



Corporate Toolkit

FUTURE PROOFING SHRIMP SUPPLY CHAINS



TRACEABILITY IN FARMED SHRIMP

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Today's shrimp supply chains are long, complex, and often opaque. Without visibility, it is impossible to handle food safety concerns, prove legality, and verify sustainability—all issues that consumers, investors, regulators, and media are increasingly demanding. Traceability is essential for demonstrating that a product is ethically and sustainably sourced.

Despite the growing number of regulations being put in place, opportunities for fraud, labor rights violations, and environmental degradation remain extensive in the food sector — especially in the seafood industry. It is incredibly challenging to document activities that occur far from the shore with little to no monitoring mechanisms, such as illegal transshipment of both food and feed products, human rights violations on fishing vessels, or even destruction of natural ecosystems. If traders are unable to track the origin of products, it puts company reputations all along the supply chain at risk, raises significant shareholder concerns, and impacts brand value and corporate social responsibility initiatives.

Traceability has become recognized as an integral process to address issues of food safety and food quality by governments and businesses and to verify claims of sustainable and responsible production. When retailers know which farms, processors, and feed

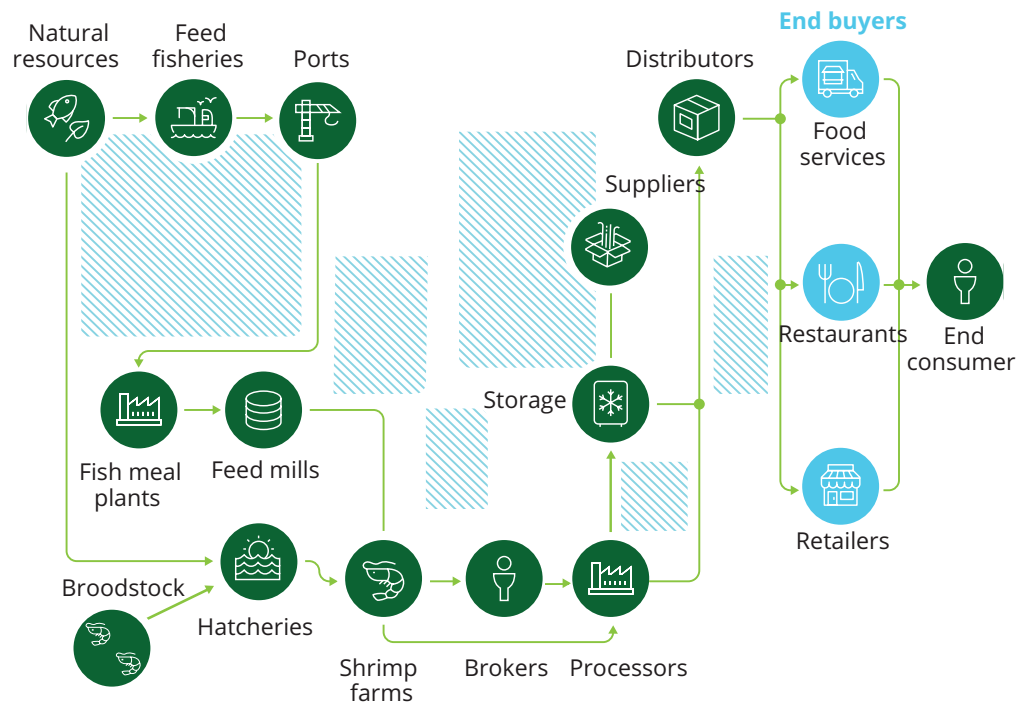
Traceability is a form of information sharing that links supply chains and provides the necessary visibility into the social and environmental elements embedded in any product. Businesses are increasing their investment in this space. According to Statistics MRC, the food traceability market is forecasted to reach \$19.7 billion globally by 2022.

producers played a role in producing their goods, they can hold them accountable, drive improvement, and help move the industry towards more environmentally and socially responsible practices.

Available Tools

A range of digital tools are emerging for businesses to improve traceability and accountability across their supply chain — from customizable conventional technologies to blockchain based systems linked to IoT devices and satellites. However, the fact remains that regardless of the technology being used, supply chain oversight is more effective when employed collaboratively with stakeholders that share the same objectives.

Farmed shrimp supply chains are complex networks that involve thousands of farms, processors, traders, export/import companies, and buyers across the globe.



transparenC

Working alongside stakeholders from the farmed shrimp industry, WWF developed an open-source, free, cloud-based smartphone app and desktop web portal called transparenC. The transparenC application can be used by farmers, buyers, and everyone in between. The affordable option avoids expensive licensing fees that have hindered past technological efforts.

Conceived in collaboration by WWF and Republic Systems, the app was developed using farmed shrimp as a test case, but the tool can easily be applied to other commodity supply chains. This user-friendly system prioritizes connecting upstream supply chain actors, which is a critical step towards understanding where our food comes from.

A Need and Opportunity for Business



Regulations: US companies are already required to comply with NOAA Fisheries' Seafood Import Monitoring Program (SIMP), and the Food and Drug Administration (FDA) has proposed new rules to expand traceability requirements for many types of food products, including farmed and wild-caught seafood.



Demand: Consumers are increasingly asking where their food is coming from and demanding companies provide that information. Similarly, investors are increasingly making decisions that incorporate Environmental, Social, and Governance (ESG) factors.



Risks: Through increased traceability, businesses can better understand their operations and the potential risks and opportunities within their supply chain and prove that a product is safe and ethically and sustainably sourced, helping to avoid operational and reputational risks.



Data: Better data is better for business. Traceability data can help reduce recall costs, streamline production planning, and help companies make data-driven management decisions.

Take Action Now

- ✓ Make a commitment to source farmed shrimp that is traceable to the source farm.
- ✓ Join precompetitive platforms like the Seafood Task Force to leverage industry momentum and tools for stronger oversight and faster transition towards more sustainable and responsible seafood.
- ✓ Source shrimp from farms that are certified by leading standards such as the Aquaculture Stewardship Council (ASC) that provide assurance that a product was produced in accordance with leading environmental and social practices.
- ✓ Use accessible technologies to demonstrate a product is fully traceable to its source and require suppliers to do the same.
- ✓ Be transparent about your farmed shrimp sourcing and report your progress.

Elemental Profiling

In addition to digital tools, there are also scientific techniques that exist to verify the origin of seafood products. For example, elemental profiling is a type of forensic analysis that can help authenticate the origin of farmed shrimp products using the unique fingerprint of metal ions left by the soil and water that the shrimp were grown in.

WWF has been working with researchers from Auburn University to undergo an elemental profiling assessment to determine the geographic origin of farmed shrimp from Thailand, India, Ecuador, Indonesia, and Vietnam.

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CONVERSION-FREE FARMED SHRIMP SUPPLY CHAINS

© Jürgen Freund / WWF

As the footprint for farmed shrimp production has rapidly expanded, it has often done so at the cost of mangrove forests in some major producing countries. Half of all mangroves worldwide have been lost since the 1940s, with farmed shrimp production accounting for 30% to 50% of the losses. While clearing mangroves for farming is illegal in many producing countries, including Thailand, India, and Ecuador, the practice still occurs in some critical geographies and continues to be a pressing issue.

Preserving these ecosystems and their functions is critical to mitigating the effects of climate change, protecting wildlife, and ensuring community livelihoods. Mangrove forests are a vital coastal ecosystem that stabilizes shorelines in the intertidal zones of sub-tropical countries.

Beyond the thousands of rare, iconic, and threatened species that inhabit them, mangroves also provide many valuable ecological functions, including filtering water, protecting shores from erosion, and serving as a natural barrier against storms. They also store three to four times more carbon than tropical forests and may be one of our best defenses against climate change. It is critical that the future expansion of farmed shrimp does not drive the loss of additional intact mangrove ecosystems.

Mangroves are vital ecosystems that offer valuable environmental, economic, and social services to the communities that live around them and to the world.



Provide essential resources and income for over **100 million people**



Ecosystem services worth thousands of dollars per ha/year



Home to over 3000 fish species, marine mammals, turtles, birds, tigers



Global fish catches depend on them as nurseries



Protect coastlines against erosion and storms



Store three to four times more carbon than tropical forests

Overall conversion rates of mangrove to shrimp ponds have decreased since 1999. However, while most shrimp farming now occurs outside of mangrove ecosystems, there are places where mangroves are still rapidly being converted to ponds. In Indonesia about 22% of current shrimp pond area has been converted since 1999; in certain jurisdictions such as Kalimantan Timur and Kalimantan Utara, that number is over 50% of 2018 pond area.

A Need and Opportunity for Business



Given the current trends in executive commitments, consumer demands, shifting government regulations, and unpredictable impacts of climate change, it is strategically advantageous for companies to think about staying ahead of the conversion-free curve now.



Businesses are increasingly making decisions based not only to the expected desires of consumers, but also to enhanced business longevity based on the sustainability of sourced materials and the products they sell.



Ensuring a conversion-free supply chain would not only reduce reputational risk and differentiate products in the market, it might also increase value creation and resilience during times of uncertainty.



Among animal proteins, shrimp farming provides a compelling example because it is the most valuable traded seafood commodity in the world by volume and can be produced without converting significant amounts of land through controlled intensification.

Take Action Now

- ✓ Make a commitment to source responsibly farmed shrimp that is free from deforestation and conversion of natural ecosystems.
- ✓ Join precompetitive platforms like the Seafood Task Force to leverage industry momentum and tools for stronger oversight and faster transition towards more sustainable and responsible seafood.
- ✓ Source shrimp from farms that are certified by leading standards such as the Aquaculture Stewardship Council (ASC) that provides assurance that a product was produced in accordance with leading environmental regulations.
- ✓ Use available geospatial maps and traceability technologies to demonstrate a product is free from conversion.

Available Tools

The first step to taking conversion out of a supply chain is identifying where it may be happening. Geospatial mapping technology, combined with robust traceability systems, is an important tool that allows companies to better understand their supply chain conditions from a social and environmental perspective.

Clark Labs Maps

Clark Labs Coastal Habitat Mapping tool identifies the ecosystem impacts of farmed shrimp operations by systematically cataloging mangrove and wetland land-use cover and change over time in production countries. When combined with supply chain traceability data that identifies source farm geographic coordinates, this can help companies confirm whether their farmed shrimp product may have contributed to wetland or mangrove habitat loss since 1999.



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USING NATURAL RESOURCES EFFICIENTLY

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Food production is the largest driver of habitat conversion and biodiversity loss, accounting for significant amounts of the world's habitable land use, pollution of freshwater and marine environments, and exploitation of global fish stocks. We currently consume more resources than what the planet can sustain, and our remaining natural ecosystems must be preserved if our natural systems are to continue to function and if we are to support an ever-growing population. To protect nature, we must cultivate and grow food efficiently and with minimal waste. We must produce more food using less resources.

Shrimp farming, one of the most valuable segments of the global seafood industry, is resource-intensive—using large amounts of land, energy, water, and wild fish as a feed ingredient. There are approximately 2.4 million hectares of shrimp ponds in the world, with 96% of shrimp coming from 1.4 million ha of the total pond area, meaning approximately 4% of shrimp is being produced with 40% of that pond area. Resources can and must be used more efficiently.

Shrimp aquaculture is ripe for transformation. What is required today is a step-change that demonstrates and quantifies an improvement pathway for shrimp farming. This means production that conserves natural resources, protects the planet's natural climate mitigation systems—particularly mangrove forests—and

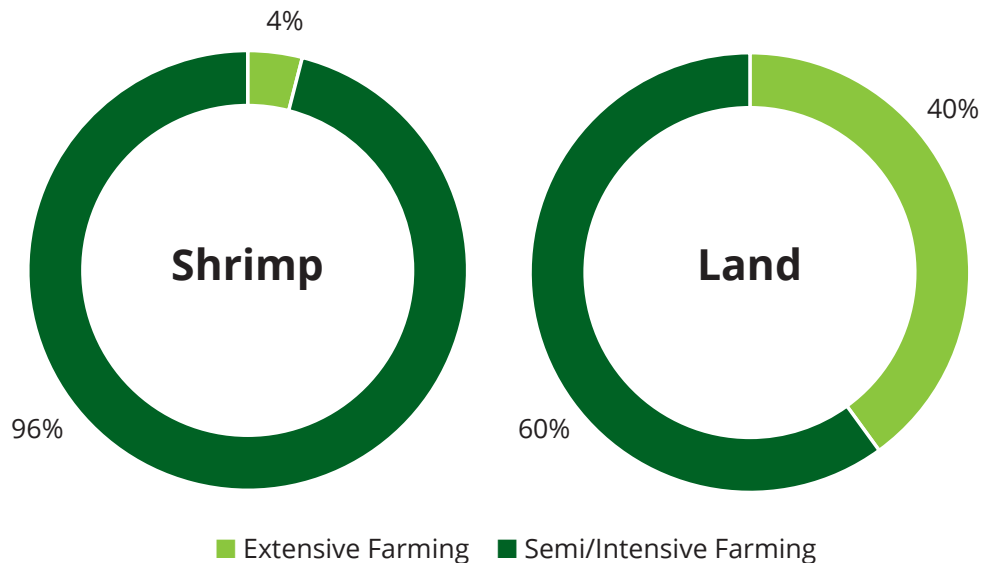
Shrimp farming is very resource-intensive—using large amounts of land, energy, water, and wild fish as a feed ingredient. To ensure the sustainability of this industry, we must produce more shrimp with less resources. Our goal is to decrease farm and feed use of natural resources by 30% by 2025.

secures the labor and human rights of those involved in production and ensures a livelihood for producers, workers, and local communities. This is the only way to continue to expand the volume of shrimp to meet the growing future consumer demand.

Intensive systems were designed to increase profitability and made possible by technological advances in formulated feed and aeration systems. However, intensive production alone is not a panacea. Numerous disease outbreaks have occurred due to the stress that increased stocking density imparts on a shrimp's immune system. The response has been to push for more systematic control, eliminating or reducing the interaction aquaculture systems have with surrounding natural ecosystems.

Across the board, as farms become more intensive, the operating cost and environmental burden per unit produced decreases. Optimizing an aquaculture production system for resource use also results in optimization of business value.

In extensive farming, approximately 4% of farmed shrimp is being produced with 40% of that pond area.



One solution to increase efficiency of shrimp aquaculture is controlled intensification, systems that enhance technology and operations to optimize land, water, and energy use, while increasing shrimp output, survivability, and profitability.

A Need and Opportunity for Business



Economic analyses conducted by WWF have shown several key indicators for how controlled intensification can be better for the triple bottom line. For example, controlled intensification can reduce the costs of land use per unit of production by more than 90%.



The most intensive farms can be the more efficient they are in energy use as well, with energy costs that could be 74% to 89% lower than extensive operations, according to the same study.



On farms in Thailand and Vietnam, the contribution of annual fixed costs to total costs decreased from 35-50% to 4-20% as production intensity increased.



More than half of the operating costs at shrimp farms are associated with feed. Decreasing the amount of feed used per unit of farmed product by just 10% can spare 106,000 ha of land, 141 million cubic meters (m³) of water, 468,000 tons of wild fish and 3.6 million gigajoules (GJ) of energy, in addition to significant cost savings. A 10% decrease in feed conversion rate across Thailand and Vietnam would equate to savings from \$85 to \$110 million for farmers.

Take Action Now

- ✓ Make a commitment to source responsibly farmed shrimp that is produced with minimal impact on natural resources (land, energy, water, wild fish).
- ✓ Source certified seafood with robust environmental standards like the Aquaculture Stewardship Council (ASC), which includes science-based metrics for resource use for farmed shrimp and other species.
- ✓ Engage with government and policy influencers in a precompetitive setting like the Seafood Task Force to support solutions that ensure responsible farmed shrimp production, strengthen seafood traceability, and uphold human and labor rights in seafood supply chains.
- ✓ Discuss natural resource efficiency in farmed shrimp with your suppliers and encourage them to source from farms that are transitioning to controlled intensification.
- ✓ Use traceability technologies that collect resource use data. Track direct and indirect carbon emissions (Scope 1-3) throughout the supply chain along with waste, energy, water use, and feed ingredients (Scopes 1-3 of the GHG Protocol).

Available Tools

WWF is collaborating with key end buyers and manufacturers throughout the shrimp value chain to encourage businesses to source their products in a resource-conscious manner that allows for more shrimp to be produced while keeping current land footprint of farms static.

Controlled Intensification

Controlled intensification is a system that enhances technology and operations to optimize land, water, and energy use, while increasing shrimp output, survivability, and profitability. Increasing efficiency is important for farmers regardless of size and scale, to streamline operations and capture more profits.

Regardless of current production practices, farmers can implement foundational technologies to transition to more controlled intensification. There are four categories of technologies that will have the most significant impact on a shrimp producer's ability to transition in the near-term and the profitability of intensified systems in the future (Materials and Biotechnology, Internet of Things and Artificial Intelligence, Connectivity Platforms, Mechanization). By using these technologies and practices, farmers can better predict and control yields, reduce costs and externalities, and drive efficiency.

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