



ALLOCATE advocacy spending to advance climate policies, not obstruct them.

In the absence of strong federal action in the animal agriculture sector, there is a unique opportunity for states and municipalities to lead by incentivizing conservation agriculture. Many farm and industry groups are speaking publicly on the ways that policy can improve farm profitability and resilience.



Increased profitability

Farmers and ranchers engaging from a perspective of Climate Smart Agriculture want to work on climate to make their farms and ranches more profitable and resilient. Introduce your government affairs team to the issues and opportunities in agriculture.

Increased resilience

The [Sustainable Food Policy Alliance](#) is a new group of food companies wishing to demonstrate that there are positive ways for companies to engage with and support on-the-ground practices that increase the resilience of their supply chains through policy. Track their actions and see if there are ways for your company to get engaged.



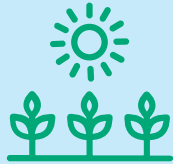
Part II

Implementation Guide

Photo: John Rae

Major impact areas:

1. Crop Production Management



2. Manure Management



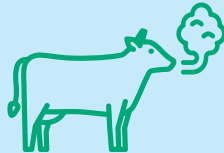
3. Litter Management



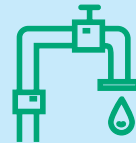
4. Grazing Management



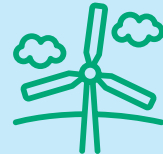
5. Enteric Emissions Management



6. Water Use Management



7. Energy Use Management



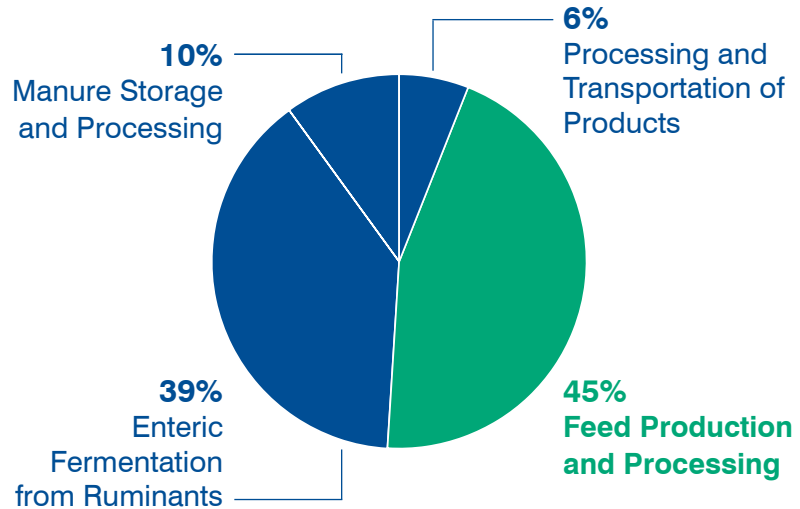


1. Crop Production Management

Row crops, like corn, wheat and soy, feed people and animals, and can be turned into a variety of ingredients found in many of the foods stocking our grocery store shelves. Focusing on the sustainability of feed grains helps reduce overall GHG emissions, improve soil health, reduce water pollution and benefit farmer economics.

Excess nitrogen that doesn't go into crops can leave the field as nitrous oxide — a potent GHG — or as nitrate — an impairment to downstream water quality. Optimizing nutrient use can reduce costs for farmers, thereby increasing their profits, all while helping to reduce GHG emissions and preserving the health of our water sources for future generations.

Global emissions from animal agriculture production



Source: [FAO](#)



1. Crop Production Management

Plan & Implement

Identify Partners

- Encourage key suppliers to work with you on feed grain opportunities.
- Identify local trusted agricultural advisers and programs that can support implementation.

Evaluate Management

- Develop or identify existing data collection methods — including Excel, ag tech software platforms or other tools such as Field to Market, which can be used to establish baseline conditions and support ongoing measurement of improvements.
- Identify opportunities and best practices to improve crop management.
- Set goal(s) for implementation of best practices.

Support Implementation

- Work with local implementation partners to collect data annually.
- Work with local trusted advisers and crop consultants to implement best practices.
- Support farmer transitions through cost sharing, extended contracts or other means.
- Support peer-to-peer learnings and localized farmer networks.

Evaluate and Report Impact

- Review data annually to find opportunities to refine your initiatives to improve crop management and reduce the environmental impacts of growing row crops.

Case Study: Campbell Soup Company and Land O'Lakes Engaging Ag Retailers

In 2018, Campbell Soup Company, Environmental Defense Fund and Land O'Lakes SUSTAIN launched a project with Land O'Lakes agricultural retailer, The Mill. Their goal: leverage agricultural retailers and their direct farmer relationships to drive sustainability on farms in the Chesapeake Bay region.

The project started with conservation trainings for both The Mill and its farmers. Next came the deployment of a new on-farm conservation management tool that would perform an agronomic analysis of baseline results to identify areas for improvement. Over the coming years, The Mill agronomists will be able to quantify the impact that project recommendations have on environmental outcomes. Innovative models like this one, which utilize new technology and leverage the relationships between agricultural retailers and farmers, have the potential to scale sustainability across the food system.



Best Practice Example: N-Balance



If you've decide to quantify the environmental impacts and benefits of agriculture, you can achieve your goals using the N-balance framework. N-balance uses readily available data to quantify how much of the nitrogen fertilizer applied to your farms is captured by crops, and how much is lost to the environment.

This calculation can help farmers learn more about their nitrogen losses, and helps companies know more about environmental progress in their supply chains. Improving N-balance — through practices such as implementing the 4Rs* of fertilizer use, cover crops and crop rotation — reduces water pollution and GHG emissions, while using fertilizer more efficiently for crop yield.

** Right source, right rate, right time, right place*



2. Manure Management

Manure from livestock can be a good source of nutrients that can be reapplied to agricultural lands. However, understanding the nutrient content and being able to apply manure precisely are challenges for many producers. Developing and following manure nutrient management plans along with adequate manure testing are critical to sustainable manure land application.

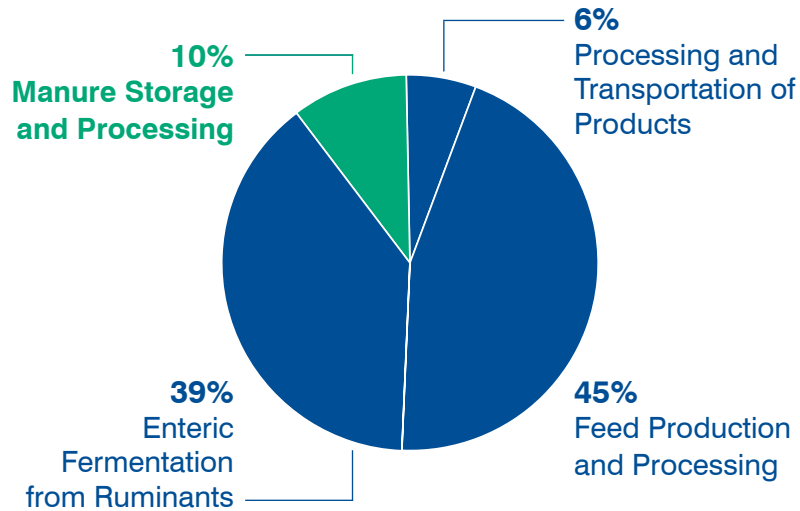
Some producers are turning to managing manure as an energy source and creating biogas using anaerobic digesters. While the technology is burgeoning in the United States and does not apply to all animals or geographies, digesters have the potential to capture methane, a potent greenhouse gas, normally released into the air and can improve water management in manure treatment.

Other less technical manure management techniques, such as solids separation, can also help lead to more sustainable manure management.

Given the large areas involved in grazing, it is more difficult to manage grazing animals' manure impacts than animal feeding operations'. However, new approaches to improving grazing manure management are being investigated, such as the application of nitrification inhibitors in fields, and the use of selected grass species.



Global emissions from manure management



Source: [FAO](#)





2. Manure Management

Plan & Implement

Identify Partners

- Identify key sourcing regions where manure is produced.
- Engage farmers, suppliers and others in the region to determine baseline management practices through surveys or meetings with farmer groups

Evaluate Management

- Work with suppliers to utilize the baseline information on manure management practices to develop improvement plans.
- Set goal(s) for implementation of best practices.
- Develop or identify data collection methods with which to continue to assess management and encourage best practices.

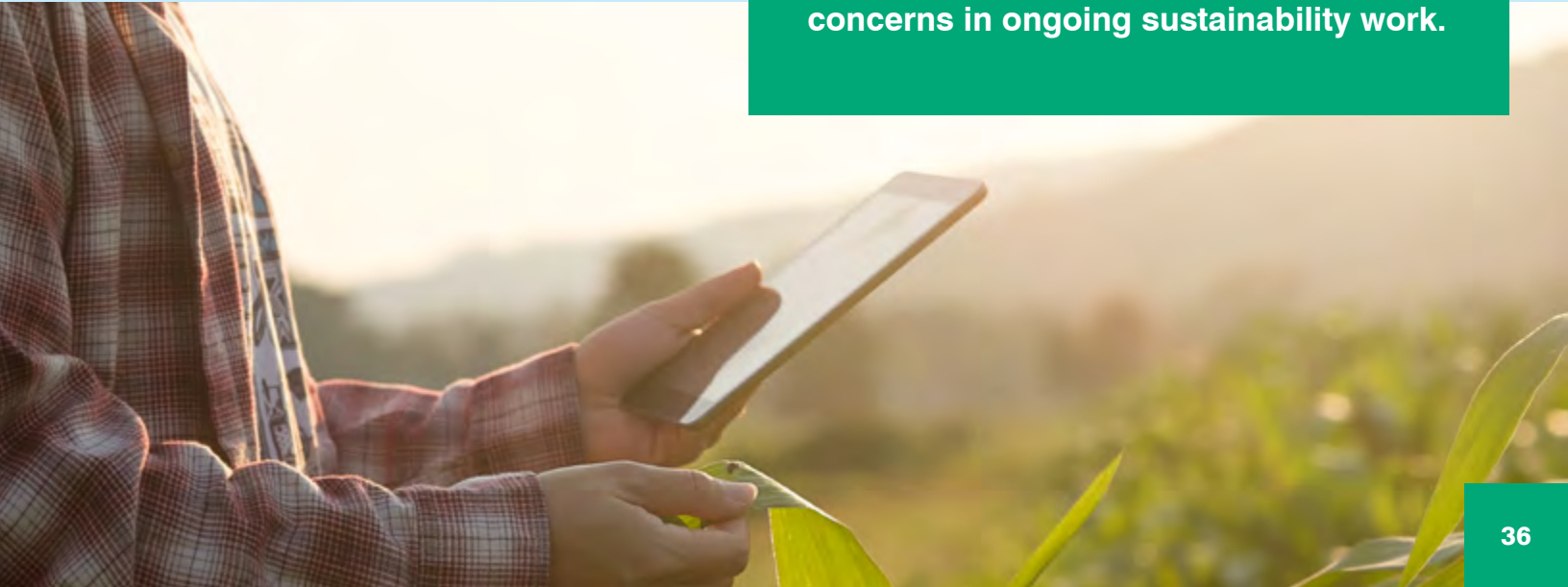
Support Implementation

- Support farmer transitions to improved manure management systems.
- Support research and pilot programs.
- Examples of good practices include:
 - Composting
 - Solids separation
 - Aerobic treatment
 - Covered anaerobic lagoon
 - Anaerobic digester
 - Developing and implementing a manure nutrient management plan

Evaluate and Report Impact

- Review data annually to assess progress.
- Look for opportunities to refine and improve your manure management and reduce environmental impacts.

Engaging local stakeholders: Manure has global impacts as well as local impacts, and both need to be considered in a robust manure management strategy. Companies should engage local community members to understand their concerns about odor, water quality or other local impacts and embed these concerns in ongoing sustainability work.





3. Litter Management

Poultry litter can increase nutrient loading into local waterways and create nitrous oxide losses into the air, driving GHG impacts.

To improve litter management systems, focus on two key areas: storage and application. Improving these areas can prevent excess runoff into waterways and nitrous oxide losses.

Helping farmers transition to improved storage or application practices, such as selling litter to generate a secondary income stream, or using covers and buffers to limit runoff, will help reduce the impact of litter management.

When land applying, test litter for fertilizer nutrients and decrease your inorganic fertilizer use accordingly. Doing so will ensure that crops' nutrient needs are met while avoiding excess nutrient (especially N) application that contributes to GHG and water quality impacts.





3. Litter Management

Plan & Implement

Identify Partners

- Engage poultry farmers and others in the supply chain through surveys or farmer meetings to determine existing litter management practices on farms in the sourcing areas.
- Communicate the value of litter as a fertilizer resource to show the value of managing litter.

Evaluate Management

- Work with suppliers to utilize the baseline information on litter management practices to develop improvement plans to reduce the impact of litter.
- Set goal(s) for implementation of best practices.
- Develop or identify data collection methods with which to continue to assess management and encourage best practices.

Implement Improvements

- Support farmer transitions of litter management systems.
- Provide financing to buy, install and/or maintain litter storage systems.
- Provide farmers with market access and connect them with buyers for their litter.

Evaluate and Report Impact

- Review data annually to assess your progress and find opportunities to refine your initiatives to improve litter management and reduce environmental impacts.



4. Grazing Management

Grazing livestock can lead to negative environmental impacts if not managed properly. Land use conversions, such as forested land being converted to pasture, can result in significant GHG emissions. Alternatively, converting marginal crop land to pasture can improve soils and increase soil carbon. Having an excessive number of livestock that exceeds the capacity of the land to support them can result in degradation of the plant community resulting in soil carbon losses. Additionally, livestock that are not properly managed can cause erosion and manure runoff, leading to water pollution.

These impacts can be reduced or eliminated through good management techniques.

Plan and implement

Identify Partners

- Identify supply chain regional distribution.
- Engage ranchers, farmers, suppliers and other potential partners in those regions.
- Work collaboratively with producers, conservationists, technical assistance providers (e.g., Cooperative Extension, NRCS) and others to identify common practices utilized by suppliers.
- Engage farmers and others in the conversation through surveys, meetings or workshops with partners.



4. Grazing Management

Plan & Implement

Evaluate Conservation Opportunities

- Collaborate with regional partners to discuss barriers to change and opportunities for improved management.
- Develop a plan that identifies strategies for overcoming potential barriers to implementation, and ways to collaborate to use those strategies.

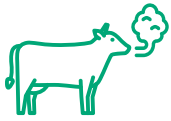
Support Implementation

- Work with suppliers to implement the plan.
- Provide support to ranchers, farmers and all partners for learning, communication and adaptation of the plan as it moves forward.
- Examples of good practices include:
 - Utilizing moderate stocking rates
 - Excluding livestock from riparian areas and other sensitive areas

- Providing periodic rest to pastures and avoiding using the same pastures at the same time every year
- Establishing buffers around water courses and field edges
- Avoiding plowing, especially in highly erodible soils and other sensitive areas
- Protecting grasslands — keeping land from conversion
- Converting marginal cropland to grassland or pasture
- Establishing trees in pastureland and riparian areas, where ecologically appropriate

Evaluate and Report Impact

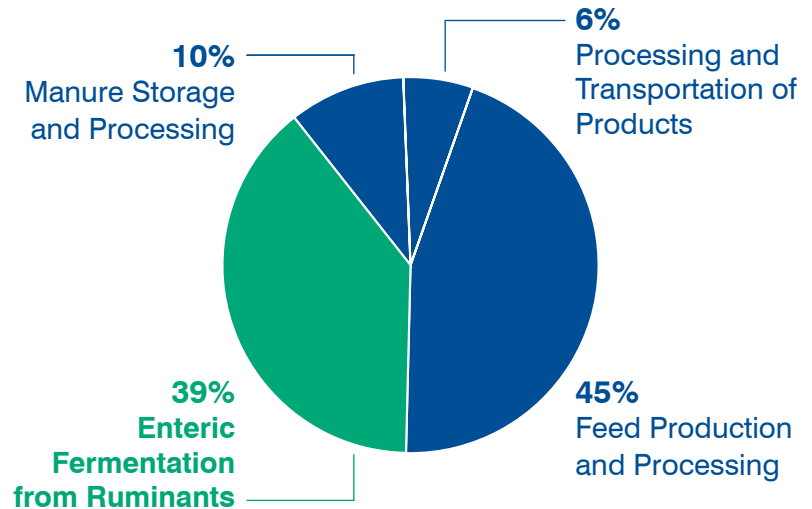
- Review data annually to assess your progress and find opportunities to refine your initiatives to improve grazing management and reduce environmental impact.



5. Enteric Emissions Management

Ruminant animals like cows and sheep produce enteric methane, which contributes over one-third of all global animal agriculture emissions. Currently, researchers are looking at cattle feed additives, from oregano to seaweed to synthesized compounds, and management techniques that will reduce enteric methane emissions. By reducing the nutrients lost in the formation of enteric methane, these techniques may also improve feed conversion efficiency. Look into partnering with universities, industry groups and other companies interested in this challenge, and see if there are ways for your organization to contribute to the research.

Global emissions from enteric emissions management



Source: [FAO](#)



5. Enteric Emissions Management

Plan & Implement

Identify Partners

- Identify sourcing regions for your supply chain.
- Engage farmers, suppliers and others in the supply chain region to identify potential local partners.
- Engage farmers, suppliers, academics and NGO partners in conversations to identify potential engagement opportunities.

Evaluate Management

- Engage suppliers to understand existing management practices.
- Work with suppliers and local experts to identify best practices for specific operations.

Support Implementation

- Work with suppliers to develop an implementation plan and a potential measurement plan.
- Support farmer transitions to improve management practices.
- Partner on research and development to support innovative cattle feed additives that reduce methane emissions.

Evaluate and Report Impact

- Review data annually to assess your progress and find opportunities to refine your initiatives to improve grazing management and reduce environmental impacts.



6. Water Use Management

Addressing water use in animal agriculture not only reduces costs for farmers but also ensures that the communities who produce animals have a secure water supply not just for the community to use but also to enable them to continue production. More efficient water use is often accompanied by increased energy efficiency.

It's critical to have an understanding of all water use within your animal agriculture supply chain for food safety, cleanliness and the animals' hydration and/or temperature control. Work with supply chain partners to conduct an assessment of major water uses and determine if there are best practices to implement to make use more efficient. A variety of technologies and management techniques exist to manage water within animal production operations.





6. Water Use Management

Plan & Implement

Evaluate Management

- Encourage suppliers to audit water use, determine baseline metrics and reduce usage year-on-year.

Identify Inefficiencies

- Implement the use of water meters.
- Check systems to identify leaks.
- Review best practices to see if changing practices could reduce water use without impacting quality.
- Assess upgrading systems to newer, more efficient water systems.

Plan and Implement

- Improvement plans can include the use of advanced irrigation techniques on farms, the design, retrofitting or construction of water-efficient barns, upgrading cooling systems, using an efficient drinker system, managing leaks or monitoring or controlling water systems.

Evaluate Plan

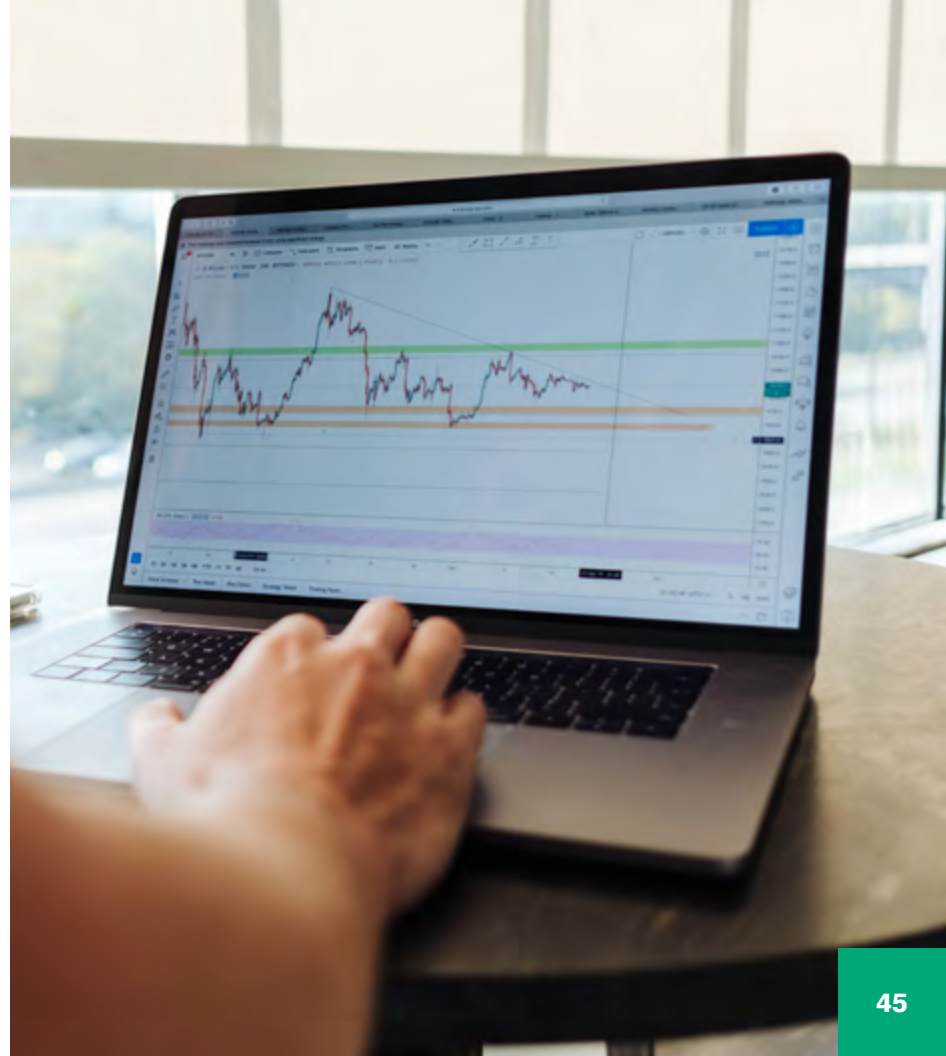
- Review data annually and look for opportunities and new technologies with which to improve water use.



7. Energy Use Management

Animal agriculture consumes significant amounts of energy in production plants, grow houses and barns. This adds to the cost of production, and the emissions of the animal ag supply chain..

There are substantial energy savings to be gained throughout the supply chain by assessing current energy performance. Managers at each level of the supply chain should continually strive to make themselves aware of inefficiencies in their own operations and of the resources and funding opportunities available for capturing and mitigating energy inefficiencies. Completing an energy audit can provide insight as to where they can improve their energy efficiency.





7. Energy Use Management

Plan & Implement

Evaluate Management

- Encourage suppliers to audit energy use, determine baseline metrics and reduce usage year-on-year.
- Use the ENERGY STAR protocol as a guide for best management practices and behaviors relevant to various areas of plant operation that industrial businesses can adopt to enhance their energy efficiency.

Identify Inefficiencies

- Based on the energy use audit, work with operations managers to identify inefficiencies, which may include excess energy use from unnecessary equipment, lighting or cooling, inefficient equipment that needs to be upgraded or poor insulation.

Plan and Implement

- Connect growers with resources such as those offered by the USDA to help farmers improve their energy footprint and cut input costs while maintaining production.
- Support farms to implement renewable energy such as solar panels. With potential tax credits, the USDA Rural Energy for America Program and other incentives can cover a significant portion of the costs of implementation.

Evaluate Plan

- Review energy data at regular intervals and take time to revise the annual plan for long-term continuous improvement.
- Explore new technologies to help reduce energy use.

Case Study: Solar Implementation and Cost Savings



In 2009, poultry grower Spencer Pope installed nearly 50 solar panels on the roof of one of his poultry houses. Utilizing a Rural Energy for America grant, he saved nearly \$250/month on his electricity bill on average. Due to this success, Pope plans to install nearly 200 more solar panels on his farm, enough to fully power his six poultry houses.

Not all farm operations have the appropriate infrastructure to support solar panels. Before recommending solar technology to suppliers, help them investigate their operation's compatibility with solar.

To read more about this and other opportunities in poultry production, see EDF and K•Coe Isom's joint report [Poultry Sustainability Guide](#).

Biodiversity Guide

Biodiversity refers to the variety of plants, animals and microorganisms living both above and below the soil within an ecosystem. Protecting biodiversity should be a top consideration in developing every sustainability plan, and it is particularly relevant in regard to crop production, manure management and grazing planning.

Farmers play a key role in protecting and restoring biodiversity through conservation practices. Working with NGO partners and local stakeholders to understand local issues and recommended conservation practices can help farmers meet dual objectives of producing food and protecting habitat.

A few examples of conservation practices include planting buffer strips around fields, planting cover crops, native grasses, milkweed and wildflowers at the edges of

fields and in other areas that don't require taking land out of production, enrolling land in habitat exchanges, and removing environmentally sensitive land from production.

[The Bee & Butterfly Habitat Fund](#) provides more information on biodiversity and pollinator habitats. The Fund identifies opportunities to establish critical pollinator habitat to help honey bee and monarch butterfly populations thrive.



Food Packaging Guide

According to the FDA, food and packaging (some of which — but not all — is used to contain food) make up about 45% of all materials in U.S. landfills. Below are a few guidelines to help reduce the amount of packaging waste and ensure that packaging keeps food safe for consumption.

- **Optimize package size and recyclability of packaging.** Modify packaging sizes and designs to optimize consumer consumption and avoid residual container waste.
- **Look for innovative packaging solutions to reduce spoilage and waste.** New and emerging packaging technologies have been proven to actively slow fruit and meat spoilage through ethylene absorption and other techniques.
- **Eliminate Chemicals of Concern in food packaging.** Harmful chemicals can enter our food by migration from environmental contamination and from food contact materials, which include final food packaging, supply chain packaging materials and food handling equipment. See [EDF's guidance](#) on testing for priority chemicals in food and food packaging.



Food Waste Reduction Guide

Every year, 40% of food in the U.S. goes uneaten. Food loss doesn't just have environmental costs; it's bad for business. It is estimated that American consumers, businesses and farms spend \$218 billion a year, or 1.3% of GDP, growing, processing, transporting and disposing of food that is never eaten.

Food waste along the supply chain is a complex issue with different solutions at each node of the chain. To get started, you must understand where waste is occurring in your supply chain through auditing and reporting. Once you have identified areas for opportunity, work with supply chain partners to identify and implement improvements. For tailored solutions for in-field losses, processing and distribution, retail, product design and packaging, and consumer waste, see [EDF's Food waste 101: get informed.](#)



Food Waste Reduction Resources:

[NRDC's 2017 Wasted report on food waste](#)
[Champion 12.3 Business Case for Reducing Food Loss and Waste](#)

[ReFed](#)



Supply Chain Solutions Center

The Supply Chain Solutions Center (SCSC) is the one-stop shop for sustainability professionals.

It cuts through the confusing complexity typical of supply chains to connect sustainability teams with solutions that are relevant to their company's needs. The SCSC offers a vast library of resources, including how-to guides, webinars and industry reports.

New resources are continuously being added from our ever-growing community of expert organizations. Expert organizations like Environmental Defense Fund, The Sustainability Consortium (TSC), CDP and Conservation International continue to add their latest supply chain research, and the leading companies of our day continue to share their lessons learned.

Learn more here: supplychain.edf.org



Industry Resources



[U.S. Roundtable for Sustainable Beef](#)

[Innovation Center for U.S. Dairy](#)

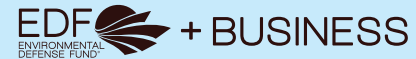
[U.S. Roundtable for Sustainable Poultry & Eggs](#)

[Field to Market](#)

[NRCS](#)

[Midwest Row Crop Collaborative](#)





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