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Supplement Journal
April **2025**
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Vol. 15, No. 3
April **2025**

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Political winds shift this way and that, but **sustainability concerns persist**

Dietary supplement brands, functioning as a subset of the natural products landscape, have always had a connection to sustainability concerns. Many of the ingredients that go into supplements are either wildcrafted (in the case of botanicals) or harvested from wild ocean stocks of fish, crustaceans, shellfish or marine algae.

Making sure those supplies are secure just makes good business sense. And then telling your customers about it has seemed to make good business sense, too.

But in the current political climate, some influencers have seized upon these messages to call out companies as being out of step with the zeitgeist.

Sustainability writ small has been bound up in a larger idea that goes by the moniker of environmental, social and governance (ESG). According to an article in Mother Jones magazine, ESG started to become a target of derision or outright attack around the time Vivek Ramaswamy launched his presidential campaign in 2022.

Even among conservatives, though, that attitude is changing. In a more recent article penned for the Columbia Law Review, Richard W. Painter, a law professor and former official in the George W. Bush administration, argued that ESG principles and conservative values can and should coincide.

Unless one adheres to the idea that there is really nothing to this climate change business, those concerns are not going to go away, no matter which party or individual sits in the chair in the Oval Office. Companies that source botanical ingredients know what the marketplace is telling them. Ingredients are becoming harder and more expensive to find, and the expertise to find and harvest them the right way is eroding.

Sustainability programs meant to address those concerns take time and money to set up and maintain. It makes little sense to inflate and deflate them according to which way the political wind is blowing.

Even large dietary supplement firms or divisions of bigger companies (like Pfizer) are very small potatoes in the overall marketplace, so the risk of a high-profile backlash from conservative influencers seeking woke pelts they can nail to the wall seems small.

In my mind, the risks of doing nothing seem larger.

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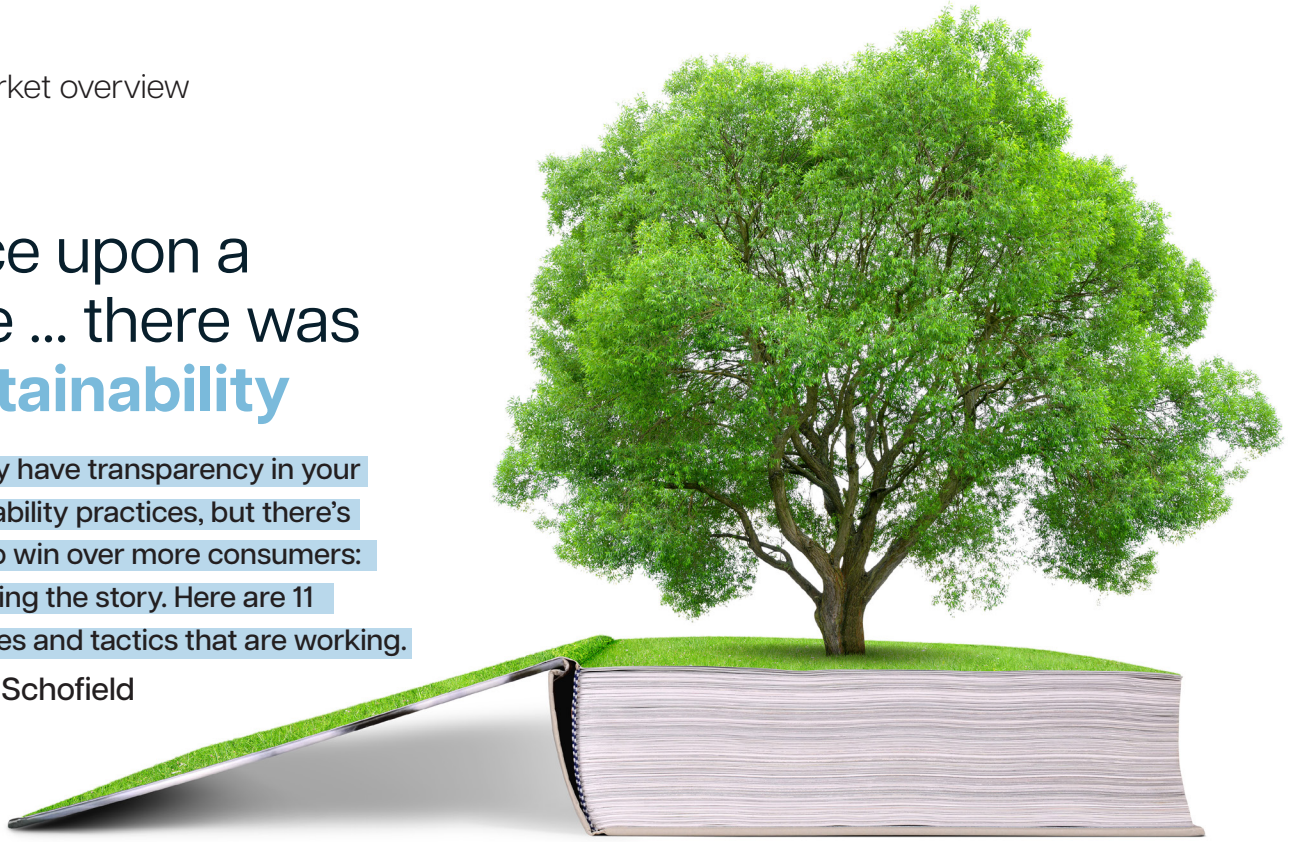
Once upon a time ... there was sustainability



You may have transparency in your sustainability practices, but there's a way to win over more consumers: romancing the story. Here are 11 strategies and tactics that are working.

by Lisa Schofield

Sustainability is a great word. It evokes pure corporate benevolence, and more consumers would love to adjoin themselves to it. The best way to do this is to tell them a story.

Although consumers like the idea of sustainable supplements, foods, beverages and more, they may not understand it enough to embed themselves in the movement.

A recent report from the Global Consumer Lab at Bain & Co. surveyed 23,000 consumers, finding that 64% are highly concerned about sustainability – and those worries are growing. Additionally, sustainability was one of the top four purchasing criteria for 50% of shoppers.

Yet they may be making decisions based on misconceptions – significantly lowering the number of truly sustainable purchases. For example, when tested, the respondents who said they prioritized sustainability were only able to accurately identify high carbon-emission products 25% of the time.

To top it off, a 2023 sustainability report from Nielsen IQ stated: "Positive consumer sentiment toward sustainability has been growing for more than a decade, but the impact of purchasing preferences has yet to inspire a green revolution within the retail industry."

True tales not textbooks

Susan Hamrahi, N.D., scientific communications specialist at AstaReal USA, noted, "When it comes to understanding the specifics of sustainability, such as ingredient sourcing, carbon footprints or packaging materials, many companies and consumers are still in the early stages of education."

Andrew Hebards, CEO and founder at Natures Crops International, agreed with this challenge, explaining that although conceptually sustainability is widely embraced by brands and consumers, "We do not see a 'depth of understanding' of sustainability always translating through to making different

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purchasing decisions. But the bigger question is whether brands and consumers prioritize sustainability enough to let it influence their purchasing decisions."

Consumers may not understand the technology of sustainability (e.g., blockchain, logistics and the differing global regulations governing varied sustainable practices), but they do actually understand a good, heartwarming story. More than half of consumers globally consider environmental, social and corporate governance as priorities in their purchase decisions, according to Bain & Co. analysts. Brand purpose is another factor swaying purchase decision. The following examples demonstrate how a handful of companies are championing sustainability in deeply personal ways.

The human element

Sustainability practices that result in giving back to communities make for a powerful tale.

Commit: High-visibility global storm events can have devastating impacts on the areas where raw materials are cultivated and wildcrafted; farmers and gatherers are on the front lines weathering the storms.

According to Viraj Patel, director of business development for K Patel Phyto Extractions in India, the climate is having a profound impact on many farmers in India, where intense heat waves and extreme weather events have been known to reduce crop yields and increase pests.

As an example, farmers were experiencing low yields for turmeric, which significantly affected their livelihoods and the overall supply chain. To address this and possibly provide a resolution, K Patel conducted a comprehensive local area survey to identify potential factors affecting the yield. They discovered that certain regions were no longer optimal for turmeric cultivation due to changes in soil quality and climate conditions. The company then found three new locations that exhibited promise for higher turmeric yields and initiated pilot batches in these new locations to validate findings. The results showed significant improvements in both yield and quality, so cultivation was scaled up and the company committed to purchasing all crops at fair prices, providing a stable and reliable income for the farmers.

Contract: Farming can be wildly unpredictable, and more suppliers are putting checks in place to help keep farmers afloat. Through its contract farming model, global stevia supplier Howtian works directly with stevia farmers across China's Shandong, Jiangsu, Anhui, Hebei and Gansu provinces, providing financial security, agricultural training and risk-sharing support, according to Rina Wang, marketing communications manager. She described these partnerships as representing an investment in the well-being of the people behind the crops.

Last season, a torrential hailstorm annihilated entire stevia crops in Jiayue Town, Zhucheng

> **Replenish, renew, reuse, recycle** and **restore** are sustainability initiatives consumers can easily revere and relate to. And they can become page-turners in a **successfully conveyed sustainability story.**

(Shandong province), leaving many farmers facing financial ruin, Wang reported. Howtian covered 50% of crop losses, helping farmers recover and ensuring they could replant for the next season. “For many farmers, a natural disaster can mean the difference between putting food on the table or not,” Wang related. Howtian’s contract farming model helps ensure its farmers don’t experience a disaster to their livelihoods as well.

Train: Those who farm ingredient raw materials also benefit from support so they can sustain crop production and their paycheck. Howtian launched a free Agricultural Sustainability Training Program in Zhangye, Gansu Province, which provides its farmers with water-efficient irrigation techniques, crop rotation strategies and pest control methods. Wang said farmers in the program have seen their incomes increase by up to 30%, as well as a reduced environmental impact and strengthened financial stability. “We provide our farmers with the latest in agronomy research and techniques so they’re best positioned for success, and so they can enjoy a sustainable and profitable career for generations to come,” Wang stated.

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Supply chain sustainability stories – video

Get a glimpse of the community of exemplary companies raising the bar for all industry stakeholders when it comes to ingredient sustainability.

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Many suppliers and contract manufacturers are stewarding **compelling** and **distinctive sustainability practices.**

In 2009, HP Ingredients, in tandem with Biotropics Malaysia, launched a knowledge-sharing program with an Orang Asli (indigenous) community in Pahang — one of its verified sources of raw tongkat ali (*Eurycoma longifolia*), according to Annie Eng, CEO and founder of HP Ingredients. "As part of this initiative, we assisted in establishing a primary processing plant to facilitate the collection and processing of tongkat ali roots. Additionally, we provide training on sustainable sourcing best practices, including selective harvesting based on specific tree type, size and age criteria to prevent overharvesting."

Develop: In a village in India, K Patel recently built a classroom for a school, provided educational kits to students and planted 125 saplings on the school grounds. Students were assigned a sapling to caretake, to foster responsibility and an appreciation of the environment. For older students, K Patel supports vocational skills development and education initiatives. Patel stated, "Promoting education, particularly girls' education, is a catalyst for positive social change and sustainable development."

The focus of FairWild Foundation, a Swiss-based nonprofit, is to transform wild plant sourcing and supply chain practices to ensure they are ecologically, socially and economically sustainable. Sarah Vito, North American business development representative, maintained, "Our framework provides the tools to achieve this by supporting businesses in responsible wild plant trade through advisory services, knowledge-sharing and FairWild certification."

Certify: Since its inception in 2008, Vito said FairWild certified the harvest of more than 50 ingredients globally, with more than 50 others on tap. She claimed this translates into more than 1.5 million hectares of land under certification for the wildcrafting of plants and approximately 12,000 people whose fair wages and working environments are guaranteed.

Community: Providing a valuable utility and reducing its cost is another way to help sustain the comfort of a local population. Astareal teamed up with Vattenfall, a large European producer of electricity and heat, to recover the excess heat generated in the production process at AstaReal's Gustavsberg facility in Sweden. "The excess heat is something that was once vented away — and it's now turned into a valuable resource," Hamrahi commented. "Since November 2022, this recovered heat has been transferred to the local district heating network, providing around 20% of the heat needed for Gustavsberg's residential area. This is enough to heat about 2,500 apartments — an impactful way to share AstaReal's commitment to sustainability with the surrounding community."

Many stories start with an R

Replenish, renew, reuse, recycle and restore are sustainability initiatives consumers can easily revere and relate to. And they can become page-turners in a successfully conveyed sustainability story.

Reforestation: In 2018, Sabinsa launched a reforestation initiative (that the company said was the first of its kind in the herbal industry) to proactively address a potential supply shortage of the medicinal Indian kino tree. Shaheen Majeed, global CEO and managing director, relayed that kino is a threatened tree species in India.

Sabinsa developed and funded a groundbreaking collaborative program that aims to plant 166,600 trees across 250 acres of forest over 10 years. The program is a collaboration between the global ingredient supplier and the reforestation organization Madhya Pradesh Rajya Van Vikas Nigam Ltd., with land provided by the Forest Department of Madhya Pradesh. Majeed reported that since its inception, the program has expanded, with a policy of planting two trees for every one tree harvested.

Renewable energy: Sabinsa has also made strides in adopting renewable energy by partnering with O2 Renewable Energy, signing a 25-year agreement to purchase 150 million units of renewable power, contributing to India's transition toward a more sustainable energy landscape. The company's manufacturing facilities also feature solar power systems that reduce reliance on nonrenewable sources.

"Sabinsa follows 'Recovery & Reuse' principles in our production process, including solvent recovery during extraction, in-house

PRODUCT PICKS

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The brand's 100% post-consumer plastic bottles are meant to be refilled. For every pouch purchased, an equivalent amount of plastic is removed from the ocean through a partnership with ReSea Project.

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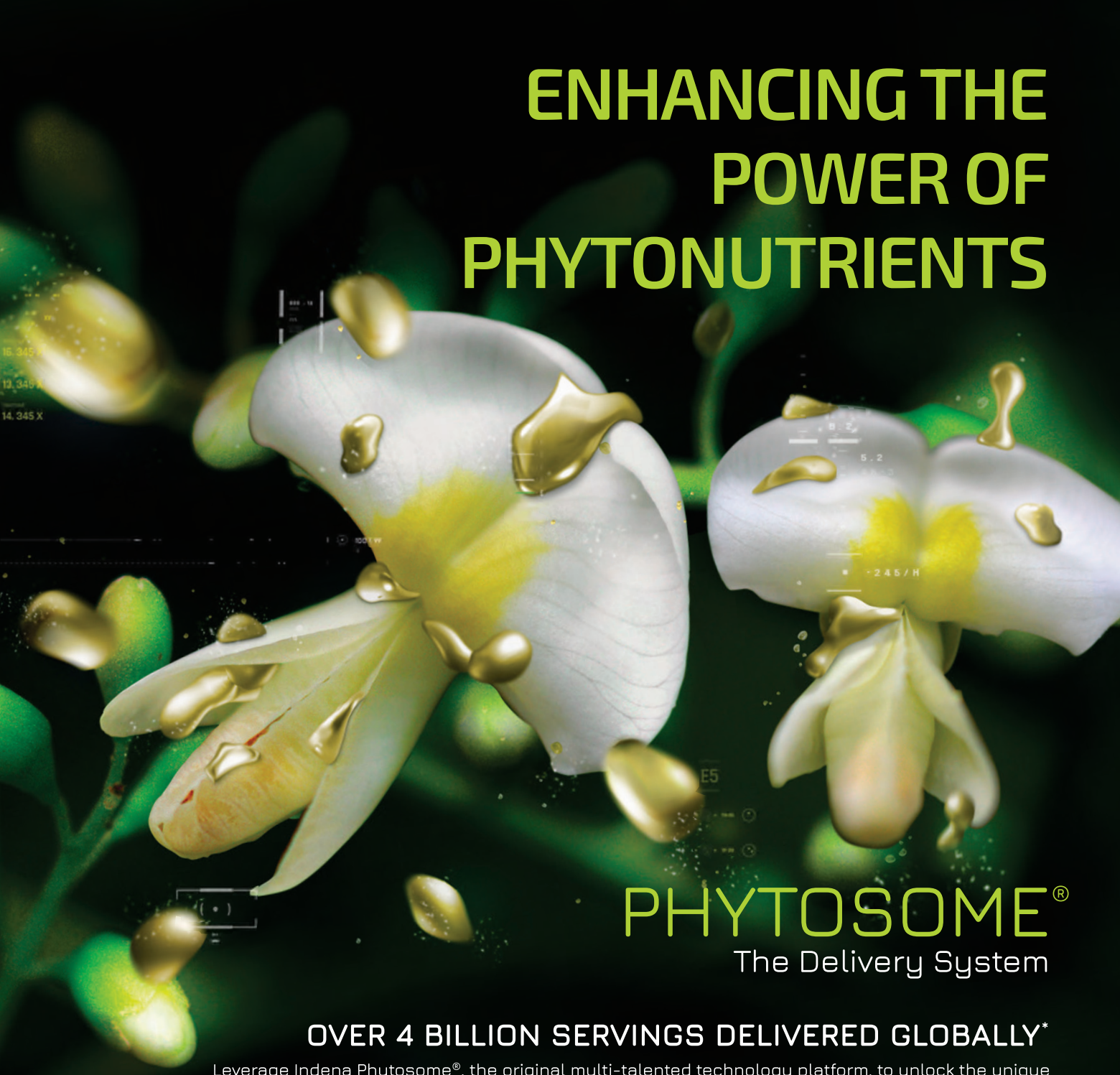

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distillation and solvent reuse for subsequent extractions," Majeed said. "Biomass reutilization repurposes spent material for fueling Sabinsa's manufacturing system," which he suggested is cost effective and environmentally sound.

Regenerative ag: For sustainability efforts at Natures Crops International, Hebards noted the farmers who produce the company's ahiflower crops use regenerative agricultural practices.

He explained, "When we first began cultivating ahiflower over 20 years ago, our oil yield per acre was equivalent to the oil content of fewer than 10,000 anchovies (a principal source of fish oil omega-3 essential fatty acids [EFAs]). By focusing on plant breeding, refining agronomic practices and collaborating with farmers to reduce inputs, we've increased production to over 500,000 anchovy equivalents per acre — at significantly lower costs. And we're still improving."

These practices enabled Natures Crops International to reduce its cost of oil production by over 30% and offer near constant oil pricing to customers, without the 600% price volatility seen in fish oil markets in the past two years.

Renewable and reduce: Regarding AstaReal's Moses Lake cultivation facility, Hamrahi said, "We access renewable hydroelectric energy, minimize land use and manage water resources responsibly." To focus on reducing both direct and indirect emissions at this facility, the firm partnered with experts in sustainability to guide the creation and implementation of greenhouse gas (GHG) carbon accounting and data management practices.

Replanting: Since 2010, supplier HP Ingredients has initiated several tongkat ali replanting programs (2010, 2014, 2018, 2019, 2022 and 2023), providing resources for the domestication and propagation of select tongkat ali plants in nurseries. These seedlings are then distributed to various Orang Asli communities for replanting, following a model where three to four seedlings are planted for each mature tongkat ali tree harvested.

"We aim to expand this initiative from its pilot phase into a large-scale, integrated program by establishing a dedicated nursery to ensure a continuous supply of seedlings while exploring viable plantation models," Eng said.

In September 2024, HP Ingredients collaborated with the Forestry Department of Peninsular Malaysia to launch the "Plant a Tree, Plant a Future" program, and also planted tongkat ali trees at Taman Eko Rimba Kuala Lumpur (TERKL).

Many suppliers and contract manufacturers are stewarding compelling and distinctive sustainability practices that, with a little dash of creativity, can be turned into wondrous stories that may increasingly appeal to consumers. ■

Lisa Schofield is a veteran writer and editor who got her start interviewing rock stars for national music magazines. She now writes and edits content for B2B media and suppliers in the natural health product industry. She has served as editor for Vitamin Retailer and Nutrition Industry Executive, and prior to that as associate editor for Whole Foods.

Algae – nature's miraculous, single-cell sustainable chemical factory

by Rachel French

Scaling challenges and high costs have put a damper on market innovation and accessibility. Now, the tide is turning – new cultivation technologies and methods are opening the door to promising opportunities for algae.

Microalgae are enjoying a healthy amount of interest, and for good reason. These powerful single-cell microorganisms are nutritional powerhouses chock-full of bioactive compounds that support good health.

Plus, the sustainability angle is impressive. Thanks to advancements in technology, ingredient manufacturers can produce nutritionally potent algal ingredients using controlled processes that make algae cultivation possible in any location – and without large amounts of land.

"Unlike conventional agriculture, microalgae cultivation does not require soil, does not deplete natural resources and is not dependent on seasonal variations," Christel Lemaire, marketing manager of nutraceutical ingredients at manufacturer Microphyt, said. "This ensures a sustainable, stable and resilient supply chain that aligns perfectly with consumer and brand demands for sustainable, ethical and constant sourcing."

But there's more to modern microalgae than meets the eye. Despite advancements, scaling

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challenges and high costs have put a damper on market innovation and accessibility. Now, the tide is turning – new cultivation technologies and methods are opening the door to promising opportunities for algae.

The challenges

Yonatan Golan, CEO of microalgae protein innovator Brevel, pointed to two traditional methods of algae cultivation: outdoor systems that use open ponds or closed photobioreactors to produce microalgae, and fermentation in tanks using sugar.

Each method has its challenges, he added.

For instance, outdoor systems produce high-quality ingredients but face low growth rates that make scaling to meet the needs of food-ingredient volume requirements difficult. That leads to high production costs and a more narrow field of applications, he said.

On the flipside, using fermentation to produce algae ingredients is "great" for growth rates, cost reduction and scalability, "but today fermentation is done in the dark and, thus, the majority of valuable ingredients and functionalities are simply not produced because they require light," Golan explained.

Collette Kakuk, chief strategic and commercial officer at microalgae producer Cyanotech, said cost is the "biggest" challenge in scaling. That's because natural algae production is both labor- and resource-intensive. "The costs associated with land, access to clean water, natural sunlight for efficient photosynthesis and energy make

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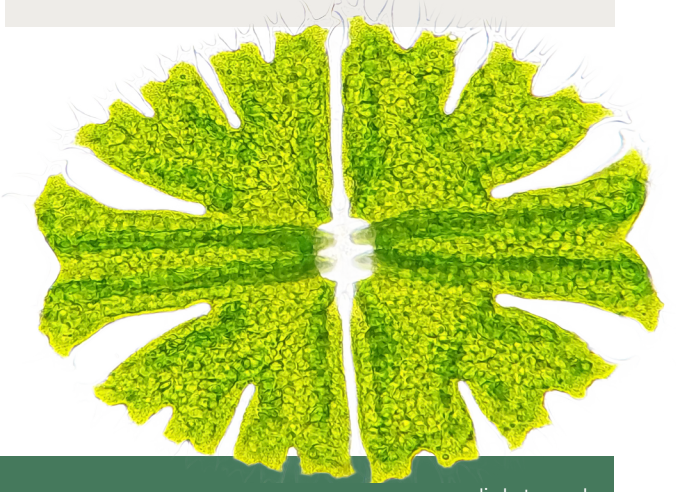
Marine algal oil from *Schizochytrium* sp. extract contains 390 mg DHA (docosahexaenoic acid) plus 195 mg EPA (eicosapentaenoic acid) – the latter of which is not always available from algae.



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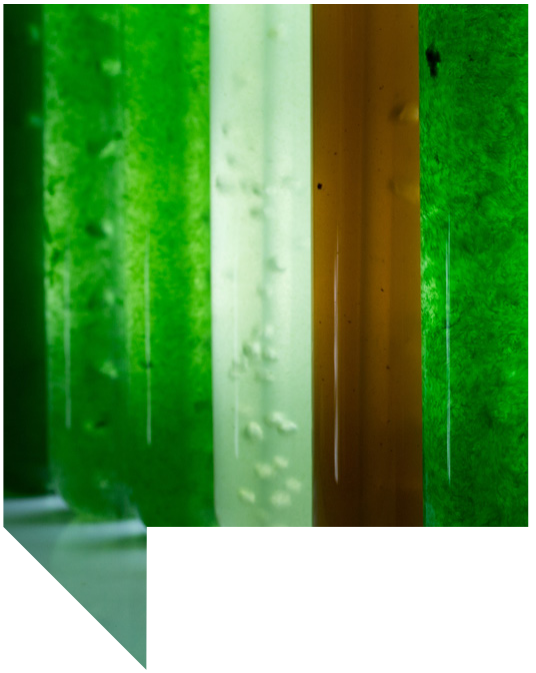
AI, blockchain, regenerative agriculture: Technology's growing impact – video

New tech is accelerating supplement innovation in many ways, from new ingredient discovery to supply chain logistics.



A wave of innovation in cultivation methods and processing techniques is expanding the pool of microalgae's potential.

location selection challenging and large-scale production a significant investment," she explained.

Photobioreactors and indoor cultivation methods are often used by companies to offset the challenges of natural cultivation, which require high energy inputs and climate-controlled facilities, per Kakuk. While these systems offer flexibility, she said they also "fail to replicate the natural resilience and nutrient composition of microalgae achieved through natural sunlight photosynthesis and outdoor cultivation."

Adding to the intricacies of microalgae production are strain-specific requirements for temperature, light and nutrients. According to Lemaire, these requirements make large-scale production "particularly complex and costly — especially for the more fragile strains that are sensitive to mechanical or shear stresses."

Maintaining batch-to-batch consistency also adds to production complexity, Lemaire said.

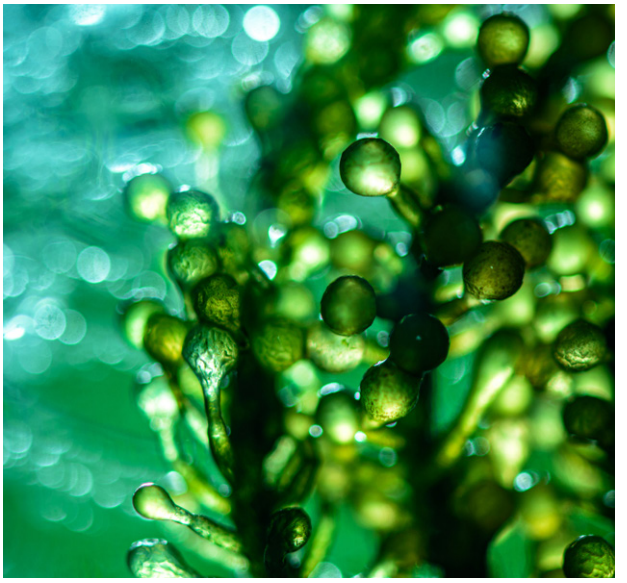
Production progress

A wave of innovation in cultivation methods and processing techniques is expanding the pool of microalgae's potential.

To improve scalability, Brevel employs a two-pronged process that uses both light and fermentation to grow microalgae "100 times faster than outdoor systems with all of the value and high quality of light-induced ingredients," Golan explained. The technology has enabled the company to produce functional and sustainable protein at "cost parity," making algae a viable option for the mainstream food industry.

Addressing the need for industrial-scale cultivation of multiple microalgae strains — including strains that are difficult to produce — is a patented hydrobiomimetic technology by Microphyt that homes in on the natural photosynthesis reaction of the microalgae.

"The microalgae culture and its culture media co-circulate in the photobioreactors with a precise balance of gases that enhances photosynthetic reaction," Lemaire claimed.



Lava-filtered Hawaiian aquifer water naturally purifies and replenishes the microalgae, ensuring **"pure, high-potency microalgae production."**

– Collette Kakuk, Cyanotech

"This optimized environment increases both microalgae production and bioactive compound concentration."

The process also reduces mechanical shear stress in the bioreactor, making it possible to cultivate fragile varieties of microalgae. That's led the company to offer ingredients with health benefits unique among algal ingredients, like its recently introduced ZenGut, an extract of *Tetradesmus obliquus* designed to support overall gut health while regulating essential biomarkers "crucial for improving mood and managing stress through the gut-brain axis," Lemaire explained.

Kakuk pointed out that working "with nature, not against it," is how Cyanotech has improved scalability of its microalgae-derived spirulina and astaxanthin ingredients.

She said the company leverages deep ocean resources and the ideal conditions of its Kona, Hawaii, location to optimize photosynthesis, reduce external energy demands and ensure purity of its ingredients. Lava-filtered Hawaiian aquifer water naturally purifies and replenishes the microalgae, ensuring "pure, high-potency microalgae production," she said.

After cultivation, microalgae is processed to produce nutritionally potent oils or powders. Traditional processing techniques sometimes add to the challenges of microalgae production.

For example, Ben Yeap, director of innovation and science at CoreFX Ingredients, said traditional spray-drying technology operates at high temperatures, "leading to nutrient degradation, poor stability and fishy off-odors."

Kakuk said Cyanotech uses a patented drying process that taps deep ocean water to maintain nutrient integrity of its spirulina, "while significantly reducing energy consumption compared to traditional drying methods."

Yeap said his company uses a novel delivery technology called CoreNhanced to turn algal oils into stable, taste-neutral powders that maintain nutrient integrity.

The twofold process first uses a unique set of carrier and multiplier systems to create a stable emulsion. Then, electrostatic spray-drying technology is employed to evaporate the moisture under very low temperatures. The process is completed in a

controlled, nitrogen-rich environment that mitigates exposure to oxygen, which is "really crucial" when dealing "with something as sensitive as algal oil," Yeap said.

The technology, which the company said also uses less energy compared to traditional spray-dry methods, makes algae oil powder suitable for a wider range of applications, like fruit juices, baked goods, confections and ready-to-mix (RTM) shakes.

Courting the algae consumer

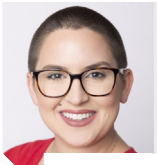
Sustainability certainly gives microalgae an edge, but experts contend there's more to capturing algae consumers than being eco-conscious.

Arun Natarajan, co-founder of specialty ingredient supplier Avlaan Inc., said sustainability is "one of the biggest draws" for the company's branded vitamin D. By using algae to produce VegD3, which is distributed by AIDP, the company is able to produce a vegan, plant-derived source of vitamin D3, a nutrient that typically hails from animal sources.

Kakuk agreed that sustainability is a "key driver" of microalgae products, but added they "must be backed by purity, efficacy and traceability to truly capture the market."

Similarly, Lemaire said market demand is primarily driven by efficacy, scientific validation and differentiation. "Consumers and brands seek ingredients that are not only environmentally friendly, but also deliver proven health benefits," she added.

Golan, however, maintained that when it comes to foods and beverages, consumers still place a higher priority on flavor, functionality and price over sustainability. ■



Rachel French joined Informa's Health & Nutrition Network in 2013. Her career in the natural products industry started with a food and beverage focus before transitioning into her role as managing editor of SupplySide Supplement Journal (formerly Natural Products Insider), where she covered the dietary supplement industry.

The **upside** of upcycling

Market for ingredients sourced from food waste and byproducts growing quickly

by Peter Rejcek

Eggshell membrane. Grape marc. Sugar beet molasses. Potato starch. Pomegranate pomace. This list might read like the ultimate ingredient challenge on a cooking show like "Chopped" or "MasterChef." But these are just a handful of the byproducts or food waste material that companies are upcycling into innovative functional ingredients for markets ranging from gut health to beauty and beyond.

Any good home cook is already familiar with the concept of repurposing fruit peels into jams or vegetable scraps into soup stock. Yet from the humble country kitchen an entire industry is emerging, dedicated to squeezing, extracting, hydrolyzing and pulverizing more monetary value and health benefits out of eggshells, fruit pulp, fish skin and just about any and all plant-based biomass. And, yes, many of these companies are also dedicated to helping save the planet in the process.

Closing the loop

In fact, environmentalism is a key part of the mission for the Upcycled Food Association (UFA), the industry's standard-bearer. Founded more than five years ago, UFA is explicitly dedicated to ending food waste while simultaneously tackling climate concerns. The organization officially defines upcycled foods as "ingredients that otherwise would not have gone to human consumption, are procured and produced using verifiable supply chains, and have a positive impact on the environment."

A third-party agency, Where Food Comes From, administers the Upcycled Certified

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> **Upcycled Certified ingredients** must be no less than **95% upcycled.**

program, which requires certified products to contain at least 10% upcycled ingredients within a formulation. Upcycled Certified ingredients must be no less than 95% upcycled. More than 800 items have been certified since the program launched four years ago.

Amanda Jepson, president of ingredient manufacturer Biova, said, "I think that the increase in interest around upcycled is just a product of the entire world being a little bit more conscientious and concerned about what we're doing to our environment." Her company markets a line of joint health and beauty supplements using water-soluble eggshell membrane (WSEM) sourced directly from some of the largest egg-breaking facilities in the United States. She estimated that Biova diverts more than 2 billion eggshells from landfills each year.

As a global leader in flavors, fragrances, food ingredients and health, IFF Health & Biosciences employs advanced technologies to optimize waste streams for some of its most innovative products. For instance, it uses betaine-rich beet molasses, a byproduct of sugar beet processing, in its clinically validated line of Genencare OSMS CC skin and hair health products.

Carole Gherardi, market segment lead of personal care at IFF, suggested, "By utilizing this byproduct, we reduce waste and promote circular economy principles, aligning with our commitment to responsible sourcing and environmental stewardship.

Sugar beet molasses is a primary source of betaine, though other sources like sugar cane molasses, wheat bran and shellfish exist. Producing betaine without upcycling is possible but doesn't align with our sustainability goals."

When it comes to finding the low-hanging fruit through upcycling, sometimes that fruit is right on the ground: HealthTech Bio Actives extracts the flavonoids used for taste modulation and functional health from immature oranges that naturally fall from trees as they grow. Norma Bisbal, ESG (environmental, social and governance) manager at the company, elaborated, "This means we essentially take something that would otherwise become agricultural waste and use it as an important raw material in our production processes."

Upcycled ingredients often possess **unique characteristics** that 'virgin' raw materials may lack.

One-of-a-kind science-backed ingredients

Boosting health and nutrition is another motivator behind upcycled functional products. Scientific journals are now filled with studies demonstrating everything from the prebiotic benefits of Chardonnay marc and the phytonutrient power of pomegranate peel to the microbiome-modulating effects of resistant starch and the joint health effects of WSEM.

In addition, upcycled ingredients often possess unique characteristics that "virgin" raw materials may lack. For instance, Biova's WSEM consists of collagen types I, V and X, as well as structural proteins like elastin and keratin, and other constituents such as essential amino acids (EAAs). Jepson noted, "You're never going to find something that combines all of the different beneficial components in one ingredient."

Another product that would not exist outside the waste stream is Solnul, a prebiotic resistant starch extracted from water used during potato processing. Formulated as an unmodified resistant starch type 2, Solnul remains insoluble in the digestive tract until fermented in the colon.

Clinical studies at a low 3.5-gram dose have demonstrated the ingredient's ability to selectively feed beneficial gut bacteria like *Bifidobacterium*, improve gut barrier function and support microbial balance without causing digestive discomfort common in soluble fibers, according to Cara Kennedy, director of marketing at Solnul.

"We have research to show that, like a prebiotic, which feeds your microbiome, [Solnul] actually takes it that next step further, because we're giving life to the bacteria in your gut," she maintained. "We are a premium branded ingredient with research that's also 100% upcycled."

Rousselot's Peptan range of collagen peptides is another example of an ingredient uniquely derived from upcycled materials – in this case, animal-based byproducts responsibly sourced from bovine, porcine and fish skins or hides. A large body of research has shown that collagen peptides support joint health, mobility, and skin and hair beauty, as well as overall well-being, from sports recovery to sleep quality and cognitive performance.

Florencia Moreno Torres, global business development

manager with Rousselot Health & Nutrition, claimed that without these animal-sourced raw material byproducts, “Collagen peptides simply could not be produced or made available on the market, meaning consumers would be unable to benefit from their multiple health and well-being benefits.”

Uphill challenges for upcycling

Like any rapidly growing industry, growing pains can be part of the equation.

For instance, while consumers generally embrace sustainable solutions, some hesitancy surrounds upcycled ingredients, as well as a general lack of awareness of the term. But momentum is building: Market research by Innova found 43% of consumers find upcycled products appealing, a notable increase from 35% in the previous year, according to Torres.

In addition, not every upcycled product is up to the standards set by UFA. That still does not stop some companies from making claims about using upcycled ingredients in finished products, according to Mike Danielson, founder and owner of Health-Car, a health and nutrition industry consulting company.

“These [upcycled materials] often represent only a small percentage of their final ingredient or products, and they lean into the trend without fully delivering on consumer promise on package,” Danielson, a 35-year industry veteran, asserted. “Most are highly processed ingredients from the waste stream, which can be misleading.”

PRODUCT PICKS

Ancient Nutrition

CANDIDA BALANCE

Among its ingredients, this whole-food dietary supplement contains certified regenerative organic turkey tail (*Trametes versicolor*) mushroom mycelium and fermented blackberry.

Stephen Lukawski, CEO of RSSI, a consultancy and business development firm for the nutraceutical industry, noted upcycled ingredients also face the same quality and adulteration challenges as dietary supplements at large. For instance, bad actors might add peanut skins to upcycled cranberry powder or dextrin to upcycled elderberry extracts. However, many of the standard testing protocols do not account for the unique compositions of these ingredients.

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The hottest supplement trends in 2024 – video

The supplement sectors best positioned for future success are included in this must-watch.

Economic upside of upcycling?

Good for the planet? **Check.** Scientifically validated outcomes? **Check.** But what about the macroeconomics of upcycled products?

One simple answer to that question doesn't exist, according to Amanda Oenbring, CEO of the Upcycled Food Association (UFA). "Sometimes the steps to stabilize and transform a stream into the end product take added cost or processing, though often simple solutions are readily available and help diminish financial and environmental costs currently associated with that previous waste or transport to non-food destinations," she said.

Hard numbers are not easy to come by for this fast-emerging industry. ReFED, a U.S.-based nonprofit that provides data and insights around food waste, ballparked an annual market annual market opportunity of $2.8 billion. But those sorts of profits don't come cheaply – ReFED also estimated it would require an annual investment of $2 billion per year from the private and public sectors to make it happen. A separate report estimated the upcycled ingredients market at about $275 million in 2022, and forecasted it to reach more than $500 million within a decade.

Kristofer Cook, chairperson and chief business development officer of Carbiotix, believes his company has hit upon the ideal business model. Previously focused on business-to-consumer prebiotic supplements, Carbiotix pivoted in 2024 to a capex-light business-to-business model, partnering with manufacturers to convert agricultural side streams onsite into functional ingredients such as soluble prebiotic fibers and proteins.

Cook explained: "It dawned upon us that we've collected so much knowledge about how to look at different plant-based materials that we said, 'Why don't we offer this as a service, instead of focusing on an ingredient?'"

This paradigm of upcycling-as-a-service, dubbed Nutracycle, leverages a client's current facilities, labor and resources. Projects start with small but scalable sub-$1 million investments, far below traditional offsite upcycling models requiring multimillion-dollar facilities. By fortifying products onsite – adding soluble fibers back into plant-based dairy, for example – clients avoid costly regulatory approvals required for new ingredients. Carbiotix, which earns 5% of the generated value, has more than 30 projects running on six continents.

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"I've had to create quality assurance standards for safety, purity and authenticity, because a lot of the testing tools out there are for botanical identification. They have no idea what this [upcycled] material is," Lukaswki explained. He helped pioneer the upcycling of cranberry and blueberry byproducts — previously discarded as animal feed — into polyphenol-rich dietary supplements at ingredient supplier Fruit D'Or.

He is now collaborating with POM Wonderful to convert some of its 60,000 metric tons of annual pomegranate byproducts into POM Biotic, a full-spectrum powder backed by $50 million in company research on the numerous potential health benefits of pomegranates.

Despite the inherent challenges, the 30-year industry veteran is incredibly upbeat about upcycling, proclaiming, "Upcycling is the future of dealing with food waste management issues." ■

PRODUCT PICKS

Genuine Health

CLEAN COLLAGEN

The collagen used here is both sustainably sourced and upcycled from grass-fed U.S. cattle. The company is a Certified B Corporation.

Formerly the world's only full-time journalist in Antarctica, Peter Rejcek is a professional editor and writer with nearly 30 years of experience covering science, technology, business and health, including the natural products industry. He also previously served as a senior editor for the supplements and health section of the Natural Foods Merchandiser.

Sustainable company directory

Click links – including company names – for more information.

ADM:
The company's sustainable plant proteins provide multiple sources for varied applications.

Aragen:
This contract research, development and manufacturing organization (CRDMO) was named by EcoVadis among the top 1% of companies worldwide for sustainability practices, from renewable energy use to water stewardship.

AstaReal:
The supplier's United States Pharmacopeia (USP)-verified natural astaxanthin comes from non-GMO (genetically modified organism) microalgae grown in a cultivation facility powered by renewable hydroelectric energy.

Biova:
A king among upcyclers, the company diverts more than 2 billion eggshells from landfills each year by using membranes for fast-acting joint health supplements.

Brevel:
This fermentation leader uses proprietary technology for cultivating microalgae – built on a process that combines light with sugar fermentation in indoor bioreactors.

Cyanotech: The company's spirulina and astaxanthin are sourced from open-air ponds on the ever-sunny shores of the Kailua-Kona coast of the Big Island of Hawaii.

FrieslandCampina:
The organization boasts numerous green-forward initiatives, including pursuit of a net-climate neutral dairy chain by 2050, circular business operations and DEI policies.

Fruit d'Or: Cran man Stephen Lukawski can't be missed at trade shows (IYKYK), extolling the benefits of upcycled cranberries and blueberries.

Howtian: At a time when transparency in sourcing is more critical than ever, this global ingredient supplier showcases what true fair trade in China looks like in action.

HP Ingredients:
This nutraceutical pioneer provides farmer

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training on sustainable sourcing best practices, including selective harvesting based on specific tree type, size and age criteria to prevent overharvesting.

IFF: Efforts from this scientific innovator range zero waste to landfill (ZWL) in its major manufacturing facilities and championing water stewardship by 2030, plus more, as enumerated in its Do More Good Plan.

Kemin: The firm reports it has decreased carbon emissions, increased renewable energy use, and adopted sustainably sourced ingredients with fair wages and ethical treatment of workers.

K. Patel Phyto Extractions: Based in India, the company built an entire classroom for a village school in the state of Rajasthan, where the company sources senna.

Lallemand: Clean label, ethically sourced, organically produced, optimized use of energy and water, reduced waste and emissions, and upcycling strategies are all included as part of its environmental, social and governance strategies.

Microphyt: The supplier boasts a sustainable, stable and resilient supply chain based on algae — consistently produced through its photobioreactor technology.

Nature's Crops International: With fickle fish oil costs and sustainability concerns, the company's Ahiflower plant source of omegas provides a traceable, regeneratively grown (and price-stable) alternative.

Nexira: The ingredient solutions provider focuses on the preservation of natural resources and the ecosystem, the origin of raw materials and the support of local communities.

Sabinsa: This visionary company focuses on four pillars of sustainability: human, environmental, social and economic. One example: Its "Food for Education" program provides afternoon meals to about 1,500 economically disadvantaged children in India.

Solnul: Talk about innovation — the brand's prebiotic resistant starch is extracted from water used during potato processing. You want fries with that?