Interconnectivity

Biotech at a
Turning Point

Nymark

WHAT IS NEXT?

How biotechnology is reshaping systems across health, agriculture, and energy.

'25 '30 '50

May 2025

This report offers insights and reflections on emerging trends in technology, shared for informational purposes only. Nymark presents these perspectives to contribute to broader industry conversations and to inspire further exploration. While we aim for accuracy, the report is not exhaustive and does not replace expert consultation or tailored guidance. Readers are encouraged to interpret and apply this information thought-fully within their unique contexts.

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Driving Positive Tech

First, why are we publishing this? At Nymark, we help technologies with real-world significance achieve sustainable success. We work with tech scale-ups and cooperates in areas such as AgriTech, BioTech, and Health Tech. Because we choose to support organisations under the umbrella of 'Positive Technologies' – those creating innovation that drives genuine societal progress.

Technology is full of big promises. And society is changing in immense ways. So it's been important for us to define: which industries are delivering real progress, and what does that look like? We began by mapping the key sectors where impact and innovation meet, then wrote up our Positive Technology Principles. Our reports now explore developments across these industries, and the deeper forces shaping the decades ahead.

Interconnectivity 2025 examines how technological innovation today sets the foundation for tomorrow's world. Each edition in this series tracks how Positive Technologies are reinforcing each other, forming a broader ecosystem of change, and shaping the future.

This edition focuses on biotechnology, a sector that could define humanity's next leap forward. Mapping biotech's potential is interesting in an era when its breakthroughs raise urgent moral and societal questions. Around the world, labs and startups are using living systems to solve humanity's most pressing challenges.

Biotechnology now acts as a connecting force across health, energy, and agriculture. After years of groundbreaking discoveries, from gene editing tools like CRISPR to mRNA vaccine platforms, the sector is starting to reshape daily life and global systems.

In this report, we cover the industries and innovations shaping biotech in 2025, and the impact its evolution could have by 2050, a milestone year for global progress. We also highlight some of its ethical dilemmas alongside one breakthrough driving real-world transformation that we've been fortunate to work with.

Enjoy reading,

The Nymark Team

Contents

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The Mission

The Mission

Biotechnology is Behind Humanity's Next Leap

1-2

Biotech has often been called "the next digital", a transformative force not unlike the computing revolution. In 2025, that promise feels closer than ever. Scientists are learning to program cells with the precision of software, enabling solutions that were inconceivable a decade ago.

The potential of this field is powerful: to use the building blocks of life to propel humanity into a healthier and more sustainable future. Whether it's curing diseases once thought incur-able or engineering microbes to produce clean energy, biotechnology is the sometimes underlooked catalyst for humanity's next great leap forward.

In the past year, doctors have begun curing genetic disorders by rewriting DNA, while environmental engineers deploy modified bacteria to eat harmful waste. These are not isolated achievements, but interconnected advances sharing common tools and knowledge.

A breakthrough in genomics might fuel progress in agriculture; a discovery in plant biology can inspire a medical therapy.

The convergence of disciplines, biology, computer science, engineering, means innovations rein-force each other.

The COVID-19 pandemic accelerated this trend. The global effort to create vaccines in record time showcased how biotech could save millions of lives and spurred unprecedented collaboration across borders. The COVID-19 vaccine was the first to successfully harness mRNA technology, unique in how it triggers the body's immune response. Now the same mRNA technology is now being repurposed to target cancers and other diseases.

Crucially, biotechnology is a global mission. The United States and China pour billions into biotech research and startups, and European scientists co-developed pioneering vaccines and lead research in gene editing and synthetic biology. (EU-funded projects often emphasise ethical frameworks alongside innovation.)

Emerging economies from India to Brazil are nurturing biotech hubs, aiming to solve local problems like drought-resistant crops or affordable vaccines.

“In the early days of recombinant DNA in the 1970s, the idea of routinely editing genes or printing organs sounded like science fiction. Now those ideas are moving into clinical trials and pilot projects.”

The Mission
Biotechnology is Behind Humanity's Next Leap

2-2

Looking ahead, the goals fueling biotech are bold. Eradicating inherited diseases, vastly extending healthy human lifespans, feeding 10 billion people sustainably, and rever-sing climate change impacts, these ambitions underpin much of the research in 2025.

The industry has evolved from the early days of recombinant DNA in the 1970s, when the idea of routinely editing genes or printing organs sounded like science fiction. Now those ideas are moving into clinical trials and pilot projects.

In the right hands and if deployed equitably, biotech could redefine life as we know it for the better. The journey from now to then will require sustained collaboration, investment, and wise governance, themes explored throug-hout this report, but the progress of 2025 shows that humanity's next leap is already underway.

Nymark's Takeaway on What's Next

NEXT BIG LEAP

Biotech's impact is accelerating fast, as innovation moves to implementation in 2025. The years ahead will test how we embed this power across health, climate, and food systems.

'25

Biotechnology breakthroughs start solving gritty, real-world problems at scale. Regulators become more agile in efforts to scale innovations such as alternative protein and gene-edited crops.

'30

Biotech becomes embedded in national climate and health strategies. Industrial ecosystems increasingly rely on bio-based production, and new public-private models emerge to ensure ethical, equitable use of emerging technologies.

'50

By 2050, many experts believe biotechnology could help realise feats such as eliminating certain cancers, restoring extinct ecosystems, or providing abundant clean materials with minimal environmental cost.

The Challenge

The Challenge

Navigating Morality, Longevity and Biotech's Expanding Power

1-2

As biotech races ahead, society is grappling with profound ethical and safety dilemmas. The power to rewrite the code of life raises a fundamental question: just because we can do something, should we?

In 2025, this debate has taken on new urgency. Scientists can edit embryos in the lab, create synthetic organisms, and potentially extend human lifespan far beyond its natural limits. Navigating the moral landscape of these capabilities is proving to be as significant a challenge as the science itself.

One pressing issue is how to draw the line on human genetic enhancement. A few years ago, the world was stunned by the case of gene-edited babies in China – children whose genomes were altered at the embryo stage.

That rogue experiment was widely condemned, and it prompted calls for international regulations. Today, the consensus among scientists is to prohibit making heritable changes to humans, at least until risks are better understood. Yet not everyone may abide by voluntary guidelines.

The technology is becoming more accessible, and there are reports of fertility clinics discreetly offering embryo genetic testing and selection for traits like disease risk. The spectre of "designer babies" still looms, forcing policymakers to consider global oversight. Europe has largely maintained a strict ban on human germline editing, reflecting public sentiment that is deeply cautious.

In contrast, some countries are more permissive or ambiguous, which could lead to ethical havens attracting those willing to push boundaries.

Another facet of the biotech juggernaut is the pursuit of longevity. Silicon Valley billionaires and pharma giants alike are investing heavily in anti-ageing research, aiming to slow or even reverse the processes that make our bodies grow old.

The prospect of adding decades of healthy life is tantalising, and raises difficult questions. If ageing can be treated, who gets access to such treatments? Would they be available to all or become a luxury for the ultra-rich, exacerbating inequality?

“Efforts are underway to develop international norms for responsible biotech research, analogous to arms control treaties, but progress is slow.”

The Challenge
Navigating Morality, Longevity and Biotech's Expanding Power

2-2

In labs, scientists have managed to extend the lifespans of mice through gene therapies and drugs that clear senescent (ageing) cells. Some early human trials of "senolytic" drugs are underway, and one cutting-edge trial even involves reprogramming cells in an attempt to rejuvenate organs.

Ethicists warn that society needs to prepare: longer lives could strain pension systems and natural resources, and fundamentally alter our social structures. There is also a philosophical debat: should we be aiming to drastically prolong life at all, or focus on quality over quantity?

Biotech's reach also extends to areas that spark concern over safety and security. The same tools that let us engineer cures could, in theory, be misused to create pathogens. This dual-use dilemma means guardrails are essential. The COVID-19 pandemic heightened awareness of laboratory safety and the catastrophic potential of bioengineered viruses, whether released accidentally or intentionally. Intelligence agencies now routinely include bio-threats in their risk assessments. The challenge is enforcing rules globally, as oversight varies widely between countries. Efforts are underway to develop international norms for responsible biotech research, analogous to arms control treaties, but progress is slow.

Beyond the lab, public perception and policy play a pivotal role in how these challenges unfold. Building and maintaining public trust is crucial, if people fear biotech, they may reject life-saving innovations or fall prey to misinformation. In 2025, the balance between enabling innovation and protecting citizens is delicate. Regulators are under pressure to update decades-old rules to accommodate technologies such as gene therapy and lab-grown meat.

In some cases, 2025 has seen regulators become more agile: the speedy approvals of certain gene therapies and vaccines show lessons learned in streamlining processes. But those very successes also raise expectations and concerns about corners being cut. The expanding power of biotechnology comes with no shortage of moral and practical challenges. How we handle them will shape the world as much as the inventions themselves.

Nymark's Takeaway on What's Next

CODE OF LIFE

As biotechnology gains momentum, the need for global norms becomes urgent. 2025 signals rising pressure to define ethical boundaries and biosecurity protocols before innovation outpaces governance.

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Ensuring a unified moral framework is a global challenge in 2025. Researchers convening at international summits continue to debate red lines, but concrete governance remains in early stages and regulation continues to adapt.

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A wave of international frameworks emerges to govern the ethical use of biotech. Biosecurity, environmental safeguards, and rights-based approaches gain traction amid geopolitical and climate instability.

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The biotech enhanced future could see human lifespans reach well beyond 100 years. With new societal norms around human enhancement, ecological intervention, and synthetic biology. And global inequalities shaped not by access to energy, but by access to bio-infrastructure.

Agritech

AgriTech
Enhancing Food Security and Sustainability

1-3

Agriculture is transforming to meet humanity's biggest challenges: feeding a growing population, using land and water sustainably, and coping with climate change. Biotechnology is increasingly seen as a critical part of the solution.

In 2025, AgriTech is undergoing a quiet revolution as the tools of genetic engineering and synthetic biology are applied to crops, livestock, and food production methods. The goal is to produce more food with fewer inputs and lower environmental impact, all while improving nutrition and resili-ence.

One of the most transformative tools in agriculture is CRISPR gene editing, and its impact is unfolding now. Unlike first-generation genetically modified organ-isms (GMOs) that often involve inserting a foreign gene into a plant, CRISPR allows scientists to make precise tweaks to a plant's own DNA. That can mean switching off a gene that makes a plant susceptible to disease, or enhancing a gene that helps it tolerate drought. These crops don't carry the stigma of "GMOs" in the same way, because they often contain no new DNA from other species. Regulators in the US and several other countries have decided that such edited plants can be treated like conventionally bred ones, speeding up their path to fields. Meanwhile, Europe's cautious regulatory approach is beginning to bend in the face of urgent need for innovation. Gene-edited crops using CRISPR begin field trials or early-stage commercialisation in Europe, thanks to loosening regulation of New Genomic Techniques (NGTs). These include drought-tolerant wheat, fungus-resistant grapes, and low-emission barley.

Making farming more sustainable is a critical focus of agri-biotech. One area drawing attention is reducing depen-dence on chemical fertilisers and pesticides. Excess fertiliser not only costs farmers money, but it also pollu-tes waterways and emits greenhouse gases.

Biotech offers alternatives: companies are developing soil micro-bes that form symbiotic relationships with crops to help them take up more nutrients naturally. Meanwhile, researchers are tackling plant diseases by creating

In January 2024, Israel became the first country to approve cultured beef for sale to the public, from Israel-based Aleph Farms.

AgriTech
Enhancing Food Security and Sustainability

resistant plant strains, aiming to cut down on pesticide sprays. Perhaps the most radical change in how we get our food is the rise of alternative proteins. The year 2025 has seen significant strides in moving lab-grown meat, also known as cultivated meat, from prototype to commercial reality.

In January 2024, Israel became the first country to approve cultured beef for sale to the public, from Israel-based Aleph Farms. In the United States, a handful of restaurants in major cities are now serving cultivated chicken as a novelty on the menu, following regulatory approval for sale.

The current production volumes are tiny and costs are high, but the industry's progress is steady. Dozens of startups globally are racing to scale up cultured beef, pork, and seafood, with pilot plants under construction.

For in-stance, in the Middle East, where food security is a national priority, a large facility is being built to produce culti-vated fish fillets, aiming to supply super-markets in the region within a few years. Public acceptance remains a question – will people readily eat meat grown in a vat? Regardless, even traditional meat companies are investing in this space, seeing it as part of the future of protein.

Plant-based meat alternatives are also evolving with biotech help. In 2025, several new plant-based products launched using fermentation to create better fats and flavour components, making them more convincingly meaty.

Meanwhile, precision fermentation is being used to create animal-free versions of specific ingredients: the dairy industry, for example, now has competition from companies that brew milk proteins in tanks (via genetically engineered micro-organisms) and combine them with plant fats to make ice cream and cheese without cows.

The sustainability implications are huge; even a partial shift away from livestock could free up land, reduce methane emissions, and alleviate pressure on forests and waterways. It's worth noting that biotech in agriculture isn't just about food, but also materials and resilience.

AgriTech
Enhancing Food Security and Sustainability

For example, researchers are engineering plants that yield not only food but biodegradable plastics or fuels (such as sugarcane that produces a plastic precursor in its sugar). Others are focused on climate resilience: tweaking photosynthesis efficiency so crops yield more with the same sunlight, or developing ultra-deep-rooted variants that can better survive droughts and sequester car-bon in the soil. Livestock, too, are seeing biotech interventions beyond the lab-grown alternatives. Gene editing has been used to produce cattle that do not grow horns (sparing them painful dehorning on farms), and pigs that are resistant to certain viruses that cause devastating swine diseases.

To feed the future, embracing biotechnology in agriculture is a necessity. The challenge will be to do so in a way that is safe, equitable, and mindful of the small farmers who produce much of the world's food. So far, the signs are hopeful: many advances in AgriTech are geared toward resilience and inclusivity, not just productivity for profit's sake.

Nymark's Takeaway on What's Next

REGENERATIVE BIO AGRICULTURE

Today's real-world impact includes gene-edited crops and cultivated proteins starting to enter fields and markets. Success in the next years involves scaling solutions equitably while maintaining consumer trust.

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The relationship between farm and lab grows closer, with leading developments in gene editing for crops sparking regulation change. Cellular agriculture (precision fermentation, cultured meat) gains consumer footholds, particularly in urban markets like Singapore, the Netherlands and California.

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Recent changes to regulatory frameworks are expected to allow commercial cultivation of certain New Genomic Techniques (NGT) crops by the late 2020s, while biological alternatives to synthetic fertilisers become widely adopted.

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By 2050, the way we produce food could be dramatically transformed. These trends point to gene-edited staple crops as standard, alongside a shift in land use, where biotech-based efficiency frees up arable land for rewilding or biodiversity corridors.

Health Tech

Health Tech
Revolutionising Medicine through Biotechnology

1-2

Few areas of biotechnology have as immediate an impact on people as health. In 2025, the intersection of biotech and medicine is delivering tangible breakthroughs while also laying the groundwork for future healthcare paradigms. This year has marked a tipping point for several technologies long in development. A standout milestone came with the advent of gene therapy moving into mainstream care. After decades of promise, gene therapies are finally curing patients of serious genetic diseases.

In late 2024, regulatory approval was granted for the first therapy that uses CRISPR gene editing, a one-time treatment for sickle cell disease. Patients who once faced a lifetime of pain and organ damage from this inherited blood disorder can now potentially be cured by an infusion of their own stem cells, edited outside the body to fix the faulty gene.

In trials, dozens of other conditions are being targeted, from rare enzyme deficiencies in babies to more common illnesses like heart disease. The significance cannot be overstated: medicine is moving from managing symptoms to editing the root causes. By 2050, it's conceivable that a whole class of genetic disorders will be virtually eliminated thanks to interventions launched in the 2020s.

Another revolution in health tech is unfolding via mRNA and vaccine technology. The success of mRNA COVID-19 vaccines proved that we can design and mass-produce a vaccine in mere months. Now researchers are deploying that platform against some of our toughest diseases. In 2025, cancer vaccines are a major focus. For the first time, large trials are underway for personalised mRNA cancer vaccines – treatments tailored to each patient's tumour mutations, aiming to train their immune system to recognise and destroy cancer cells.

The integration of artificial intelligence in medicine is accelerating the precision trend: AI algorithms can scan medical images or genomic data to identify patients at risk of diseases far earlier than conventional methods. Healthcare could become more proactive, precise and personalised, to catch diseases at their onset or even predict them and, “Large trials are underway for personalised mRNA cancer vaccines, with treatments tailored to each patient’s tumour mutations.”

Health Tech
Revolutionising Medicine through Biotechnology

customising treatments to each individual's genetic makeup and lifestyle. Meanwhile, labs are growing organoids, miniature, simplified versions of human organs grown from stem cells. These mini-livers, kidneys and even brain tissues are already invaluable for research and drug testing, reducing the need for animal testing and helping scientists understand diseases in human tissue. The holy grail is to grow full-size organs in the lab for transplant.

3D bioprinting technology is advancing: in 2025, a biotech company successfully printed a tiny but functioning piece of human liver tissue, which could survive when implanted into test animals.

There's hope that within a couple of decades, we'll print patches to repair damaged hearts after heart attacks, or new cartilage for arthritic joints. Regenerative medicine also extends to novel treatments like gene therapy for blindness (a gene therapy for a form of hereditary blindness has been treating patients for a few years now) and stem cell therapies that might heal spinal cord injuries.

The common thread is using living cells as therapy, a profound shift from treating the body as a passive recipient of drugs.

As with all leaps, health tech faces hurdles. Cost is a major concern for the first generation of gene therapies. Some solutions include instalment payment plans and efforts to streamline manufacturing (for example, making gene therapy production more like vaccine production to achieve economies of scale).

Another challenge is ensuring global equity, advanced cures developed in wealthy countries must not bypass poorer regions. Initiatives from organisations like the WHO and partnerships like COVAX (which was used for COVID vaccine distribution) are being retooled to handle the distribution of complex therapies in the future.

Nymark's Takeaway on What's Next

PERSONLISED HEALTH INTERVENTIONS

Gene therapies and personalised medicine are soon to start changing lives. Health tech is enabling a future where interventions are precise, proactive, and deeply individualised.

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mRNA platforms, microbiome diagnostics, and CRISPR-enhanced cell therapies begin reaching patients across oncology, rare diseases, and inflammatory conditions. Longevity biotech becomes a venture capital magnet, with focus on cellular reprogramming and tissue rejuvenation.

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Pharma companies in Europe and the US, funding the largest trials in personalised mRNA cancer vaccines today, are hoping to roll out cancer vaccines for several tumour types by the 2030s if trials succeed.

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By 2050, the hope is that genetic cures and personalised medicine will be as routine and widely accessible as antibiotics and vaccines became in the 20th century. With a biologically integrated system featuring cellular therapies, programmable immune responses, and regenerative biotechnologies, health-span gains could be profound.

Energy Tech

Energy Tech
Pioneering Sustainable Solutions

In 2025, biotech innovations are addressing some of the toughest pieces of the energy puzzle, creating cleaner fuels for sectors hard to electrify, capturing carbon from the atmosphere, and finding new ways to produce vital materials without fossil fuels.

A major focus is on biofuels and bio-based energy. While biofuels (like ethanol from corn or biodiesel from vegetable oil) have existed for years, they've had limitations and controversies, such as competition with food crops and mixed environmental benefits. Biotechnology is now helping to produce advanced biofuels that overcome some of those issues.

In 2025, several com-panies have commercialised pro-cesses to turn non-food biomass, things like agricultural waste, wood chips, or specially grown grasses, into liquid fuels. Enzymes engineered to break down tough plant fibres have become far more efficient, allowing us to extract sugars from sources like corn stalks or straw and ferment them into ethanol or other fuels.

This year saw a breakthrough in enzyme design: a new cocktail of enzymes can deconstruct plant cellulose at nearly double the speed of previous methods, reducing the cost of making biofuel from waste.

The result is that producing fuel from leftover biomass is looking increasingly practical. Some European airlines are already flying test flights using a blend of traditional jet fuel and biofuel derived from waste products, part of an EU-backed initiative to decarbonise aviation. These demonstration flights in 2025 are small steps, but they indicate confidence that biofuels can work at scale for planes, a sector where electric batteries remain too heavy for long-distance travel.

Biotechnology is reimagining how we deal with carbon emissions. A fascinating development is the use of microbes for carbon capture and sequestration. In Iceland, researchers have experimented with pumping CO2 into basalt rock formations where certain bacteria accelerate its mineralisation into solid carbonate, effectively locking it away. Meanwhile, labs are tweaking cyanobacteria

“Some European airlines are flying test flights using a blend of traditional jet fuel and biofuel derived from waste products, part of an EU-backed initiative to decarbonise aviation.”

Energy Tech
Pioneering Sustainable Solutions

(blue-green algae) to absorb CO2 more rapidly, creating living carbon sponges. Another area is "bioconcrete", using bacteria to capture CO2 and help form construction materials. Such innovations straddle energy and cons-truction sectors, showing the versatility of biotech solutions.

From an economic perspective, industrial biotech is being embraced as a key to decarbonisation. Chemical companies are partnering with synthetic biology firms to produce chemicals and materials using fermentation instead of petroleum. Take plastics: rather than refining oil to make plastic, some companies are using engineered microbes to ferment plant sugars into the very same building blocks of plastic. One of the world's largest plastics makers announced in 2025 a collaboration with a biotech startup to produce a bio-based polypropylene at scale within a few years, a move that could make a widely used plastic much greener.

Energy storage and generation are also seeing biological twists. For example, scientists are studying enzymes that can produce hydrogen from water at room temperature.

Photosynthetic bacteria naturally produce hydrogen in small amounts; by modifying their metabolic pathways, researchers aim to make biological systems that generate hydrogen fuel efficiently using just sunlight and water. 2025 brings incremental progress: a team in Japan managed to double the hydrogen output of a certain algae by gene editing, an encouraging sign for bio-hydrogen as a concept. Another experimental avenue is microbial fuel cells – devices where bacteria that feed on organic matter release electrons, essentially creating electricity from waste.

Of course, no single technology will solve the climate crisis or energy transition. Biotech solutions have to scale-up and prove economic viability, and there are environmental considerations (for instance, that growing biofuel crops or algae doesn't create new problems or that genetically modified organisms used in the wild don't disrupt ecosystems). Yet, 2025 demo-nstrates that biology offers powerful tools to complement wind turbines and lithium batteries, becoming integral to the patchwork of energy tech solutions at play.

Nymark's Takeaway on What's Next

WASTE BECOMES ENERGY

Biotech is emerging as a vital tool for clean energy. With key developments in industrial biotech bolstering the energy transition. The coming decades will test its potential to scale sustainably.

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European projects combine CO_2 capture with algae cultivation at industrial sites. Biotech firms develop microbial batteries, hydrogen-producing bacteria, and organic solar interfaces, with government grants supporting early-stage testing. Green hydrogen meets biotechnology: electrofuels and bioengineered catalysts attract major research funding.

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Biotech converges further with clean energy infrastructure. Engineered organisms are used in carbon capture, biorefineries and grid balancing. Synthetic biology allows the development of custom enzymes to break down biomass and industrial waste into clean fuels with higher efficiency.

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Bioenergy and synthetic biology are embedded in global climate frameworks. By 2050, we might see a sizable portion of our fuels and industrial feedstocks coming from biorefineries dotted across the globe, working in tandem with solar and wind farms to power a net-zero carbon economy.

Case Study

Case Study
Unlocking the Potential of Algae

1-2

In 2025, algae is enjoying renewed scientific and commercial interest as a sustainable powerhouse: a source of food, fuel, carbon capture, and even materials. Its potential applications cut across sectors, and this year has seen a string of breakthroughs that suggest algae may soon shed its reputation as a niche curiosity and emerge as a central player in climate, food, and energy solutions.

Algae is finding renewed relevance in the energy sector as another biofuel frontier. Once touted as a silver bullet for renewable energy, algae research went through ups and downs, but now steady progress is paying off.

Companies in the US and Europe have built algae farms, essentially large pools or bioreactors where algae, fed on sunlight and CO2, produce oils that can be refined into fuels. In one notable project in Spain, a commercial facility has begun churning out algae-based crude oil, which can be processed in existing refineries. By engineering the algal strains, scientists have boosted their oil production capacity and resilience to weather changes. What makes algae uniquely powerful is its breadth of application and its potential to thrive in spaces where conventional agriculture and industry cannot. The advantage of algae is that it doesn't use arable land or fresh water, and it consumes carbon dioxide as it grows.

The challenge has been making it cost-competitive. 2025 may be remembered as the year algae fuel finally achieved a cost drop significant enough to attract bigger investment. Governments are pitching in too, the EU's Green Deal includes funding for advanced biofuel plants, and the US reinstated biofuel tax credits, spurring innovation.

In 2025, a flagship project in the Netherlands, co-funded by the EU and several Dutch biotech firms, completed the first phase of Europe's largest algae-based carbon removal pilot. Using engineered strains of microalgae optimised for local sunlight conditions, the facility captured 40% more CO_2 than conventional strains.

Meanwhile, a joint venture between a German biotech startup and an Italian energy company is testing whether large-scale coastal ponds in the Mediterranean could act as "living carbon sinks," absorbing emissions

"Researchers are engineering plants that yield not only food but biodegradable plastics or fuels."

Case Study
Unlocking the Potential of Algae

from nearby cement and steel plants. Biotech innovators are also turning algae into food, packaging, and pharmaceuticals. In Singapore and the UK, food tech companies are incorporating protein-rich algae into meat substitutes and supplements, citing its superior amino acid profile and lower environmental footprint compared to soy or pea protein.

One UK firm recently launched an algae-based protein pow-der with a carbon-negative label, backed by third-party lifecycle analysis.

In Denmark, an algae-derived omega-3 oil received novel food approval, offering a sustainable alternative to fish-based supplements that deplete marine stocks.

Despite the momentum, the core challenge is industrial scalability. Algae cultivation still requires stable environmental conditions, and contamination risks can derail entire production batches. Scaling remains complex and cost-intensive, and the global supply chains for algae-based products are still immature. Many of these barriers are being addressed by scale-ups today.

Biotech advances like strain selection and genetic engineering are improving yields, and better photobioreactor designs are boosting productivity.

Nymark's client, photobioreactor specialist Lgem, is helping other companies farm microalgae at scale. Lgem has built a 7,000 m^2 "AlgaeHUB" near Amsterdam to let producers test large-scale cultivation with its patented systems.

By tackling issues of contamination and automation, Lgem aims to make growing algae as reliable as brewing beer.

Nymark's Takeaway on What's Next

ALGAE POWERED INFRASTRUCTURE

Algae's long-promised potential is finally gaining traction in food, energy, and carbon capture. As innovation scales, algae could become a foundational platform for a more circular, bio-integrated economy.

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This year sees commercial proof of concept across food, feed and carbon capture. Algae protein and supplements enter mainstream markets in Europe, while algae in carbon capture trials include land-based photobioreactor systems integrated into industrial sites.

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Bio-based plastics and packaging from algae expected to be commercially viable and increasingly adopted by consumer goods and cosmetics firms. Algae biofuel may power a minority of aviation and maritime transport.

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Algae could be a mainstream bioindustrial platform, underpinning sectors from agriculture and aquaculture to pharmaceuticals and grid-scale carbon drawdown.

Thank you.

Sustainable Growth For AI

Nymark solves growth complexities for technologies that matter. Through digital transformation and new ways of working, we pave the way for sustainable success.

Nymark