



European
Biosolutions
Coalition

Making Europe's Biorevolution Happen

Unlocking the potential
of biosolutions:
What are they and
why they matter?

Inspiring cases
from across Europe



“I want Europe to make the most of the biotech revolution. Biotechnologies supported by AI and digital tools can help modernise entire parts of our economy, from farming and forestry to energy and health.”

Ursula von der Leyen, 2024

Political Guidelines 2024 – 2029

Making Europe's biorevolution happen

Invented here – so let's scale it here

Biosolutions as the key to European competitiveness, resilience and sustainability

Europe stands at a crossroad. The world urgently needs resilient supply chains and reduced CO₂ emission. Europe can meet that need by harnessing the potential of biosolutions – biological innovation that cut emission, reduce dependence on fragile supply chains, and create new industries.

Biosolutions are a European strength and can drive the transformation of traditional industries and agriculture, jump-starting competitiveness in the process. However, Europe must act now if it is not to fall behind and watch other regions capitalise on innovation that was born here.

Biosolutions are more than a technological frontier; they are a strategic necessity. In a world of geopolitical fragmentation and disrupted supply chains they strengthen resilience and bolster Europe's autonomy. In an economy defined by low growth and sluggish innovation they open the door to new markets, jobs, and competitive advantages. The Draghi Report on European competitiveness highlights the need for bold investment in innovation and industrial capacity – and biosolutions provide precisely that.

At the same time, Europe faces the defining challenge of our time: climate change. Biosolutions offer a credible path to defossilisation – replacing petrochemicals with bio-based inputs, reducing land and water use in food systems and cutting greenhouse gas emissions at scale. From enzymes, that turn waste into valuable resources and precision fermentation producing proteins without livestock, to biomaterials - that remove reliance on oil - biosolutions expand the technological possibilities of a circular low-carbon economy.

This publication presents European biosolutions innovators already building that future. Their work shows that the “biorevolution” is not an abstract promise but a growing industrial reality. Yet, it also reveals the barriers; slow regulation, fragmented policies, and underinvestment that risks turning Europe into the place where technologies are invented only to see them scaled elsewhere.

The task is clear. Europe must create the conditions for biosolutions to flourish on its own soil – by modernising regulation, mobilising investment, and embracing the transformative potential of biotechnology across all sectors. This will not only reinforce Europe's competitiveness, resilience, and sustainability. It will also ensure that the benefits of the bio-revolution are harvested inside Europe.

Let's make Europe's biorevolution happen.



Sofie Carsten Nielsen
Director of European Biosolutions Coalition

What is a biosolution?

When we combine biology with technology, we enter the world of biosolutions. By using nature's own toolbox and applying it at scale, we can contribute significantly to combatting climate change, safeguarding biodiversity, protecting the environment, and securing food for a growing population.

The term Biosolutions refers to goods and services derived from combining biology and technology with the ambition of strengthening Europe's competitiveness and resilience, and accelerating the green transition.

How does it work?

The industrial revolution was characterised by massive factories.

The biorevolution is defined by 'micro-factories': Biosolutions are about using natural microorganisms and processes such as fermentation that have been used for centuries to create the products we need.



Barriers to a European biorevolution

This publication presents a variety of innovative European biosolutions companies – and the many barriers they face in their efforts to bring new and more sustainable bio-based products and solutions to market, such as:

Regulation made for old paradigms

Today, biosolutions are regulated by various regulatory regimes in the EU. These sets of rules have one thing in common: they are not designed with biosolutions in mind. The current regulations are aimed at foods and fossil-based substances. This results in outdated regulatory requirements that do not support innovative biosolutions and the acceleration of the green transition.

Biosolutions and bio-based industries are not recognised

No clear incentives for bio-based content in products are in place. Also, the current regulations do not always consider the role of sustainability properties, such as biodegradability and compostability, in a systemic way.

The consequence is this: European companies are now looking to other regions such as the United States, China, Brazil, Singapore, and the Middle East, when it comes to investment, production, and feasibly obtainable markets.

As a result, EU is falling behind its global peers, while preventing European consumers and industries from accessing innovative and sustainable solutions of European origin. These are solutions that could deliver on the EU's green ambitions.

Regulation and approval processes require renewal

While China, the United States and other regions are rapidly advancing their biotech and biomanufacturing industries through strategic investments and streamlined regulations, Europe has the slowest regulatory system among our competitor regions, risking its position as a leader in this sector. The long timelines make it difficult to attract funding and hard to compete. If swift action is not taken, Europe will birth ground-breaking bio-companies that will only grow and flourish elsewhere.

Key concepts within biosolutions



Bacteria

There are more bacteria on this planet than grains of sand – billions more. Bacteria are the most powerful life form on earth.

Bacteria and other microorganisms are essential for our survival (over 90 percent of the genes humans carry are contributed by the bacteria with which we live in close symbiosis). With bacteria we can boost plant health and keep food products fresh and safe for longer, simply because good bacteria help to naturally inhibit the development of pathogens and mould.



Enzymes

All living things have enzymes. Enzymes are biologically active proteins found everywhere in nature. When one substance needs to be transformed into another, nature uses enzymes to speed up and control the process.

Enzymes are small biological catalysts that increase the speed of various processes in living organisms. In the absence of enzymes, all chemical reactions would be so slow that the organism could not function.

Enzymes can be used on an industrial scale to optimize output, deliver better products, and accelerate processes, while saving water, energy, and raw materials.



Fermentation

Fermentation is the breakdown of carbohydrates like starch and sugar by microorganisms such as bacteria or yeast. Fermentation of food is an old technology used to safely preserve food for a longer period, for example in bread, cheese, wine, and fish. The technology is widely used in the current food system, from animal feed to yoghurt.

Fermentation has the potential to create a more sustainable food system with safer food by reducing spoilage and pathogens. Fermentation can also help produce healthier food and reduce food waste, for example by improving the nutritional composition of food and prolonging its shelf life. Microorganisms can be genetically engineered to produce high-value products such as nutrients, bio-pheromones, and biomaterials through precision fermentation.



Microorganisms

Microorganisms encompass different kinds of microscopic organisms that are found all around us in the millions.

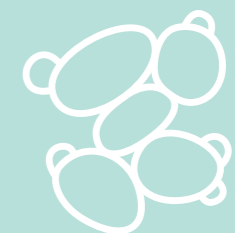
There are many kinds of microorganisms, and specifically bacteria, yeasts, and algae are of interest. Their roles differ, yet they often use organic carbon as fuel for their natural processes, such as fermentation. Their output is essential for our environment and for human life.



Precision fermentation

Fermentation has been around for thousands of years in human societies. However, today we can use precision fermentation, which is a more calculated technology. Precision fermentation introduces organic carbon to microorganisms, especially bacteria and yeast, which then create outputs of different kinds of proteins.

These microorganisms have been carefully crafted and undergone specific bioengineering techniques. Here, they are given specific genetic codes that change the fermentation process by instructing them to produce the desired molecule or compound of interest, such as proteins or pigments. These genes are not new; in fact, they are identical to DNA sequences found in animals or plants. But no living beings need to be involved, as the DNA sequences can be kept and reproduced in digital databases.



Yeast

Yeast is another microorganism that has been present in the world for hundreds of millions of years. Yeast is actually a fungus, but it grows as single cells, rather than as a mushroom. Yeast consumes sugar and produces by-products such as alcohol, carbon dioxide that makes bread dough rise, and other biochemical compounds. Yeast enables fermentation, and thanks to advances in genetic engineering, yeast – just like bacteria – can be modified to produce high value products.

To compete, Europe needs to invest from lab to market

Europe risks a scenario in which European researchers and companies sow the seeds of the biorevolution only to see others harvest, weakening both its competitive advantage and its ability to respond to future challenges with homegrown solutions.

1

The Opportunity

- Biosolutions have the potential to increase resilience and reduce the CO₂ equivalent emissions of food, materials, and energy dramatically and to replace fossil-based solutions.
- The market potential is enormous. The value of biosolutions on the European market is currently 60 million EUR, projections suggest that by 2035, the sector could contribute up to €291 billion directly, highlighting both the scale of opportunity and the strategic importance of supporting its growth¹.
- Advanced biotechnology has the potential to cut CO₂-equivalent emissions by 3-4 gigatons—or more than 5 percent of global emissions from 2022—and repurpose between 2-4 million square kilometers of land, roughly the size of India².

¹ Amsterdam Data Collective. *The Value of Biosolutions: Growth and Prosperity to 2035 – Europe Edition*. Commissioned by Novonosis, * 2025, p. 51.

² McKinsey Global Institute. *The Bio Revolution: Innovations transforming economies, societies, and our lives*. McKinsey & Company, May 2020, p. 69.

2

The Challenge

- While Europe offers strong support for science and R&D in biotechnology, scaling up commercialization to the industrial level poses significant challenges. This is especially true for SME's, which often face difficulties financing infrastructure to scale their biosolutions.
- Technological innovation in biotechnology is accelerating rapidly, but regulatory frameworks have struggled to keep pace. This lack of clarity, combined with lengthy fast-track approval processes, continues to delay the transition from lab to market, hindering efficient commercialisation.
- Business and market dynamics continue to present barriers, as conventional strategies and models often fail to reflect the distinct value of bio-based innovations. Strengthening biotech education and raising public awareness are key to building a skilled workforce and fostering societal trust, both essential for unlocking the value of biosolutions.

3

The Policy Recommendation

- Strengthen incentives for scaling and infrastructure, with targeted support for pilot and demonstration facilities to bridge the gap between R&D and market readiness as well as enable faster commercialization of biotech innovations
- Simplify and harmonize authorization procedures across member states to reduce delays and enable faster market access for bio-based products.
- Implement a risk-based and product-focused regulatory framework to assess biosolutions based on safety and environmental impact, rather than production methods, to support innovation and sustainability.

The EU should act as a strategic co-investor in public-private biotech partnerships to de-risk industrial investments, accelerate deployment, and ensure long-term commitment to biosolutions.

AFYREN

Turning biomass-waste into the acids that power everyday life

Problem: 99% of organic acids are petroleum-based

They provide flavour and work as natural preservatives in your food, inhibit mould in animal feed, and are a key ingredient in any flavour and fragrance product, just to mention a few.

Organic acids are used across many value chains and serve as a key component in everyday products from food and feed to cosmetics, materials, and lubricants. The market is large and growing. Still, it is estimated that nearly 99 percent of the organic acids on the market today are petroleum-based. Decarbonising the production of organic acids is essential if industries are to cut emissions and meet rising expectations for safer and more sustainable ingredients.

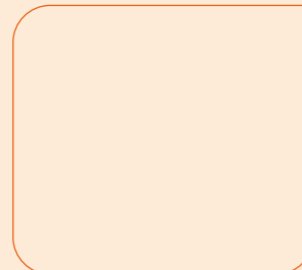
Biosolution: Renewable acids with no waste

The French green technology company AFYREN has found a way to produce carboxylic acids without relying on oil, gas, or coal. Instead, they turn renewable plant-based materials, like local agricultural by-products, into biobased organic acids; acids that can replace traditional petrochemical ingredients used in many consumer and industrial products.

They do so by using a natural fermentation technology and a fully circular process – which means there are no waste products. Everything that enters the system is either turned into valuable products or reused. This environment friendly and zero waste technology enables the valorization of different types of biomasses, not competing with human food chain.

Impact: A sustainable and responsible transition

AFYREN's acids are versatile and can be used across many industries. They play a role in preserving food, supporting animal health, and formulating flavours for a variety of consumer products. By offering bio-based alternatives to petrochemical ingredients AFYREN is helping different sectors transition towards more sustainable and responsible production.



These cases are a part of a broader selection of cases represented by the European Biosolutions Coalition. Get to know even more examples of biosolutions.

With a yearly production capacity of 16,000 tonnes at their French plant, AFYREN can, compared to fossil-based production, reduce greenhouse gas emission along the entire value chain by 30,000 tons every year.

AFYREN also ensures that the plant-based feedstocks used in their production are all sourced and produced locally, using safe and sustainable processes. The company's technology use very little water and requires no additional agricultural land, as it relies on non-food agricultural byproducts rather than crops grown specifically for industrial use.

Barriers: Rules and regulations do not support biosolutions

If innovative companies like AFYREN are to be able to compete on equal terms with traditional petrochemical producers, it is crucial that existing production regulations do not fail to account for biotechnology-based processes. Many rules and regulations are written for conventional chemical manufacturing. They need to be updated to accommodate and support modern bio-based production methods.

Another issue is the lack of standardised terminology. Without clear, legally recognised definitions for bio-based products it is difficult for regulators, businesses, and consumers to distinguish them from fossil-based alternatives. AFYREN stresses the need to properly account for the environmental benefits of bio-based products in official assessment tools such as life cycle analyses (LCA) and carbon accounting systems. This would ensure that their lower carbon footprint and renewable sourcing are fully acknowledged in both policy and market decisions.

Website: afyren.com

LinkedIn: [linkedin.com/company/afyren](https://www.linkedin.com/company/afyren)

AustroCel Hallein

Down to the last fibre and beyond:
Turning wood into fuel, fibres, and other groundbreaking innovations

Problem: We need more raw materials with less climate impact

European industries urgently need fossil-free raw materials and climate-friendly production methods to move towards a truly sustainable economy. Yet, forestry residues such as branches, logging leftovers, and sawmill scraps are mostly used in low-value applications – or not used at all – despite their high potential.

To fully convert these biogenic resources into high-quality materials and green energy – unlocking their full value for climate, environment, and society - this calls for integrated solutions across Europe.

Biosolution: High quality products from wood residue

In Austria the company AustroCel Hallein can use up to 98 percent of the industrial wood residues and transform them into high-quality products.

How? By developing one of Europe's most advanced integrated biorefineries, where biomass residues – in this case wood – are utilised down to the last fibre. Here, the wood is turned into substances like cellulose - which is used in textiles, construction, pharmaceuticals, and food - and into advanced bioethanol that can be used as fuel in the transport sector, while leftover parts provide energy for electricity, district heating, and biogas. In this circular way the company replaces fossil raw materials, reduces emission, and strengthens regional value creation.

In collaboration with the start-up AgroBiogel GmbH, AustroCel Hallein has developed the world's first 100 percent biological hydrogel from another wood component called Lignin. The biodegradable hydrogel helps soil retain water during dry periods and thereby supports farmers worldwide to facilitate growth on dry soils.



Impact: More quality, less emissions

Through their pulp production AustroCel Hallein prevents emission of more than 100,000 tons of CO₂ every year.

Furthermore, their ethanol production replaces fossil fuels and meets around 1 percent of Austria's gasoline demand, while the surplus bioenergy from the biorefinery supplies 30,000 households in the Salzburg region.

Barriers: Uneven playing field and muddy regulation

For a company like AustroCel Hallein, it is crucial that the expansion of integrated, small-scale solutions in Europe are not held back by the spread of unsustainable, low-cost alternatives on global markets.

At the same time, EU regulations - such as the EU Waste Management Law - still classify many biogenic side streams as waste rather than as resources. A clear regulatory recognition of integrated biorefineries as key players in the bioeconomy would greatly facilitate investment, market access, and circular solutions.

Website: austrocel.com

LinkedIn: linkedin.com/company/austrocel

Biosphere

Taking sustainability to an industrial scale

Problem: The hurdles towards a biobased industry

Combining biology with technology holds tremendous potential in the battle against climate change and in our efforts to live more sustainably. But to fully release the potential of biosolutions, constant innovation is necessary to turn today's chemical industry into a biobased one – with green, sustainable, and environmentally friendly processes.

The key tools are already there. They are just too small to see: enzymes, microorganisms, and their derivatives. To put them into use – at scale – companies that develop biosolutions need a strong partner. A partner that delivers the research necessary to overcome technical and engineering hurdles. A partner that supports the process to implement biosolutions into industrial processes at full scale – and into our everyday lives.

Biosolutions: Sustainability and innovation go hand in hand

The Italian company Biosphere can be that partner. Biosphere is a key player in the Italian industrial biotechnology sector and works as a technology platform, delivering deep tech along with research-based scaling facilities in which other companies can improve and test their products. Biosphere provides research and development along with scale-up services in the field of fermentation and industrial biotechnology, supporting customers and partners in the industrialisation of their projects.

Biosphere is also known for its development of tailor-made enzymes and microorganisms for a variety of market sectors. For example, Biosphere develops optimised microbial strains that can improve a plant's nutrient uptake and protect against diseases. The company is also involved with the creation of cosmetic, nutraceutical and food ingredients that have enhanced properties thanks to the fermentation processes. Moreover, enzymatic processes are now under development

at Biosphere to solve end-of-life issues of plastic materials with new and sustainable degradation processes.

Impact: The power of enzymes

Turning today's chemical industry into a biobased one requires strong collaboration between scientists and the industry. Biosphere is a key facilitator in this collaboration, helping new and innovative biosolutions to go from idea to reality.

Biosphere customises enzymes, designing and optimising them for specific applications, so that they can perform a very selective action. Using enzymes avoids the production of by-products in chemical reactions while operating in mild reaction conditions. This means less energy consumption and fewer harsh chemical compounds. The result? A safer process for people and for the environment.

Barriers: High quality research calls for high funding

To unlock the great potential of biosolutions, actions are needed on multiple fronts. First and foremost, there is a big need for funding in high-quality research, ensuring high level training for graduates in a number of different fields. Funding is also crucial in supporting the development of existing scale-up facilities, to appropriately cover the gap between ideas and industrial applications.

Website: biospheresrl.com
LinkedIn: [linkedin.com/company/biosphere-spa](https://www.linkedin.com/company/biosphere-spa)



Biotalys

Battling food waste with natural proteins for crop protection

Problem: What a waste!

Globally up to 30% of food produced for human consumption is wasted – even before it hits our plate¹. What a loss of resources and money, not to mention the massive impact it has on our climate: food waste is estimated by the Intergovernmental Panel on Climate Change to contribute 8–10% of total human-made greenhouse gas emissions².

This calls for numerous solutions – one being more innovative, biobased, and sustainable crop protection and food production. Still, chemical pesticides make up 90% of the market in today's agriculture with great risks for the environment.³

Biosolution: Battling fungi with proteins

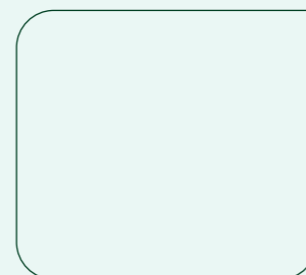
Farmers cultivating high-value fruits like grapes and strawberries that are particularly vulnerable to destructive fungal diseases can turn to a promising solution being developed by the Belgian company Biotalys. This innovative bio-based approach effectively combats grey mould and powdery mildew, providing a safe, chemical-free defence for produce that is often consumed directly.

The first biobased crop protection product developed by Biotalys, a biofungicide named EVOCA™, is based on proteins – the core ingredient of nature. The proteins are produced through precision fermentation, a biological process that utilises mainly sustainable and natural resources. It is a production method with great potential to become a sustainable alternative to conventional chemical pesticides.

This is how the proteins work: They are mixed with water and then sprayed on the crop. Here they interfere with the cell wall of the fungus, which bursts, and the fungus dies off. The proteins themselves are fully biodegradable, turning into amino acids that could even be beneficial for soil life.

Impact: A greener tool for growers

With proteins from Biotalys, growers gain a revolutionary tool to safeguard their crops while maintaining yield and income. These proteins are engineered



to replace chemical pesticides, ensuring crop protection and food consumption that is safer and more sustainable.

Extensive field trials around the globe have demonstrated that the product performs at par with existing crop protection products in spray rotation programmes. In grapes for example, the integration of a protein-based biocontrol in a spray rotation programme achieves fungal disease control comparable to or better than traditional methods, with effectiveness reaching up to 87% compared to untreated grapes.⁴

Barriers: We wait, and wait, and wait

At the EU level, the timelines to approve biobased solutions that can replace chemical pesticides are far too long. For example, Biotalys' first biofungicide, EVOCA, currently awaits registration by the European Commission. The file was submitted under Regulation 1107/2009 to the authorities in March 2021 and review has been going on for more than 3 years, with various regulatory steps still ahead. In the meantime, the product has already been produced in Italy and Austria, and Belgian and Danish distributors have been appointed. But European growers cannot start using the product if regulatory approval has not been obtained.

This threatens not only the viability of innovative small and medium-sized enterprises (SMEs), but more importantly the livelihood of farmers and the safety of produce for consumers.

To address these challenges, the sector is advocating for modifications to the current regulatory framework as a short- to mid-term solution. This can be achieved by establishing a green priority lane for biocontrol products, eliminating time-limited registration, reinstating provisional authorisations, and streamlining the process for label expansions. These changes would accelerate the authorisation process and bring biocontrol solutions to market more swiftly.

Website: biotalys.com

LinkedIn: [linkedin.com/company/biotalys-nv](https://www.linkedin.com/company/biotalys-nv)

¹ *The Boston Consulting Group, "Tackling the 1.6b ton food loss and waste crisis", 2018*

² *UN Sustainable Development Goals: the Sustainable Development Agenda*

³ *Biocontrol market now over worth 1.6 billion euro but EU policies a bottleneck to unlocking full potential*

⁴ *Biotalys announces results independent field trials US*

Borregaard

From wood to world solutions

Problem: There are petroleum-based chemicals in your home

They are the invisible helpers in your laundry detergent and dishwasher tablets, keeping clothes bright and glasses clear. While hard to live without, today's home-care formulations still rely heavily on petroleum-based chemicals – making the household detergents industry a major consumer of chemicals.

While some biobased chemicals are available, they are often derived from food crops, only partially biobased, and provide limited greenhouse gas reductions. On top of that they are often significantly more expensive.

This calls for more innovation in homecare formulations, with a focus on creating ingredients from circular biomass that have a low carbon footprint, can be produced at scale, and match today's petrochemical ingredients on both cost and performance.

Biosolution: Fewer chemicals and no compromise on quality

In Norway, the company Borregaard has developed a new type of biopolymer which is a natural building block that can be used to create new, functional materials: LignoBrite. It is designed to replace synthetic chemicals in homecare detergents without compromising performance.

Borregaard produces LignoBrite by taking lignin – a side stream of the pulp and paper industry – and carefully refining it into a water-soluble, bio-based ingredient. The result is a clean, consistent polymer that can be added to detergents and cleaners to boost performance without the need for petrochemical modification.

LignoBrite can substitute multiple commonly used to ensure cleaning efficiency, such as automatic dish-washing detergents and laundry detergents, where it prevents greying and encrustation, helping fabrics retain brightness.

Impact: Clean household, clean planet

Replacing synthetic ingredients in household detergents with alternatives like LignoBrite delivers significant benefits. The most immediate impact is a substantial reduction in greenhouse gas emissions. Life Cycle Assessment (LCA) and Environmental Product Declarations (EPD) show that LignoBrite has a 70% lower carbon footprint compared to polycarboxylates, which are prevalent in detergents.

LignoBrite significantly enhances circularity by utilizing lignin, a side stream from the pulp and paper industry. Household detergents already depend on the pulping of wood to produce cellulose, which is widely used in both detergent ingredients and packaging. By incorporating lignin, the natural byproduct of this process, into detergent formulations, the homecare industry can make far better use of the biomass it already requires.



Barriers: Regulation blocks circularity

LignoBrite faces some limitations under the current EU Ecolabel rules for detergents. Although the Ecolabel aims to promote sustainability across the product life cycle, its criteria for household detergents has a high focus on biodegradability with limited consideration of carbon footprint, circularity, or raw material origin (except for palm oil and packaging). Most non-edible biomass, including lignin and cellulose, do not meet the biodegradability standards set by Ecolabel, effectively limiting the amount of sustainably sourced biobased ingredients in certified detergents. Although LignoBrite can be used in Ecolabel-certified detergents, its maximum dosage is limited.

Conversely, synthetic polymers made from petroleum can be engineered to meet the biodegradability criteria with relative ease, allowing their unrestricted use in Ecolabel products regardless of the high CO₂ emissions and environmental damage associated with sourcing and producing these chemicals. This creates an unintended consequence: the detergents industry becomes even more dependent on petrochemical raw materials, undermining the Ecolabel's stated goals of reducing carbon emissions and promoting circularity.

Website: borregaard.com

LinkedIn: [linkedin.com/company/borregaard](https://www.linkedin.com/company/borregaard)

BRAIN Biotech AG

Upcycling CO₂ into a raw material

Problem: Our waste contains large amounts of carbon

Every day, industry and daily life produces significant quantities of waste streams such as household waste, sewage sludge, and industrial wastewater. An average of 740 grams of solid waste is produced by every person on Earth every day, amounting to 2.01 billion metric tons annually worldwide – equivalent to 502.5 million elephants.¹

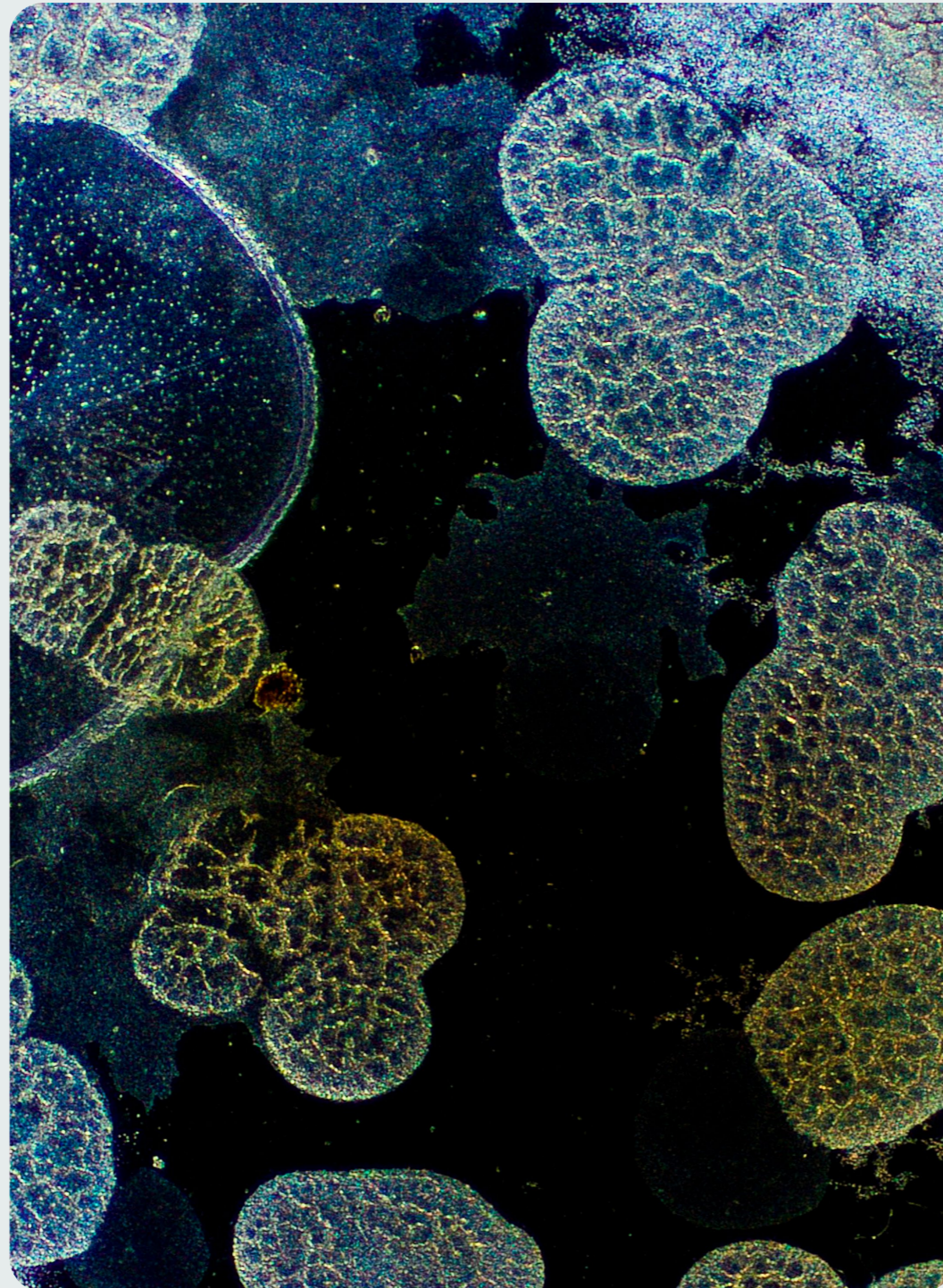
Hidden inside these streams are substantial quantities of carbon. When released into the air, this carbon poses a great threat to the environment. But what if we were able to convert the carbon from waste streams into valuable products – into a functional biomass?

Biosolution: From carbon-problem to carbon-potential

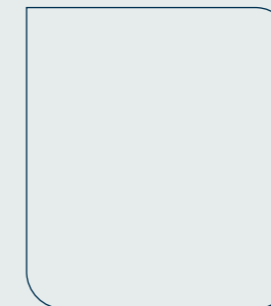
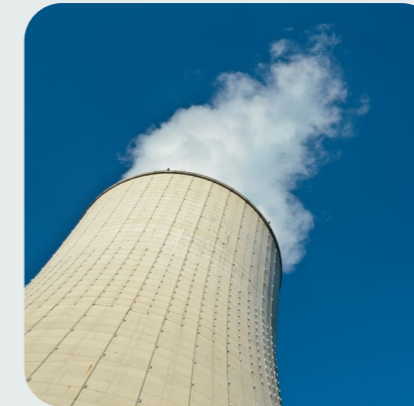
In Germany, a joint development program named ZeroCarbFP funded by the German government has been established to answer just that question. It uses biotechnology to identify enzymes and microorganisms that help utilise and transform waste streams into sources of raw materials. The best candidates are then optimised to prepare them for application in industrial production.

The German company BRAIN Biotech is in charge of developing a biotechnological process that utilises biogenic CO₂ from the production plants of Südzucker AG. The aim is to stabilise it for use as a raw material, convert it into valuable products, and eventually bring these processes to pilot scale.

BRAIN Biotech has now developed special microorganisms that use biogenic CO₂ as the carbon source to produce an intermediate raw material and to convert that to a platform chemical called monomer succinate. Due to its chemical structure, it can be easily converted into other chemical compounds and can also be used as a building block in polymer chemistry. Current uses include the production of clothing fibres, plastic,



¹ [Overview of municipal solid wastes-derived refuse-derived fuels for cement co-processing](#)



solvents, paints, inks, food and feed additives, pharmaceuticals, and perfumes.

Impact: The future is CO₂ in products, not in the air

Converting carbon from waste streams into valuable CO₂-based products can help reduce greenhouse gas emissions from existing production facilities.

BRAIN Biotech's concept could also be licensed to other CO₂ suppliers, such as utility companies handling waste, coal, or lignite. It could be licensed to heavy industry like steel and concrete production, or even bioproduction facilities, to reduce their emissions as well.

Barriers: Let's help consumers make better choices

CO₂-based products have enormous potential, but the market is competitive. This calls for a different pricing policy to encourage the provision of CO₂-based products. If you ask BRAIN Biotech, it could be as simple as this: reward the material use of CO₂ while taxing fossil-based products. Another tool could be a labelling system that informs customers about the carbon footprint of individual products, giving them the information needed to make more sustainable choices. Such regulation needs to be put in place on all levels: international, EU, country- and state-wide.

Other regulatory hurdles include the use of "waste" material in certain markets, especially food or cosmetics or employing genetically optimised organisms (GMO) for production.

Website: brain-biotech.com

LinkedIn: linkedin.com/company/brainbiotech

dsm-firmenich

Improving infant health while taking better care of the planet

Challenge: Breast-fed or bottle-fed, babies need human milk oligosaccharides

Human milk represents the nutritional gold standard for the approximately 385,000 babies born each day across the globe. However, some mothers may choose not to breastfeed, may only partially breastfeed, or cannot breastfeed at all.

Infants who are not breast-fed miss out on the natural Human Milk Oligosaccharides (HMOs) that are crucial compounds in infant nutrition. With human milk being the only natural source of HMOs, one way to help these infants is to produce HMOs for infant formula at an industrial scale. This can be achieved by combining biology with technology.

Biosolution: Fermentation = more HMOs and less CO₂

The Swiss-Dutch company dsm-firmenich uses biotechnology to make the production of HMOs more efficient and sustainable.

Here is how it works: dsm-firmenich uses a dedicated micro-organism that has been subject to extensive research and checks to ensure its safety. Thanks to gene technology, the microorganism has been tailored to produce specific compounds: in this case, HMOs.

The production is achieved through precision fermentation, which is a process through which microorganisms, such as bacteria, are fed with carbon sources, such as sugars, to produce other molecules (in this case, HMOs). This happens within an isolated and controlled environment in which temperature, pH, feeding material, and other factors are strictly controlled. The customised microorganisms are separated from the final product, so that the final product does not contain any genetically modified microorganism (GMM).

This biotech-driven approach enables HMOs to be produced in ton quantities, ensuring these beneficial molecules are available and affordable for a much broader population. The production methods used at dsm-firmenich offer several other advantages too, particularly in terms of sustainability. The fermentation processes are operated with renewable resources and thereby contribute to



Website: dsm-firmenich.com/en/home.html
LinkedIn: [linkedin.com/company/dsm-firmenich](https://www.linkedin.com/company/dsm-firmenich)



a circular economy. Biomass is recycled into biogas, while all electricity used is from renewable sources.

Impact: Better health, better planet

Breast milk is the gold standard for infant feeding and is the only natural source of HMOs. But when breast feeding is not possible, the best option is to improve infant formula with the addition of sustainably produced HMOs. Their intake has been associated with improvements in gastrointestinal microbiota and reduced infections and may assist with cognitive development.

It's a win-win situation, supporting the health and well-being of infants while also taking care of the planet that they will inherit.

Barriers: Regulation is hampering innovation

HMOs are registered as novel foods in the EU. At the same time, since they are produced with GMMs, their manufacturing process must comply with EU rules on the contained use of genetically modified micro-organisms (Directive 2009/41/EC). These regulations and their national implementation are becoming increasingly cumbersome. Result? The innovation and competitiveness of European industries are curtailed.

One example: some EU Member States, based on a questionable interpretation of EU legislation, require that the absence of recombinant DNA (rDNA) in such products is experimentally confirmed at the parts per billion level to demonstrate compliance of fermentation products with EU legislation on the contained use of GMMs. Achieving this level of purity is extremely demanding and not proportionate to the actual safety risks. And according to a significant body of scientific literature¹, the requirement for absence of rDNA is not per se of safety relevance but makes the production process more time-consuming and more costly than necessary.

¹ Lensch, A., Duwenig, E. and Dederer, H.-G. et al. (2022) Recombinant DNA in fermentation products is of no regulatory relevance. *Food Control* 141, 109170. <https://doi.org/10.1016/j.foodcont.2022.109170>.

Epoch Biodesign

Transforming plastic waste into a valuable resource

Problem: Life with plastic, not fantastic

Plastic is everywhere, from the bottom of the ocean to the cells of the food we consume. Most plastic is never recycled, so the Earth is now covered in over 10 billion tons of plastic waste¹.

Our mismanagement of plastic has made it one of the world's biggest environmental problems, and with no viable solution, it floods into our natural ecosystems. Alternatively, the plastic is incinerated, releasing polluting gases into the atmosphere, and with them, the value of their fossil carbon.

Biosolution: Machines of the biological kind

The UK company Epoch Biodesign has developed a technology that transforms plastic and textile waste into infinitely recyclable materials and everyday chemicals.

By combining generative AI, biology and chemistry, Epoch engineers "biological machines" known as enzymes. These enzymes catalyse rapid, low-energy chemical reactions to break down long plastic molecules into their chemical building blocks, which can be used to make virgin-quality recycled materials again and again. This significantly reduces carbon emissions and unlocks processes with game-changing unit economics.

With no compromise on cost or quality, Epoch Biodesign provides an end-of-life solution for complex pre-and post-consumer waste and is paving the way for a more sustainable, less polluted future in which production can be decoupled from fossil carbon extraction.

Impact: Solving two problems with one enzyme

The impact of this innovative technology is significant and multifaceted. Epoch Biodesign provides a solution for end-of-life plastic waste and produces sustainable recycled materials that reduce our reliance on fossil carbon.

This limits plastic pollution by providing an economic alternative to clogging landfills and oceans, harming wildlife, and littering ecosystems. It also lowers greenhouse gas emissions by decreasing our use of fossil carbon for the production of new chemicals and materials.

¹ [EIA study reveals a 10 billion tonne plastic pollution bomb ticking away in every corner of the planet](#)



Transforming waste into a valuable resource supports a circular economy, promotes environmental sustainability, and helps mitigate climate change, benefiting both nature and human health.

Barriers: Let's design for recyclability

A number of developing and incoming EU regulations could remove barriers and support the adoption of this technology at scale, including the Waste Framework Directive, Ecodesign for Sustainable Products Regulations, and Extended Producer Responsibility (EPR).

For example, the requirement that textiles placed on the EU market have a certain percentage of closed-loop recycled content and be designed for recyclability will increase demand for the technology developed by Epoch Biodesign. Additionally, the potential for using EPR to finance end-of-life waste management facilities would ensure the collection and sorting of post-consumer waste scales to meet the demand, and therefore remove a significant barrier for the technology to access this feedstock.

A potential barrier to these regulations having the expected impact is the lack of harmonisation and clarity across different member states. In addition, it remains to be seen if manufacturers and brands will meet the requirements of the most demanding regulations or will find a way around them. Additionally, the use of the term "recycled" without truly defining what it means, and if it is from an open or closed-loop sources, provides additional challenges to promoting a truly circular solution within industries and for consumers.

Website: epochbiodesign.com

LinkedIn: [linkedin.com/company/epochbiodesign](https://www.linkedin.com/company/epochbiodesign)

Futero

Reinventing chemistry using nature's own molecules

Website: futerro.com

LinkedIn: [linkedin.com/company/futerro](https://www.linkedin.com/company/futerro)

Problem: Fossil fuels and chemicals dominate Europe

The chemical industry is faced with a major challenge. Chemicals are present in about 95 percent of manufactured goods and are the basis of Europe's major value chains.

In addition, the industry is one of the largest CO₂ emitters in the EU¹, and around 95% of feedstocks in the chemical industry come from fossil fuels².

While full decarbonization is not feasible, since carbon is a fundamental component of most chemical industry products, the sector urgently needs eco-friendly, defossilised methods to produce essential chemicals, materials, and circular plastics.

Biosolution: From sugar to bioplastic

With over 30 years of experience, the Belgian company Futero develops and produces bio-based platform molecules such as lactic acid and lactide, as well as PLA (polylactic acid) which is a sustainable, bio-based, and circular polyester.

How? By converting sugar from crops like corn and wheat into lactic acid using fermentation, which is then polymerized into PLA. A process that harnesses CO₂ captured by renewable resources through photosynthesis.

Lactic acid and lactide can serve as a base for the chemical industry, enabling the production of applications such as green solvents, natural preservatives, and ingredients for the food and feed sectors.

Meanwhile, PLA can replace traditional fossil-based plastics in many different applications like textiles, 3D printing, food packaging, films and more.

Impact: A truly circular model

Bio-based chemicals and plastics are key to reinventing chemistry. PLA is entirely circular, capable of offering the most suitable end-of-life option for each application such as reuse, industrial composting or recycling.

Also, Futero has developed LOOPLA[®] technology, a system that can break used PLA materials back to its original building blocks; lactic acid. This allows the material to be recycled again and again - forming a truly circular model where nothing goes to waste.

Barriers: Lack of market incentives and regulatory action

To support the development, commercialisation, and widespread adoption of bio-based chemicals and materials, the EU needs to provide clear market incentives. This means turning ambitious strategies — like the Clean Industrial Deal — into real action through concrete regulations such as the Biotechnology Act, the Packaging and Packaging Waste Regulation, and the End-of-Life Vehicles Regulation.

Another key step is recognising first-generation biomass like crops as a viable and necessary alternative to fossil materials. This should be supported by a sustainability criteria and used in accordance with the cascading use principle. For companies like Futero it is also essential to ensure that the benefits of using biomass over fossil-based materials are properly reflected when measuring environmental impact.



¹ Transition pathway - European Commission
² Sustainable emissions pathways in the chemicals industry | PwC

Koppert

Look to nature to find safe and healthy ways of growing food

Problem: Food production is out of touch with nature

With a growing world population, we need to produce more food than ever before. But business as usual isn't working anymore. Not when our current agriculture and food system is responsible for a third of the world's greenhouse gas emissions and as much as 70% of land biodiversity loss.¹

Add to that pollution of our soil, air, and water along with considerable risks to human and animal health caused by chemical plant protection products. To make our food production healthier and more sustainable – and to pave the way for sustainable agriculture – we need to offer farmers and growers a selection of efficient and low-risk biological control solutions.

Biosolution: Protecting European crops with fungus

The Dutch company Koppert has more than 55 years of experience in the production of natural enemies and microorganisms. Found in nature, Koppert's products work as biological solutions for farmers and growers to protect their crops against pests and diseases.

One example is Mycotal – a fungus that can attack and kill pests. Mycotal works as a bio-insecticide that prevents whiteflies and several other pests in vegetables, ornamentals, nursery trees, and soft fruit in protected cultivation.

The bio-insecticide contains spores that germinate rapidly after spraying, penetrating the pest's body cavity and destroying its tissues. The fungus then grows through the insect cuticle and produces spores on the outside of the cadaver, which may spread the infection to other vulnerable pests.

Impact: Healthy plate, healthy farmer, healthy nature

Biocontrol allows farmers to operate in a sustainable manner and bring high-quality products to our tables.



Bio-insecticides like Mycotal, which is already available on the market, originate from nature. They provide farmers and growers with tools to control pests and diseases in a sustainable and eco-friendly way. Koppert's biological solutions also reduce risks for human and animal health while supporting ecosystem services. They present no adverse effects on the environment while also being safe for beneficial insects.

Barriers: Same, but different

Measures are needed to speed up the availability of biocontrol solutions so farmers and growers can have access to effective and safe alternatives. Unfortunately, the greatest barrier for the marketing of such products are the excessively lengthy and burdensome processes applicable to products like Mycotal under the EU Regulation 1107/2009.

The current European authorisation process is very slow, averaging 7 to 8 years, and in practice can take up to 10 years. In contrast, other major markets take only 1 to 3 years or less. As a result, Europe has become less attractive for new investment, forcing biocontrol companies, whose investors demand a timely return on investment, to deprioritise Europe.

Website: koppert.com

LinkedIn: linkedin.com/company/koppert-global

¹ Duurzaam voedsel | WWF | Voedselsysteem bedreigt natuur

Novonesis

Keeping food fresh for longer with fermentation

Problem: Yoghurts and other foods are wasted because they are past their use-by date

Food waste and food safety continue to be serious issues. In the EU alone, up to 17% of all yoghurt is wasted annually, equivalent to 1.5 million tons.¹

Up to 80% of yoghurt wastage occurs because the use-by date passes, sometimes without the product even being opened.² As consumers are becoming more conscious of what is in their foods, there is a need to address shelf-life issues without adding artificial ingredients.

Biosolution: Fighting bad bacteria with good bacteria.

Fermentation is an ancient way to keep food fresh for longer. It is a natural way to reduce spoilage and contamination with “bad” bacteria. The Danish company Novonesis produces beneficial bacterial cultures (food cultures) that optimise the fermentation process. This way, it is possible to enhance the quality, freshness, and shelf-life of the final product. The food cultures create an extra protective hurdle against “bad” bacteria in, for example, meat and dairy products, as well as in ready-to-eat foods, during processing, transportation, and storage, and even after the product has been opened.

Impact: 7 more days save us tons of CO₂

The use of selected food cultures can play an important role in achieving the EU goals related to the reduction of food waste and CO₂ emissions. If food cultures are used to prolong shelf-life of yoghurt by 7 days, this could lead to a reduction of up to 30% of yoghurt waste in Europe alone. This reduction would result in estimated annual savings of 250 million euros and a decrease of 520,000 tons of CO₂ emissions.³ Similar reductions can be achieved for other food categories.

¹ Qbis Consulting 2016, *Reducing food waste and losses in the fresh dairy supply chain*, p. 31. The study was commissioned by Chr. Hansen
² *Ibid*, page 22
³ *Ibid*, page 31. See also Chr. Hansen's summary of the results, at: *Our fight against food waste* (chr-hansen.com)



Barrier: Fermentation is not an additive, it's a natural process

At the EU-level, a Commission proposal is being discussed to classify the use of food cultures outside of traditional fermentation as so-called “food additives” under the EU Food Additives Regulation. This proposal risks creating an unnecessary burden on the biosolutions industry and EU authorising bodies. It will also hinder the innovative potential that lies in fermentation technology, which is key in the transitioning towards more sustainable food systems.

In the EU, any substance that falls under the definition of a food additive must obtain a preapproval, go through an EFSA risk assessment, be authorised for use as a food additive in its specific product category, and be included in the ingredient declaration of that product with their name or ‘E’ number. Classifying food cultures as additives is unnecessary and disproportionate for food cultures, which are a normal part of the microflora of any food, our surroundings, and ourselves. Furthermore, food cultures have a long history of safe use as food ingredients in fermented foods.

Instead, a simple solution could be to inform consumers of the presence of food cultures in the food by labelling the food cultures in the ingredients list.

Website: novonesis.com/en

LinkedIn: linkedin.com/company/novonesis

Revyve

Replacing egg ingredients using yeast proteins

Problem: We need to rethink food in the future

Rising egg prices are putting pressure on food producers who need stable, affordable ingredients to keep costs under control. At the same time, consumers and regulators are questioning ultra-processed foods, pushing brands to simplify recipes and remove additives without sacrificing texture or quality.

Add to that a growing demand from retailers and manufacturers to cut CO₂ emissions across the supply chain, making sustainable alternatives to animal ingredients more important than ever.

Biosolution: Egg-like functionality with yeast

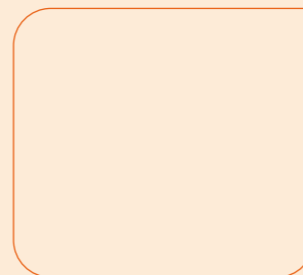
The Dutch food-tech company Revyve creates high-performing texturizing ingredients from brewer's and baker's yeast – natural, animal-free alternatives that replicate the functionality of eggs in a wide range of food applications.

The core of their technology is a process that partners with breweries and yeast producers to source high-quality yeast. They use a relatively gentle mechanical and thermal treatment to open the yeast cells and extract the proteins and fibres, without using enzymes or solvents. This preserves the natural functionality of the proteins, including their ability to gel, emulsify, stabilize, and bind.

Unlike many plant-based egg replacers that rely on blends and additives, Revyve achieve egg-like functionality with a single ingredient: yeast protein. This enables cleaner labels, greater functionality, and easier integration into existing production processes.

Impact: Food solutions that deliver on taste and texture

Clean labels, cost stability, and credible sustainability are now baseline expectations. Consumers want natural ingredients and food experiences that deliver on taste and texture, while brands need scalable solutions that reduce reliance on eggs. Revyve can deliver just that.



The Dutch company is also tackling some of the key sustainability and nutrition challenges facing the food system. Their solutions reduce dependence on animal ingredients such as eggs, which require large amounts of land and energy and have a relatively high climate footprint. By offering food manufacturers an alternative that can deliver the same functionality – binding, emulsifying, gelling – without eggs, Revyve helps lower CO₂ emissions and the overall environmental impact of many foods.

Barriers: Europe faces tomorrow with yesterday's rules

Revyve's growth in Europe hinges on two key reforms: unlocking different financial channels and modernizing EFSA's regulatory processes. These changes would benefit both Revyve and strengthen the EU's position as a global leader in biotechnology, sustainability, and food innovation.

Financing is a major challenge as biotechnology is capital-intensive and requires substantial upfront investments in facilities, research, and meeting regulatory requirements. To make this possible, companies like Revyve need easier access to significant EU funding, while (venture) debt could help speed up the build-out of new infrastructure. Simplified application processes and clearer rules for who qualifies would help more companies tap into these funds.

EFSA's regulatory framework presents significant challenges too. An example is the guidelines for Novel Food applications which are fragmented and lack cycles of early feedback. This increases the complexity and the risk of regulatory rejections.

Website: revyve.bio
LinkedIn: [linkedin.com/company/revyve-simplygood](https://www.linkedin.com/company/revyve-simplygood)

Those Vegan Cowboys

Animal-free cheese made by a stainless steel cow

Problem: Dairy farming needs to up its game

Cheese is great. Cows are amazing. But dairy farming could do with an update. It's become notorious for its burden on land, water, biodiversity, and climate. Combine that with the expectation from the UN's Food and Agriculture Organisation (FAO) that global animal protein consumption will double by 2050, and it is clear that something's got to give. Free the cow from cheese production, and the environmental impact becomes practically zero – a major leap forward for the entire industry.

Biosolution: Meet Margaret – the stainless steel cow

To make this happen, the Belgian company Those Vegan Cowboys has built a stainless-steel cow in their milk lab in Ghent, Belgium. You may call her Margaret, like that other Iron Lady who made European history.

By using the ancient art of fermentation, Margaret serves the world real classic grass-fed cheese with the help of microbes. The process is called precision fermentation: a technology that is 50 years in the making.

Margaret's microorganisms are trained to express the casein milk proteins. Caseins are then produced at large scale by grass-fed fermentation. It's a lot like brewing beer but instead of alcohol, you get the casein milk proteins.

Impact: Food for 5 times more people

Margaret is at least 5 times more efficient in energy conversion, land, and water use. She offers the dairy industry the key to growing past the cow's physical limitations in the healthiest way imaginable, and we can feed 5 times more people from the same amount of land. A recent comparison of company LCAs (life cycle assessments) shows even greater benefits for non-animal fermented products.

Along these lines, an independent LCA at the University of Helsinki, focused on the different forms of energy used to produce all kinds of animal-free proteins from precision fermentation. Published in the journal ScienceDirect in 2021, it concluded that precision-fermented proteins had a 53–100% lower environmental impact than animal-based proteins.



Margaret has already achieved the impossible: she produces real casein, the most difficult and essential ingredient for cheese. Now that different kinds of delicious regulatory cheeses are ripening in Those Vegan Cowboys' cheese caverns, the next steps are refining, upscaling and perhaps the biggest challenge of all: getting the paperwork sorted.

Barriers: The European Regulatory Approval process – so we look outside the EU

With EU's Novel Foods regulation and current timelines, European precision fermentation companies have no choice but to submit their applications in the USA & Asia. For example, the EU transparency regulation for food and the EU requirement for absence of host DNA in the product do not create an equal level playing field.

To be more specific: Those Vegan Cowboys can produce casein and are currently scaling. They work together with large dairy players to make the best cheeses. But due to the European regulation timeline, Those Vegan Cowboys are not able to enter the European market for at least the next four years. This disturbs the pace of innovation, as they are ready to enter the market, but held back by regulation. Due to the long timelines, it's hard for companies like Those Vegan Cowboys to attract funding, while similar players in the USA or Asia speed up. This creates an unequal playing field and puts Europe at a disadvantage in the progress towards a more sustainable food system.

That is why Those Vegan Cowboys together with other European precision fermentation companies formed the Food Fermentation Europe alliance to address EU legislation with one voice. As the old cowboy saying goes: if you want to go far, go together.

Website: thosevegancowboys.com

LinkedIn: [linkedin.com/company/those-vegan-cowboys-grassroots-bandits](https://www.linkedin.com/company/those-vegan-cowboys-grassroots-bandits)

Twig

AI ingredients that don't cost the earth

Problem: Fossil fuels continue to harm our planet

Pick up any bottle, box, tube, or container and have a look at the small print on the back. Here you will find the biggest little ingredients that make the world go round: acetone, isoprene, and palmitic acid – just to name a few. They are used in many of our everyday products such as cosmetics, soaps, paints, and even margarine.

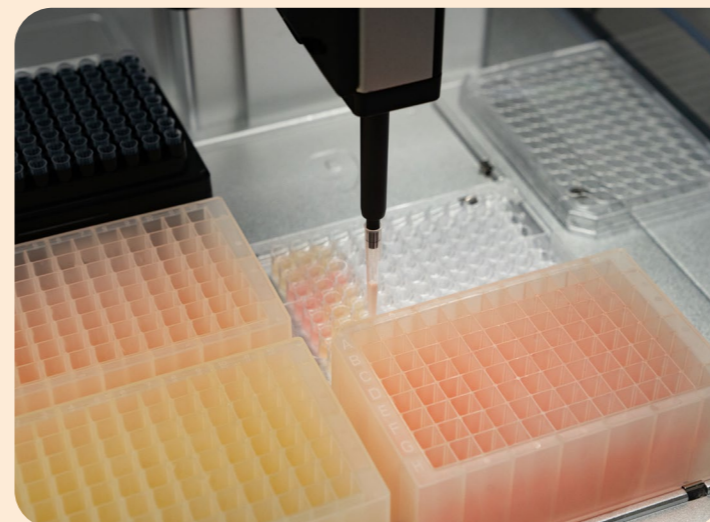
But most often these ingredients are produced from fossil fuels or through intensive farming methods that harm forests, wildlife, and contribute to climate change. Acetone, isoprene, and palmitic acid are just a few of hundreds of ingredients that could have better alternatives with little to no compromise. How? By replacing them with cleaner, bio-based alternatives.

Biosolution: Top-performing microbes for high-quality ingredients

Combining AI with biology, the British ingredient company Twig is speeding up the development of and improving sustainability in everyday ingredients. Twig can make hundreds of different ingredients in a clean and sustainable way by using microbes as miniscule factories. It is called precision fermentation - a technology that allows Twig to create microbes that can grow all the ingredients we rely on every day.

Here is how it works: Using an AI-driven system called "BioDrive" Twig is able to explore billions of possible microbe designs. It then evaluates which designs are most promising and prepares them for lab testing – all in seconds rather than weeks. Twig's automated lab system "GrowBot" then takes the AI-generated microbe designs and grows them in plates and fermentors. With very fast, low-cost testing, it generates real-world data to identify the top-performing microbe for scaling. This ensures scalable production in large volumes, addressing a key challenge in industrial biotech.

With AI, biology and robotics working together, Twig can create drop-in replacements for existing ingredients, initially focusing on the cosmetics industry, with the potential to expand into food, pharmaceuticals, and other sectors.



Impact: Bioengineered ingredients using less time and resources

The AI-powered bioengineered ingredients from Twig stand to benefit not just the planet, but also consumers and manufacturers - saving time, resources, and reducing environmental impact. Twig's first ingredient coming to market was developed in under a year and replaces fossil-fuel-derived chemicals in beauty products.

Twig prioritises the use of waste feedstocks, partnering with companies such as Tate & Lyle Sugars to repurpose their waste streams. The initial focus is on utilising waste sugar from food processing, transforming a discarded resource into a valuable input for their bio-manufacturing process. This approach reduces reliance on fossil fuels and intensive farming, contributing to a circular economy and minimising environmental impact.

Barriers: Regulations make it difficult for new biosolutions and companies

Close partnerships with manufacturers are crucial for Twig's business model, ensuring that they can efficiently supply ingredients to customers worldwide. As Twig's range of bioproducts grows and demand increases, it is vital that contract manufacturers have the right capacity and processing capabilities. This will require continued investment and growth in these providers. Another barrier for companies like Twig is high electricity costs as biomanufacturing depends heavily on energy to heat, cool, and run fermentors. Therefore, competitive electricity prices are essential for any country aiming to build a strong biomanufacturing sector.

To date, complex regulations have made it difficult to bring new biobased products to market. Only large, established companies have the resources to navigate the requirement with multiple agencies and departments covering product authorization (SCCS), manufacturing (REACH) etc. A more transparent and innovation-friendly process could unlock a wave of new technologies and products - while still maintaining high safety standards.

Website: twig.bio

LinkedIn: [linkedin.com/company/twigbio](https://www.linkedin.com/company/twigbio)

Visibuilt

Reimagining road construction, inspired by nature

Problem: Our roads are built the same way they were 100 years ago

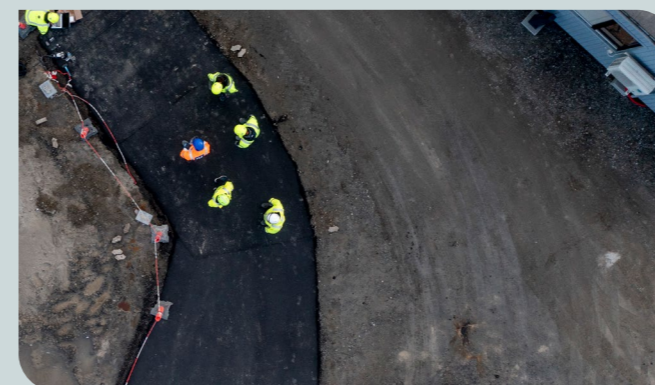
Highways, avenues, streets and roads connect us across cities, borders, and in our daily lives. But road construction still relies heavily on crude oil and oil-dependent principles similar to those used 100 years ago, with little to no real alternatives available on the market. In fact, the asphalt industry has remained virtually unchanged over the last century, with a key ingredient being bitumen, a product of crude oil refining that is shipped in overseas. Bitumen acts as the binding agent in asphalt. However, it requires temperatures of up to 200°C and is both a polluting and highly energy-intensive resource.

Biosolution: Mycelium can connect the world

The Danish biotech startup Visibuilt can support the asphalt industry by replacing the fossil-based binder bitumen with their fungi binder, visiBIT, derived from nature's own binding agent: mycelium. Mycelium is the natural root-like structure of very small fungal threads that grow underground, into a resilient net, through the soil.

visiBIT is developed through fermentation, where mycelium is grown on organic side streams inside a bioreactor. The process is remarkably energy efficient. Traditional asphalt production with bitumen requires heating of rock materials up to 200 degrees Celsius, while mycelium-based asphalt can be constructed at room temperature. This means the potential energy savings are huge. Once applied with rocks, visiBIT develops into a strong network that binds the stones tightly.

Visibuilt's innovative solution leverages the potential of fungi. When using visiBIT, it is possible to reduce the road industry's dependency on fossil fuels, as it offers an alternative to bitumen. Existing bio-based solutions often only partially replace bitumen, typically acting as fillers rather than binders, but with visiBIT, the road industry can be transformed.



Website: visibuilt.com

LinkedIn: linkedin.com/company/visibuilt

Impact: The road to a competitive, resilient and sustainable Europe

The global pressure for climate-neutral solutions is increasing and securing a green transition for an otherwise overlooked industry, such as road construction, can create significant climate impact and supply-chain security. With more than 60% of the world's roads to be built before 2050, there is a critical need for new solutions within the road industry, with less dependency on solutions, such as fossil fuels, that are susceptible to fragile supply chains.

The novel technology visiBIT can help decrease the industry's reliance on fossil fuels while also contributing to a safe working environment. The global market potential exceeds 100 billion euros annually. Since asphalt is produced in the same way all over the world, it allows visiBIT to be the scalable solution the asphalt and road industry has been waiting for.

Barriers: Europe's outdated ways

The transition to sustainable solutions in the road construction sector is currently hindered by several key barriers. The most significant is EU's standards, which dictates the use of bitumen in asphalt. This prevents asphalt customers from using visiBIT in a standardized way and locks in dependence on fossil-based materials. At the same time, the approval process for new standards is far too slow, often taking more than 10 years, making it nearly impossible to bring new technologies to market in a timely manner in EU.

Furthermore, there is limited access to test areas in Europe where companies can demonstrate the real-world performance of their solutions. Combined with a lack of public and patient capital, this puts many promising startups at risk of failure before they can scale. Investors are hesitant to commit to European startups when outdated regulation blocks the path to market. To secure Europe's leadership in bio-based innovation, companies like Visibuilt urgently need faster approval processes, strong political commitment, and better access to both test sites and long-term funding.

The European Biosolutions Coalition

The European Biosolutions Coalition is an initiative established by European industry organisations, representing a substantial amount of the companies working with biosolutions in Europe, to elevate the prominence of biosolutions on the European agenda.

The Coalition is dedicated to advocating for the green transition, fostering more intelligent approaches within the industry, and creating enhanced prospects for companies working with biosolutions in Europe.

eubiocoalition.eu



The European Biosolutions Coalition is supported by the Novo Nordisk Foundation and Danish Industry