

This case study is one in a series co-sponsored by Washington Department of Ecology, the Oregon Sustainability Board, and the Oregon Department of Environmental Quality to help companies in the Pacific Northwest understand the challenges and benefits of product environmental footprinting.

# IMPOSSIBLE FOODS

## explores possibilities of better burgers through life cycle assessment

Impossible Foods' use of an internally developed and externally reviewed life cycle assessment (LCA) helps them understand the impact and resource use along the supply chain of its flagship product, credibly communicate with customers, and help drive select business decisions. In addition to their own product LCA, Impossible Foods uses LCA results from the academic literature to quantify sustainability and resource use trends within the existing US food system.

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## THE ISSUE

Impossible Foods, a producer of plant-based alternatives to meat and dairy products, has a mission to help transform the global food system by providing a way to reduce the environmental impacts of animal product consumption. They pursue this mission through food technology innovations in taste, texture and more.

Their flagship product is a plant-based burger made from ingredients such as coconut oil, textured vegetable protein and potato protein. Since beef is one of the most resource intensive components of global diets, Impossible Foods needed a robust internal understanding of the environmental impacts of food ingredients and processes on water, land and the climate, for both their product and that of beef.

They and their customers are interested in understanding how their products perform relative to animal-based products, and the key drivers of environmental impacts. For its flagship plant-based burger product, clear and credible environmental messages are expected to further motivate consumers beyond the taste experience to seek out its product as an environmentally preferable option.

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## THE SOLUTION

Because providing environmentally-friendly food choices is core to its mission, Impossible Foods knew from the start they'd commit to maintaining an up-to-date and rigorous LCA of its products.

They began by internally performing a farm-to-factory LCA of its Impossible Burger product to understand its impacts and hotspots, as well as its comparison to ground beef. They had this LCA externally reviewed to ensure the quality of the information before communicating the findings publicly. A farm-to-factory boundary was selected as it is expected to be equivalent for the beef comparison for the outbound distribution stage.

After first constructing an assessment in spreadsheets using data from multiple open-source LCA tools, they moved their modeling to a professional LCA software to ensure the quality and consistency of data used, and to more thoroughly explore the findings.

They saw investing in a professional software and learning to use it as a step that would help them fully integrate the insights from LCA into both their product development and also their marketing and communications, as well as present new opportunities for use of product environmental footprinting, or LCA, in business decisions. Separate from their product LCA, Impossible Foods made use

of existing published LCAs in the academic literature to understand the resource use and environmental impacts of animal agriculture production systems (for instance, resource use variability among region, product, and by conventional, grass fed, and organic systems).

In some cases, both the LCA software and the academic literature for product LCA have been useful in providing context for business decisions. For example, in assessing environmental burdens associated with different sources of plant-based fats, they used the default data in their software to develop an initial assessment, which was then refined through a broader literature review of the available information on the production systems associated with the different ingredients in their product.

They found that the impact information available for many of these ingredients tell part of the environmental story, but require additional context from other data sources such as scientific literature and statistics from the Food and Agriculture Organization of the United Nations (FAOSTAT). That understanding informs not only the 'why' behind the product but also the means to improve their environmental performance by identifying hotspots in production and supply chains.

# THE CHALLENGES

Due to the mission (and branding) of Impossible Foods and its flagship product, environmental footprinting was a necessity, and their leaders provided full support. As a fairly young start-up offering plant-based alternatives to meat, footprinting established performance benchmarks and demonstrated credibility.



## COST

The initial inventory and assessment was developed internally, by employees who specialize in LCA. However, in terms of staff time, costs of software license and consulting support, that process could be perceived as labor and resource-intensive. The inventory stage of data collection required bandwidth not just from the company's sustainability practitioners but from all operations-owners across the company, including manufacturing, R&D, and facilities, as their expertise was required in model development.

For example, Impossible Foods uses a novel fermentation method to develop 'heme,' a key ingredient that functions as an analog to the myoglobin found in meat. Commercial-scale fermentation has general parameters for energy requirements, but each system is very different, and those collecting the life cycle inventory data worked closely with engineers to model the process based on launch-scale energy requirements of yeast culture.

As such, the time required by multiple parties was significant, but this may not be a concern for companies wishing to footprint a product with a more ubiquitous and well-documented set of ingredients/inputs.



## RESOLUTION

Impossible Foods chose to hire consultants to perform a review of its internally developed LCA to identify inconsistencies or gaps, and to transition the model from Excel to professional software.

This review helps lay the groundwork for a future ISO-compliant audit: ISO compliant LCAs go through multiple rounds of peer review, and entail significantly more time and resources. Impossible Foods plans on pursuing ISO compliance for the LCA in the future, when the bill of materials, processes, and commercial production partners are less subject to change. The future peer-reviewed LCA is not expected to deviate significantly from the current reviewed results, but is expected to refine understanding of impacts and hotspots within the supply chain.

Impossible Foods first engaged an independent consultant for support and eventually opted to engage a well known LCA consulting group at a higher price point. Based on their experience, Impossible Foods found that expertise, location, cost, and time constraints are the main criteria for choosing between an independent consultant and a larger firm when undertaking an LCA study.

# THE ADVICE

Impossible Foods has provided the following advice for companies considering taking on product environmental footprinting:

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For companies tackling LCA independently/ internally: read lots of industry reports and journal articles. For those engaging in footprinting through partnering with sustainability consultants: read lots of journal articles, and ask lots of questions!

The consultants are a valuable source of expertise—methodologies and theory behind the various footprinting protocols are dynamic and specific, and company staff should understand those frameworks prior to trying to communicate results or make product comparisons.

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We chose to begin our sustainability consulting vendor relationship with an additive approach, beginning with our internal LCA and pursuing rigorous independent review, while building core competency in LCA in-house. Once our bill of materials and supply chains become less fluid, we are likely to embark on a full ISO compliance process for our LCA with our sustainability consulting partners.

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Finally, for companies interested in making use of footprinting results in marketing: engagement between marketing/ communications and footprint developers is key. No model is perfect, and footprinting procedures should be communicated with the understanding that variation in results is inevitable and the footprint is simply an estimate of real physical and energy flows—contingent on modeling assumptions, assessment methods selected, and real-time changes in bills of materials and supply chains.

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We would recommend that all companies attempt to understand their respective environmental impacts and improve them accordingly. However, fully reviewed and vetted environmental footprinting spanning multiple metrics (not just carbon) can be a big-ticket-expense for small and medium size companies.

Development of a LCA should be undertaken with clear sense for how the results will be leveraged in marketing, vendor relations, and establishment of benchmarks and future environmental performance goals. Start small, and give your staff lots of time.

Begin building a life cycle inventory long before any marketing or branding needs necessitate the process, and build the inventory with the intent of understanding baseline performance as a starting point for future improvement.

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In initiating our review process, vendor selection was a top consideration. The sustainability consulting industry hosts a multitude of excellent groups, and selecting the right vendor is tough. After meeting with a number of potential sustainability partners, we selected a vendor based on body of work (focus on food footprinting), engagement with and initiatives in the quantified sustainability community, and their ability to meet our ambitious pre-product launch review deadline.

For those operating under tight communications deadlines, geographic location of consultants might be a consideration, as real-time responses across large time zone gaps may have proved challenging in our particular case.

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As we scale, we can leverage our in-depth understanding of our resource use (and established baseline) to address hotspots and streamline operations, potentially by partnering with vendors. Anecdotally, the impact of dietary patterns on global ecosystem health is not well-known among consumers, and our footprinting activities facilitate some consumer education along those lines. ”

– *Rebekah Moses, Impossible Foods*

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## THE BENEFITS

The flagship product was only very recently launched, so direct economic benefits thus far aren't possible to assess. But Impossible Foods has already found value in the ability to communicate the relative sustainability of the product to customers and investors, and knowledge of impact-areas within their production practices.

They are looking for opportunities to integrate this knowledge more closely in further developments of the Impossible Burger as well as in new product development. Knowledge of impact-areas/hotspots has also been critical for future growth strategy and in determining optimal facility design for future scale-up (for example, planning for reduced electricity demand by conceptualizing co-generation facilities, grid alternatives, and various forms of energy reclamation techniques, particularly for fermentation processes).

Expected economic benefits resulting from this footprinting work and outreach are reduced expenses within their direct operational control and supply chain, enhanced brand recognition, increased communication with customers resulting in sales growth, vetting performance of future products, and the ability to answer customer requests for data.

The environmental benefits include reducing the impact of their own production and suppliers' practices based on learnings from the study and helping consumers select and use environmentally preferable products.

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