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Center for
Sustainable Business

Reducing the Use of Harmful Chemicals: Proposed Benefits & Monetization Methods

April 2023

ROSI™ Framework

Return on Sustainability Investment (ROSI™) Framework

By embedding ESG risk and opportunities within core business strategy, the return on sustainable investment can be quantified, delivering the possibility of both financial value and positive societal impact.

Overview of Food & Agriculture Framework

NYU Stern CSB is developing a ROSI™ framework for food & agriculture with publicly available monetization tools to help the industry understand where and how sustainability can unlock financial value.

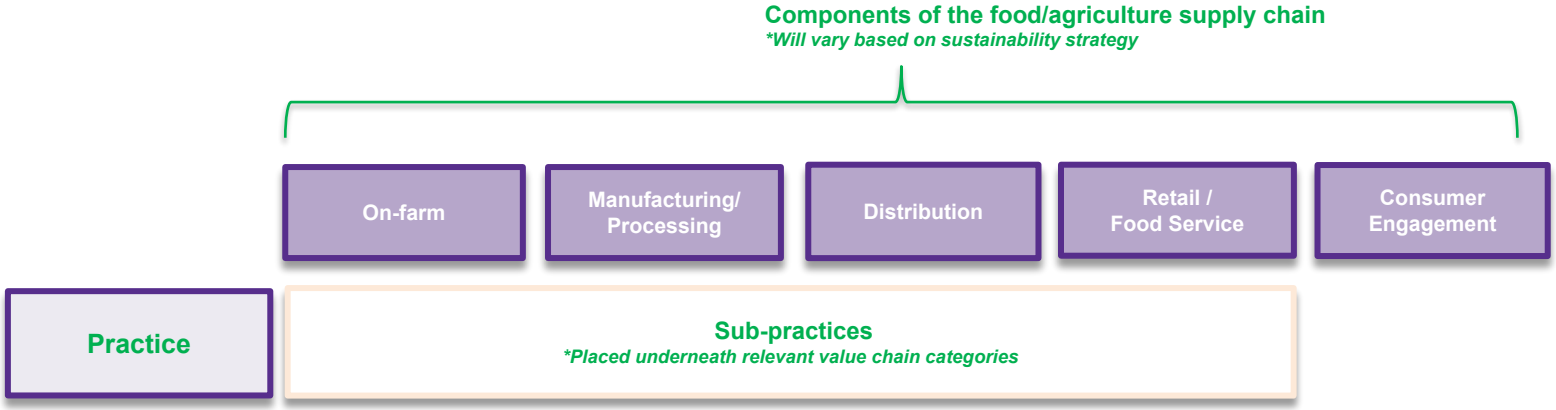
Based on research, experience, and engagement with industry leaders, we have identified the following sustainability strategies* used by the industry to include in the framework:

Water security	Soil health	Climate change	Chemical management
Biodiversity and ecosystem conservation	Animal stewardship	Food waste management	Sustainable sourcing
Food safety and nutrition	Sustainable packaging	Employee and supplier well-being	Brand marketing and communications

Identified Sustainability Practices and Sub-Practices

Framework Layout

- Through our research, we identified key sustainability practices and sub-practices food and agriculture supply chains are implementing to achieve their sustainability strategies
- Each strategy includes sub-practices which are mapped under the relevant components of the food/agriculture supply chain, (if not relevant to a part of the supply chain, it is excluded)
- There are some benefits that are referenced across multiple strategies
- Compliance / enforcement practices are not explicitly listed in this framework but should be considered when implementing the twelve strategies
- Please see diagram below of the framework layout, which is illustrated for each strategy in the subsequent slides



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Reducing the Use of Harmful Chemicals

Reducing the Use of Harmful Chemicals

	On-farm	Manufacturing/ Processing	Distribution	Retail/Food Service	Consumer engagement
Reduce use of chemicals	Identify and monitor use of harmful chemicals across value chain, esp. through regular soil, contaminant, and nutrient testing				
	Employ integrated pest mgmt, including cultural and biological controls	Replace chemical-based fertilizers with bio-based			
	Ensure minimal required dose of fertilizer through testing soil and careful application techniques**				
Eliminate or replace highly toxic chemicals	Transition to organic/bio farming and seek certification				Encourage consumer awareness of certifications
	Seek certification with standards other than organic that require limited chemical usage				
		Eliminate all phthalates and fluorinated chemicals in food packaging			
Ensure safe use of chemicals	Train workers across supply chain on safe and efficient transport of chemicals to reduce waste, spillage, and human exposure				
	Train workers across supply chain on safe use of chemicals including providing PPE and accurate use of signage when chemicals have been applied				

***these practices are also included the soil health strategy, which collects soil health practices across strategies and maps them in a single visualization*

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Monetization Approach

Investing in Responsible Use of Chemicals

Overview of Sustainability Strategy and Impact Categories

In the following slides, we will be focusing on benefits from the *Chemicals* strategy, which are categorized based on the impact categories highlighted below

Sustainability Strategy Definition	
Investing in Chemicals	**The supply chain reduces the use of chemicals which degrade land harm animal, ecosystem and human health in farming, manufacturing processes and retail/food service**

Impact Categories	Benefits that…
Operational Efficiency (OE)	**Optimize corporate and supply chain efficiencies to lower cost and increase profits**
Sales and Marketing (SM)	**Increase volume of sales through brand and marketing policies**
Customer Loyalty (CL)	**Attract an increasing community of conscious buyers & consumers, while reducing retention costs**
Risk Management (RM)	**Encourage risk mitigation and resilience within the value chain**

Investing in Responsible Use of Chemicals

Overview of Sustainability Strategy and Impact Categories (continued)

In the following slides, we will be focusing on benefits from the *Chemicals* sustainability strategy, which are categorized based on the impact categories highlighted below

Impact Categories	Benefits that…
Stakeholder Engagement (SE)	Improve goodwill among the broader stakeholder community (i.e. NGOs)
Talent Management (TM)	Attract and retain high-quality talent
Supplier Relations (SR)	Improve upon the relationships between the company and its suppliers
Media Coverage (MC)	Increase a company's media presence with the development of traditional and social media content
Innovation (IN)	Create new revenue streams using sustainable business models

Investing in Reduction of Use of Chemicals, ON FARM

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Reduce Use of Chemicals	Identify, monitor and reduce use of harmful chemicals across value chain especially through regular soil, contaminant, and nutrient testing	WS-15	Reduced risk for future water quality regulations	SM	Estimate probability of regulations related to water quality occurring (taxes, loss of or limitations on water permits) and estimate associated costs to calculate benefits of avoided costs
		BD-6	Cost savings due to reduced chemical use	OE	Calculate chemical input use prior to and after using IPM. Calculate savings by the multiplying the volume saved by the price of chemical-based pesticides. Subtract IMP-related costs (additional farm labor, technological costs, etc.) to calculate final cost savings

Investing in Reduction of Use of Chemicals, ON FARM

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Reduce Use of Chemicals	Identify, monitor and reduce use of harmful chemicals across value chain especially through regular soil, contaminant, and nutrient testing	BD-7	Reduced risk of liability related to chemical run-off	RM	Estimate probability of restrictions on water use occurring and the estimated the impact on yields. Multiply potential yield reduction by average price to calculate benefits of avoided costs
		BD-8	Reduced airborne pesticide pollution effect on pollinator population and preserve yield	RM	Calculate current estimated airborne pesticide and associated yield. Compare to use of alternative bio-control product and associated yield holding all other factors constant.
	Employ Nutrient Management (NM) practices to ensure minimal required dose of fertilizer through testing soil and careful application techniques	SH-5	Supporting sustainable agriculture strategies within the supply chain leads to cost effective reductions in nitrogen and phosphorus runoff to achieve Scope 3 water quality goals	RM	Use a research based estimate for amount of N&P reduction per acre related to a specific soil health practice adoption and apply to impacted acres. Multiply the total amount of N&P reduced by estimates of market value to parties seeking water quality offsets to quantify the benefit
		SH-8	Implementing sustainable soil health practices increases soil biota and improves soil fertility reducing fertilizer use and/or cost	OE	Calculate fertilizer cost before and after implementing practices to improve soil biota and divide by the # of acres farmed during each period to get cost per acre. Multiply difference in cost per acre by total acres to calculate the benefits

Investing in Elimination of Highly Toxic Chemicals, ON FARM

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Eliminate or replace highly toxic chemicals	Transition to organic	CH-1	Cost savings linked to reduced chemical use	OE	Estimate the total volume of chemical used prior to implementing organic agriculture on the farm. Multiply by market price for each chemical product to get the total benefit. Obtain the net benefit by subtracting all the costs of transitioning to organic agriculture.
		SS-4	Improved revenue by selling product at a premium	SM	Calculate the sales differential by comparing the volume of product sold with the certification at a premium compared to volume of product if it had been sold on the conventional market. Apply the margin % to the sales differential (accounting for costs) to estimate the net benefit. Note that there may be a lower volume produced after implementing the practices.
	Seek certification with standards that require limited chemical usage	SS-4	Improved revenue by selling product at a premium	SM	Calculate the sales differential by comparing the volume of product sold with the certification at a premium compared to volume of product if it had been sold on the conventional market. Apply the margin % to the sales differential (accounting for costs) to estimate the net benefit. Note that there may be a lower volume produced after implementing the practices.

Investing in Safe Use of Chemicals, ON FARM

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Ensure safe use of chemicals	Train workers across the supply chain on safe and efficient transport and application of chemicals to reduce waste, spillage, and human exposure (e.g., use of PPE)	WB-1	Increased retention leading to lower hiring costs	TM	Design and conduct an employee survey on the impact of the organization's sustainability initiatives on employee retention. Track improvements in scores over time to estimate # of additional employees retained due to sustainability. Multiply the # of additional employees retained with hiring costs per employee to estimate cost savings. An alternate measure is to track employee turnover rate before and after implementation of initiatives and calculate the # of additional employees retained due to sustainability and then follow the rest of the steps through.
		WB-2	Increased retention leading to lower vacancy costs	TM	Design and conduct an employee survey on the impact of the organization's sustainability initiatives on employee retention. Track improvements in scores over time to estimate # of additional employees retained due to sustainability. Multiply # of retained employees with vacancy costs (e.g., margin loss due to vacant employee position) per employee to estimate cost savings. An alternate measure is to track employee turnover rate before and after implementation of initiatives and calculate the # of additional employees retained due to sustainability and then follow the rest of the steps through.
		WB-3	Improved ability to attract talent leading to improved productivity	OE	Compare the farm's productivity measure against standard productivity measures and estimate the difference. Calculate the monetary increase by multiplying number of employees by average annual margin per employee and then multiplying by the positive difference between the company's measure and the standard.

Investing in Safe Use and Proper Does of Chemicals, ON FARM

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Ensure safe use and of chemicals	Train workers across the supply chain on safe and efficient transport and application of chemicals to reduce waste, spillage, and human exposure (e.g., use of PPE)	WS-7	Less use of chemicals/pesticides reduces cost of inputs and mitigates risk of potential liabilities	OE	Calculate fertilizer and pesticide cost savings by comparing current costs per acre with costs per acre before implementing storm management system and multiply by the number of acres to calculate the benefit
		WS-8	Access to water credits from companies, municipalities or state governments for showing improvements in water quality	IN	Note - this is for cases where the municipality had developed a program to support payments for water quality. The payment is tied to improvements in water quality and can be calculated based on the value assigned to improvement by the municipality

Investing in Reduction of Use of Chemicals, COMPANIES

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Reduce use of chemicals	Identify and monitor use of harmful chemicals across value chain especially through regular soil, contaminant, and nutrient testing	WS-15	Reduced risk for future water quality regulations	SM	Estimate the probability of regulations related to water quality occurring (taxes, loss of or limitations on water permits) and estimate associated costs to calculate benefits of avoided costs
		WS-16	Reduced operating costs for using less chemical inputs	OE	Calculate the differential of chemical input and waste management costs before and after process changes (minus CapEx for equipment and/or associated costs for BAU) to achieve cost savings

Investing in Elimination of Highly Toxic Chemicals, COMPANIES

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Eliminate or replace highly toxic chemicals	Eliminate all fluorinated chemicals in food packaging	CH-7	Reduced risk for future fluorinated chemicals regulation in packaging	RM	Estimate the probability of regulations limiting the use of polyfluoroalkyl and perfluoroalkyl substances (PFAS) occurring (taxes, prohibition of packaging containing PFAS) and estimate associated costs to calculate benefits of avoided costs
		SS-8	Avoid revenue loss due to reputational risks	RM	Estimate the likely decline in sales to top-sustainability customers and include how this might shift to other segments. Estimate either the change in mix or loss in revenue and multiply by profit margin (differentials or absolute) to estimate the potential loss in earnings. Multiply this result by a probability factor to calculate likely profit loss on sales changes and deduct any additional costs (PR costs, legal costs, etc) to measure avoided costs.
	Seek certification with standards that require limited chemical usage/organic/bio	SS-10	Increased sales to high sustainability driven customers and or retail channels	SM	Forecast sales volumes of customers focused on sustainability or all customer segments using category growth and market share assumptions. Estimate the incremental growth in customer volumes (increased market share or retail penetration) due to sustainability initiatives. Apply company estimate of profit margin earned to quantify the benefit of increased sales and deduct any incremental costs to quantify the net benefit.
		SS-11	Adding product certifications can increase higher-margin products or products sold at premium (improved sales mix)	SM	Gather historical sales data (volume, average sale price and margins) for both sustainable and conventionals products. Estimate the sales impact due to adding certifications (overall increase, or change in mix if operating at capacity) and calculate the profit margins. Compare profit results to historical levels (or forecast that excludes adding certifications) to calculate the earnings benefits

Investing in Safe Use and Proper Dose of Chemicals, COMPANIES

Overview of Benefits and Monetization Methods

Practice	Sub-Practice	Metric #	Proposed Benefits	Impact Category	Suggested Monetization Methods
Ensure safe use of chemicals	Train workers across the supply chain on safe and efficient transport of chemicals to reduce waste, spillage, and human exposure	CH-4	Improved productivity of workers due to better health	OE	Measure the lower incidence of chemical-related disease contaminating workers and leading to sick days and or early retirement. Measure the reduction in sick days following the transition to organic agriculture and how it affects farm productivity and lowers administration costs. Measure the reduction in worker turnover due to "chemical-induced early retirement" following the transition to organic agriculture and calculate administration cost savings of finding new workers to replace them
		WS-7	Less use of chemicals/pesticides and improved waste management reduce cost of inputs and mitigate risk of potential liabilities	OE	Calculate fertilizer and pesticide cost savings by comparing current costs per acre with costs per acre before implementing storm management system and multiply by the number of acres to calculate the benefit


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