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Deep Dive 1 2 3 4

Agrifood Biotech

Extending Dutch agrifood leadership into the biotech era.



Agrifood biotech

Supported by the European Union under the InvestEU Advisory Hub

Introduction to the Invest-NL Biotech Series

Biotechnology is becoming a defining technology of the 21st century, transforming industries and strengthening economic resilience. The Netherlands has world-class science, companies and expertise, but must turn innovation into scalable businesses and lasting economic value.

Invest-NL helps bridge that gap by investing, mobilising capital and removing barriers to growth. Through this series of deep dives, we identify investment opportunities and bottlenecks, providing entrepreneurs, investors and policymakers with a shared evidence base to strengthen the Dutch biotechnology ecosystem and unlock its full potential.

Enabling biotech

Focuses on the enabling technologies and platform capabilities that underpin the entire biotechnology ecosystem.

Agrifood biotech

Explores how biotechnology can strengthen the future of food production, agriculture and food security, building on the Netherlands' globally leading agrifood ecosystem.

Industrial & Circular biotech

Explores how industrial biotechnology can accelerate the transition towards a circular, bio-based economy while strengthening the competitiveness of Dutch industry.

Life Sciences & Health biotech

Examines how the Netherlands can translate world-class medical research into globally competitive biotechnology companies, improving health outcomes while strengthening strategic autonomy and economic growth.

Want the full picture on Dutch biotech?

Discover the Invest-NL Biotech series: **invest-nl.nl/en/biotechnology**

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Step 1 The value chains

We analyse three distinct value chains to evaluate and compare scaling conditions across different market segments.



A **Seed breeding and genetics**



B **Biological agricultural inputs**



C **Biotech ingredients and food applications**

Step 2 How we analyse

We apply the same **6 dimensions** across all three value chains to assess their scaling potential and readiness.

1. Market demand
2. Capital
3. Infrastructure
4. Regulation
5. Talent
6. Ecosystem collaboration

Step 3 How we act

Flowing directly from the six dimensions, we set **3 recommendations** to fix recurring bottlenecks: start more new companies, launch products faster, and help businesses grow to industrial scale.

Fertile Ground
Create more scalable ventures

Foundation
Accelerate market entry

Flywheel
Enable industrial scale-up

Foreword

The Netherlands is well placed to lead in agrifood biotech, but the opportunity will not wait

This is the second report in Invest-NL's biotechnology deep-dive series. The first looked at the technologies behind modern biomanufacturing. This report turns to agrifood, an area where the Netherlands already has a strong position.

Over decades, the Netherlands has built leading positions in seed breeding, biological crop protection and food innovation, backed by strong biotechnology and biomanufacturing capabilities. Together they can grow existing industries, create new companies, and keep valuable knowledge and economic activity in the Netherlands and Europe.

The international context is moving fast. Other countries are investing heavily in biotechnology and strengthening their own food and biomanufacturing capabilities. Climate change and geopolitical tensions are making resilient food systems and strategic autonomy urgent priorities for Europe. The Netherlands has a credible starting point, but that position cannot be taken for granted. Therefore we are happy to hear that the government announced the agrifood innovationagenda. An agenda to stimulate and accelerate in innovations within biotechnology in food and resilient crops.

Agrifood biotech can become an important source of growth and resilience for the Netherlands. Realising that potential will require changes. New technologies need regulators willing to approve them, farmers willing to test them, consumers and food companies willing to buy them, and investors willing to fund them. None of that happens without closer cooperation across the value chain.

This report looks at three areas where the Netherlands has distinctive strengths and opportunities: seed breeding and genetics, biological agricultural inputs, and biotech ingredients and food applications. Each starts from a different point and faces different barriers. The report examines where the Netherlands can build on its existing strengths and what is needed for companies and innovations to grow.

We are grateful to the entrepreneurs, companies, researchers, investors, policymakers and ecosystem builders who shared their experience and challenged our thinking along the way.

Jellie Banga, Chief Business Officer Invest-NL



The big picture: Three priorities to scale Dutch agrifood biotech

This chapter brings together the main findings, priorities and investment agenda for Dutch agrifood biotech. Chapters A–C provide the underlying analysis and recommendations for each value chain and can be read independently.

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The opportunity

The Netherlands has a strong starting position, but competition is moving quickly

The Netherlands has a strong starting position in agrifood biotechnology. It combines leading breeding and food companies, high-tech horticulture, strong research and biotechnology expertise, and specialised industrial and application capabilities. The opportunity is to build on these strengths by creating more companies, bringing innovations to market faster and helping the strongest companies reach scale.

The first deep dive in this series focused on the technologies that enable modern biomanufacturing. This report looks at where those capabilities matter in agrifood.

We focus on three value chains where the Netherlands already has relevant strengths and where biotechnology is likely to become increasingly important. Each requires a different approach.

The Netherlands has a rare combination of agrifood expertise, biotechnology and entrepreneurship. The opportunity now is to turn that foundation into a new generation of companies that can compete internationally and deliver measurable impact.

- Maarten van Dam, Partner, Pymwymic

Scope | Agrifood biotechnology:

in this report, agrifood biotechnology refers to the use of biological systems, microorganisms, biomolecules, cellular processes and genetic technologies to develop agricultural inputs, food ingredients and production processes in which the biological component is a primary driver of performance and value creation.

Approach per value chain:



Seed breeding and genetics: Defend & Extend.

The Netherlands is already a global leader in plant breeding. Keeping that position will increasingly depend on the ability to use and commercialise new genetics, phenotyping, data, AI and other technologies that can shorten breeding cycles and improve breeding outcomes.



Biological agricultural inputs: Build the Pipeline.

The Netherlands has strong capabilities in biocontrol, advanced horticulture, growers and practical testing environments. The priority is to turn these strengths into a larger and stronger pipeline of biocontrol and integrated growing solutions for relevant crop, pest and disease challenges. Other biological inputs should be developed selectively where Dutch capabilities offer a clear advantage.



Biotech ingredients and food applications: Scale the Winners.

The Netherlands combines fermentation science, process expertise, food application knowledge and major agrifood companies. The best opportunities are likely to be in differentiated, higher-value ingredients and specialised bioprocessing, rather than in bulk production where energy, feedstock and scale are the main sources of advantage.

Success in these three value chains could add around €17 billion in annual Dutch revenues by 2040 while strengthening the resilience of the food system. Taken together, the global markets covered in this report could be roughly €400 billion by 2040, although the range is wide and differs substantially by value chain. Beyond the economic upside, improved genetics can make crops more resilient to changing growing conditions, biological inputs can reduce dependence on conventional chemical inputs, and biotechnology-enabled ingredients can diversify production routes and reduce pressure on land and other resources. The precise impact differs by application, but together these technologies can make the food system more resilient while reducing its environmental impact.

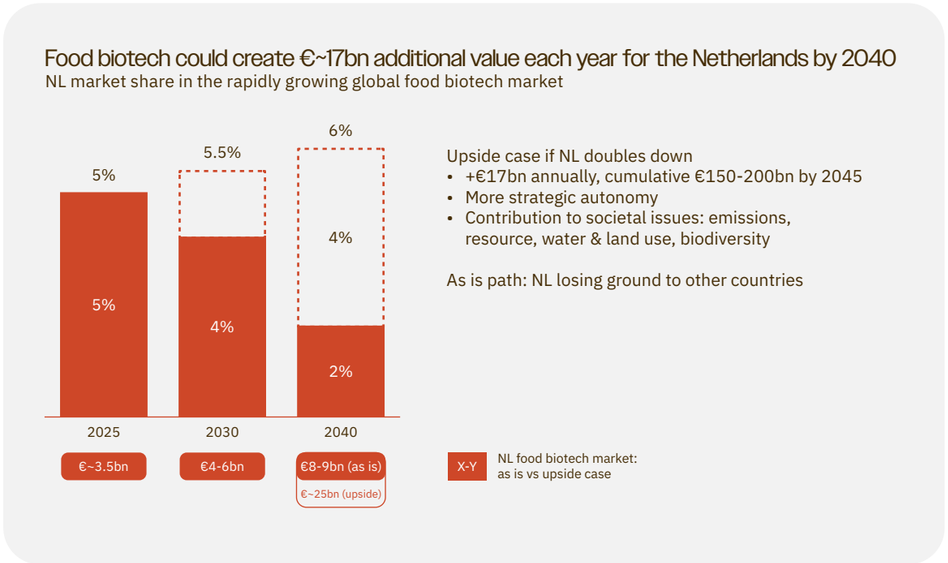
Realising this value requires deliberate choices about what should be anchored in the Netherlands. The Netherlands is unlikely to compete structurally on low energy prices, cheap feedstocks or production volume. Its strengths lie in science and technology, specialised process and application knowledge, leading customers and a closely connected agrifood ecosystem. The Dutch objective should therefore be to anchor critical knowledge, companies and selected scale-up capabilities, not to maximise domestic production volume. Where production economics favour other European locations, Dutch companies should be able to scale through European value chains while retaining strategic control points in the Netherlands.

International competition is accelerating. The United States has built strong links between research and commercialisation. China is using industrial policy, capital and market creation to expand its biotechnology and biomanufacturing industries, while India is also investing in biotechnology and production capacity. Europe continues to produce world-class science, but too often the companies and production capacity that follow are built elsewhere. For the Netherlands, maintaining a leading position will depend on building more companies and helping them reach scale.

Agrifood biotechnology has the potential to address some of our biggest societal challenges, ranging from biodiversity, greenhouse gas or land use. Realising that potential means helping companies bridge the gap from breakthrough innovation to commercially viable businesses.

- **Tijl Hoefnagels, Partner, Rubio Impact Ventures**

Figure 1. Dutch agrifood biotech revenues under the baseline and upside scenarios, 2040. Source: Invest-NL analysis. Revenue of top NL players, S&P, Marketsandmarkets, Fortune Business Insights, Food2040, Plantum, McKinsey, Strategy&



Market dynamics & Scaling Conditions: three recurring gaps limit scale-up

Input from more than 150 stakeholders, through interviews, workshops and discussions, points to three recurring problems. Too few promising innovations become scalable companies. Companies take too long to validate their technology and reach the market. And too few make the jump to industrial scale.

Recent TNO data suggests that this is not limited to agrifood. The Netherlands accounts for 3.3% of biotech start-ups worldwide, but only 1.3% of scale-ups. Only 11.7% of Dutch biotech companies in the internationally comparable dataset have crossed the $10 million funding threshold, compared with 15.8% in the EU and 25.0% globally. Biotech companies may look like digital ventures in terms of company size and revenues, but their development path is closer to hard tech. Development takes longer, physical scale-up matters, scientific uncertainty remains high and capital needs increase sharply as companies grow. Generic deep-tech support and financing therefore do not always fit the journey from research to market and industrial scale.

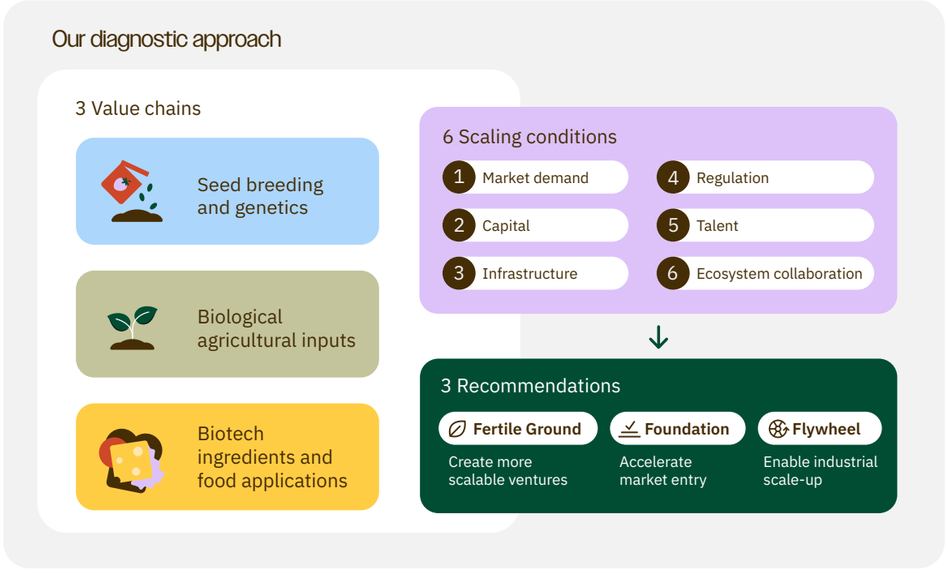
Across the three value chains, we looked at six conditions that determine whether companies can scale: market demand, capital, infrastructure, regulation and market access, talent, and ecosystem collaboration. Together, they point to three priorities.

Fertile Ground is about creating a stronger pipeline of ventures.

Foundation is about getting companies through validation and into the market faster.

Flywheel is about helping the strongest companies reach industrial scale.

Figure 2. Six scaling conditions translate into three priorities for Dutch agrifood biotech



The frameworks serve different purposes. The six scaling conditions are the diagnostic lens. Fertile Ground, Foundation and Flywheel summarise the three recurring gaps across the sector. Defend & Extend, Build the Pipeline and Scale the Winners describe where each value chain needs the greatest emphasis. The five interventions are the common actions that follow from that diagnosis.

Fertile Ground

Too few promising innovations become scalable businesses

The first gap is at the start of the company pipeline. The Netherlands produces strong research and has experienced entrepreneurs, companies and investors, but too few promising ideas develop into scalable agrifood biotech businesses. University spin-out rates remain below those of leading international peers, while relevant innovation also comes from entrepreneurs, SMEs and established companies. Biotech Booster is an important step in improving the route from science to business by bringing researchers, entrepreneurs, investors and industry together. The next challenge is to make venture creation less dependent on individual projects and programmes and build a more continuous pipeline of new companies.

More companies alone are not enough. New ventures also need a clear route to customers. Stakeholders repeatedly pointed to technically strong teams that involve farmers, food companies and other customers too late. Earlier market testing and stronger commercial capabilities can help companies find out sooner whether they are solving a problem customers are willing to pay for.

Table 1. Number of Agrifood Biotech Companies Founded per Year (2020–2024)
Invest-NL data analysis based on PitchBook data available through April 2026.

Year	Seeds & Genetics	Agricultural Inputs	Biotech ingredients	Total
2020	0	3	3	6
2021	0	1	6	7
2022	0	1	3	4
2023	2	1	2	5
2024	0	1	0	1

Foundation

Companies take too long to move from validation to market

Once a company has been formed, it needs to show that its technology works reliably, meets regulatory requirements and solves a real customer problem. In practice, companies often have to work through these issues at the same time, while capital continues to run down.

Three barriers recur.

- **Regulation and validation take too long and remain difficult to predict.** Food safety and environmental protection should not be compromised, but existing frameworks are not always well suited to emerging biological technologies. Long and uncertain procedures increase both time to market and financing needs.
- **The right infrastructure is not always easy to access.** Pilot capacity exists for many applications, but costs can be high, the required equipment or expertise is not always available, and gaps remain between pilot and commercial demonstration. The issue is therefore not simply building more infrastructure, but making the right capabilities accessible at the right stage.
- **Commercial validation often starts too late.** Farmers, food manufacturers and other customers need to be involved while technologies and applications are still being developed. Otherwise, companies can spend years and substantial capital improving a technology before knowing whether customers value it enough to adopt it.

These problems are closely linked. Faster regulation does little if a company cannot access the right pilot facility, just as technical validation is of limited value if there is no customer willing to adopt the product. The challenge is to reduce these risks together.

Flywheel

Too few companies make the jump to industrial scale

The financing challenge changes again when companies move towards industrial production. Growth equity alone is often not enough to finance large production assets. Debt and infrastructure investors, meanwhile, usually want operating data, revenues and customer commitments that a first-of-a-kind project cannot yet provide.

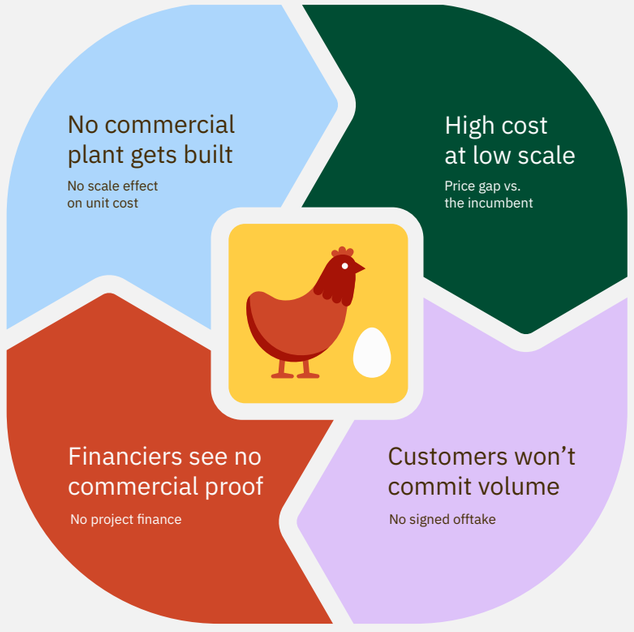
This creates a simple but difficult cycle, particularly for biotech ingredients and other capital-intensive applications:

Breaking this cycle requires several things to happen together. Companies need access to pilot and demonstration facilities to generate technical proof. Regulatory processes need to become faster and more predictable. Customers need to commit earlier where the business case is credible. And public finance needs to absorb part of the risk before a project is ready for conventional private finance.

The benefit goes beyond the individual projects that receive support. Companies that reach scale create experienced founders and operators, bring specialised investors and customers into the market and generate knowledge that can make the next project easier to finance and build. That is the flywheel the Netherlands currently lacks.

The chicken-and-egg challenge in biotech

Too few companies make the jump to industrial scale



One common framework, shaped by value-chain bottlenecks and broader industrial conditions. The same three priorities matter across all three value chains, but the main bottleneck differs. In seeds and genetics, the focus is on renewing the ecosystem through a strong pipeline of science, enabling technologies and new ventures, supported by access to genetics, phenotyping, data and NGT capabilities. In biological agricultural inputs, the challenge comes later, as promising products need to move through regulation and practical validation into use by growers. For biotech ingredients, the hardest step is industrial scale-up, where customer commitments, operating capabilities and FOAK finance need to come together. The starting point for intervention therefore differs by value chain.

Wider industrial conditions also matter. Energy and grid access, suitable sites, feedstocks, labour and the broader policy environment all influence where production takes place. New biotech solutions also compete with established agricultural and food production systems that have benefited from decades of infrastructure, regulation, subsidies and public risk-sharing. Differences in industrial support between countries add another layer. These issues cannot all be solved through the agrifood biotech programme itself. They need to be addressed through wider Dutch and European industrial policy.

Supporting cross-cutting evidence is provided in Appendix 1; the analytical framework and methodology are described in Appendix 3.

It is encouraging to see biotechnology firmly established as a strategic priority for the Netherlands. Now is the time to turn that ambition into action by accelerating the commercialisation of breakthrough innovations through long-term investment and stronger collaboration across the innovation ecosystem. Only then can promising biotech discoveries become scalable solutions with lasting societal and economic impact.

- Nettie Buitelaar, CEO, Biotech Booster

Recommendations: The next step is coordinated implementation around three strategic priorities and five interventions

The Netherlands does not need another agrifood biotech strategy. It needs to act on the gaps that already stand in the way of companies reaching the market and scaling. The National Technology Strategy, the Cabinet Vision on Biotechnology, the Wennink Report, Food 2040 and several sector agendas already recognise biotechnology as a strategic priority. This report adds a more practical layer: where the main gaps are in agrifood biotech and what government, companies, investors and knowledge institutions can do about them.

The analysis points to three outcomes that should look materially different by 2030: more ventures entering the pipeline, much faster routes to market and more companies reaching global scale. To make that ambition concrete, we set three goals: 2x more agrifood biotech ventures, 3x faster time to market and 5 globally competitive Dutch agrifood biotech champions.

Fertile Ground, Foundation and Flywheel provide the framework for reaching these goals. The emphasis differs by value chain: seeds and genetics requires Defend & Extend, biological inputs Build the Pipeline, and biotech ingredients Scale the Winners. The five interventions below form the common implementation agenda; Chapters A–C specify what they mean for each value chain, who needs to act and what financing is required.

Public support should be selective and focused on problems the market is unlikely to solve on its own. The same principle applies to where activities take place. The Netherlands should retain knowledge, companies and specialised capabilities that are important for its future position, while using European infrastructure and production capacity where that is faster or more economic.

The Netherlands has everything it takes to remain a global leader in biotech food ingredients: a strong science and industrial base, with ventures that are among the most promising in the world. What's still undecided is whether we organise the industrial scale-up here, or hand that value to countries moving faster on commercialisation.

- Guido Laman, Foodvalley & Food 2040

Figure 3. Three implementation priorities to close the scaling gaps in Dutch agrifood biotech



Fertile Ground

2030 ambition: Double the number of agrifood biotech ventures

1. **Connect long-term knowledge development to a permanent valorisation and venture-building pathway.** Sustain pre-competitive research where knowledge spillovers, strategic IP creation and long development cycles justify public support and connect it to experienced entrepreneurs, customer insight and sector-specific venture-building capabilities. Provide milestone-based early-stage funding to help promising cases reach meaningful technical and commercial proof points. Venture creation, licensing, co-development and shared platforms should remain equally valid outcomes.

   Lead: Biotech Booster for venture creation and venture building, working with TTOs and knowledge institutions on technology and IP, and with sector organisations, companies, customers and investors on validation and commercialisation.

Foundation

2030 ambition: Reduce time to market by a factor of three

2. **Make regulatory pathways faster, more predictable and workable for emerging biotech.** Strengthen specialist capacity, earlier guidance, proportionate requirements and controlled testing environments while maintaining high safety standards. Use more standardised pathways for comparable products and tailored assessment where novelty genuinely requires it.

   Lead: The responsible Dutch ministry and competent authority for each regulatory pathway, with a named policy owner for national improvements and EU advocacy. Regulatory authorities retain responsibility for independent assessment and statutory decisions.

3. **Create an accessible infrastructure and validation pathway.** Improve access to complementary facilities, data and expertise before building additional capacity. Connect breeding infrastructure and biological datasets, crop-specific practical validation, and fermentation and downstream-processing capabilities across the Netherlands and Europe. Access should include the people and operating expertise needed to generate reliable technical and economic evidence. New investments require credible utilisation, affordable access and sustainable operating models.

   Lead: Government for national coordination and public funding conditions; facility owners, operators and knowledge institutions for delivery; sector organisations and users for validation priorities. ROMs and Invest-NL should contribute where financing or investability is a constraint.

Flywheel

2030 ambition: Scale five globally competitive agrifood biotech champions raising more than €100 million

4. **Build the financing pathway from growth capital to FOAK and industrial scale**, combining equity, debt and infrastructure finance with targeted public risk-sharing (e.g., through blended finance).

   Lead: Invest-NL for developing and structuring financing solutions, working with ministries, RVO, European public financiers and private equity, debt and infrastructure investors.

5. **Turn customer needs into commercial evidence and financeable commitments.** Involve breeders, growers, food manufacturers and other buyers early to validate performance, applications and willingness to pay. Build commitments progressively through paid trials, co-development, customer qualification and purchasing agreements appropriate to the product and its maturity. For biologicals, organise crop-specific adoption support and share transition risks across growers, suppliers and downstream buyers. Temporary public support can address verified transition risks. It should only support propositions with a credible path to customer demand.

   Lead: Companies and customers for commercial decisions and commitments; sector organisations for connecting value-chain partners; financiers for translating commercial evidence into suitable financing structures.

Delivery should build on existing institutions

A new programme office is not needed. For each intervention, government and delivery partners should agree one accountable policy owner, a lead delivery organisation, initial milestones and the resources required. Existing biotechnology coordination arrangements can then track progress across the five interventions and address dependencies between them. Many of the necessary building blocks already exist in Dutch and European programmes, sector initiatives, infrastructure and financing providers. The important step is to make their respective roles explicit rather than assume that the pieces will connect by themselves.

Invest-NL can develop markets, mobilise capital and invest selectively

Invest-NL can contribute in three ways. Through its market development activities, Invest-NL can address structural barriers that prevent promising propositions from becoming investable. Invest-NL can mobilise capital and bring public and private financiers together around ventures, infrastructure and FOAK projects. Selective investment can support propositions where technical and commercial evidence is credible, strategic value and long-term economics are sufficiently strong, additionality is clear and the investment fits its mandate.

This does not shift responsibilities from other actors. Policy ownership remains with government and regulators, while companies, customers, operators and knowledge partners remain responsible for technical and commercial validation. Invest-NL's role is to help develop, structure and finance credible propositions where financing is a binding constraint.

Use existing public resources more effectively and fill the remaining gaps

Part of the financing need can be addressed through better use of resources that already exist at Dutch and European level. Current instruments do not always match the development path of agrifood biotech companies. Eligibility criteria, mandates or financing conditions may need to change, while support for shared infrastructure could be coordinated better across programmes and regions.

Additional resources will still be required where these changes are not enough. The appropriate instrument depends on the type of intervention. Grants and programme funding are important for pre-competitive research, regulatory capacity and shared capabilities. Loans, guarantees, equity and other risk-bearing instruments become more relevant as companies approach commercial scale.

The balance also differs by value chain:

Seeds and genetics mainly requires investment in research and enabling capabilities.

Biological inputs needs support across venture development, validation and adoption.

Biotech ingredients has the largest requirement for risk-bearing finance to reach industrial scale.

Table 2 translates these different needs into indicative public financing capacity for 2026–2030. The ranges include existing, reallocated and new public resources and should therefore not be read as an equivalent amount of new government expenditure.



Drone-based crop monitoring, illustrating how digital phenotyping and precision agriculture can support biotechnology-driven plant breeding and crop improvement.

Table 2.

Indicative public financing capacity (€m) With investment references and benchmarks

Seed breeding and genetics

Fertile Ground Strengthen ecosystem renewal around enabling technologies. Fund long-term pre-competitive research in strategic breeding technologies and strengthen dedicated IP, technology-transfer and venture-building capacity, so breakthroughs can be protected and valorised through licensing, co-development and new ventures.	80–150 €m	CropXR, Biotech Booster and the proposed Breeding Accelerator (€55m public within a €110m programme); Food 2040 provides a broader venture-studio reference. VIB and imec provide international models for integrating research, IP, licensing and venture creation. Denmark provides a public R&D benchmark.
Foundation Accelerate translation into commercial breeding applications. Turn the NGT framework into a competitive advantage and organise shared access to genetic material, phenotyping, field trials, greenhouses, compute, biological data and enabling technologies, including for strategically important open-field, protein and specialty crops.	20–50 €m	NPEC and existing breeding infrastructure. NPEC's original €22m programme provides a benchmark for shared research infrastructure.
Flywheel Leverage strong incumbents and established routes to market. Use established breeders for co-development, validation, licensing, strategic investment and market access.	No separate public envelope	Scale-up is expected primarily through established breeders and private capital; public support is concentrated upstream.
Subtotal	**100–200 €m**	

Biotech ingredients and food applications

Fertile Ground Strengthen commercialisation and market readiness. Build stronger teams, validate customers earlier and provide targeted early-stage financing to help promising ventures reach investability and a credible route to market.	50–100 €m	Biotech Booster, StartLife and Cellular Agriculture Netherlands provide existing foundations for venture and ecosystem development; Food 2040 provides a broader venture-studio reference.
Foundation Build the science-to-commercial-demo corridor. Improve regulatory pathways and affordable access to complementary fermentation, downstream-processing and scale-up facilities, operators and validation capabilities.	100-150 €m	Ferm-Bridge NL provides an infrastructure reference; Regional NTS work identifies access and OPEX needs. Existing Dutch and European facilities should be used before adding new capacity.
Flywheel Unlock commercial scale-up through demand and risk sharing. Build the FOAK financing pathway and convert commercial proof into customer commitments, using equity, patient capital, loans, guarantees and blended finance where appropriate.	200–300 €m	Existing Dutch and European instruments first; IPCEI is a potential route. Recent European projects illustrate ticket sizes: Solar Foods (€77.8m public grant/loan package), Formo (€35m EIB financing) and MATR Foods (€20m EIB financing).
Subtotal: Biotech ingredients	**350–550 €m**	

Biological agricultural inputs

Fertile Ground Build companies, knowledge and capabilities. Strengthen the biocontrol innovation pipeline through long-term pre-competitive research, sector-specific venture building, milestone-based early-stage finance and stronger knowledge, advisory and education capabilities.	60–100 €m	Biotech Booster and Groenpact provide foundations for venture creation and sector capability building. France's Grand Défi Biocontrôle et Biostimulation provides a direct benchmark: €60m over six years (€42m public and €18m private) for sector coordination, shared development infrastructure and innovation projects.
Foundation Make regulation and practical validation work. Strengthen regulatory guidance and capacity, and organise crop-specific validation through shared protocols, standardised data and comparable technical, agronomic and economic evidence, building on existing grower-led initiatives and extending proven approaches from greenhouse and high-value crops towards relevant open-field applications.	20-50 €m	100% Groen Geteeld and the Crop Protection Covenant provide implementation references. The US IR-4 programme received more than $41m for 2022–26 to generate shared efficacy and regulatory evidence. France's Grand Défi additionally allocates €17m to shared resources and infrastructure for biologicals development and validation.
Flywheel Turn validation into adoption and market pull. Combine value-chain commitments with temporary public-private risk sharing and test the case for a sector-led greenhouse innovation fund.	120-200 €m	Crop Protection Covenant: €250m indicatively reserved for the broader transition. Relevant allocations may contribute to this agenda and must be reconciled with the envelope shown here; they should not be treated as additional funding on top. France's PARSADA, a national programme to accelerate crop-specific alternatives and transition pathways, made €146m available in 2024.
Subtotal: Biological inputs	**200-350 €m**	

Total indicative portfolio	**650–1,100 €m**

Note: The ranges combine existing, reallocated and new public resources, including grants, programme funding and risk-bearing financial instruments with different budgetary implications. They should therefore not be read as an equivalent amount of new government expenditure.

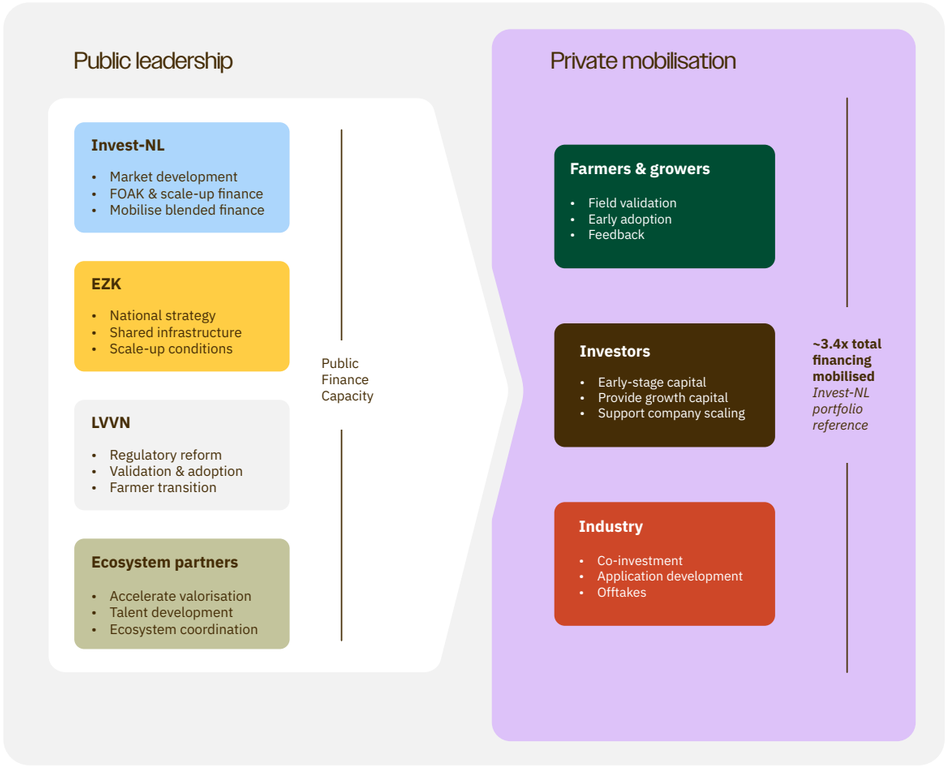
Public financing can mobilise substantially larger investment packages.

Invest-NL's existing food and alternative-protein portfolio provides a practical reference, with total financing amounting to approximately 3.4x Invest-NL's own contribution. The precise leverage will vary by instrument and project maturity. This is consistent with the broader logic of European risk-sharing instruments such as InvestEU, where guarantees, debt and equity are assessed by the additional financing and investment they mobilise relative to the underlying public contribution. The next step is to agree which interventions to take forward first, confirm who will lead them and secure the necessary public and private commitments. The investment agenda in Table 2 provides a starting point for those decisions. The following chapters explain the choices for each value chain and set out the specific actions required.

Building a globally competitive agrifood biotech ecosystem requires more than breakthrough science, of which the Netherlands and Europe have no shortage. It requires the infrastructure, capital and market adoption needed to translate sustainable innovations into industrial-scale impact.

- Alex Hoffmann, General Partner, Forbion

Figure 4. Public leadership and private mobilisation in the agrifood biotech investment agenda





Fermentation equipment at NIZO, used to develop and scale biological production processes.

European best practices: long-term institutions turn strategy into execution

Case study Denmark: Coordinate the journey from venture creation to scale

Denmark has built complementary institutions around the company lifecycle. The BioInnovation Institute supports early venture creation and company building, while EIFO provides financing into later growth stages. Dedicated support create greater continuity as companies move from science towards commercial deployment. The relevant lesson for the Netherlands is institutional connectivity: companies should not have to navigate disconnected support systems as their financing and infrastructure needs change.

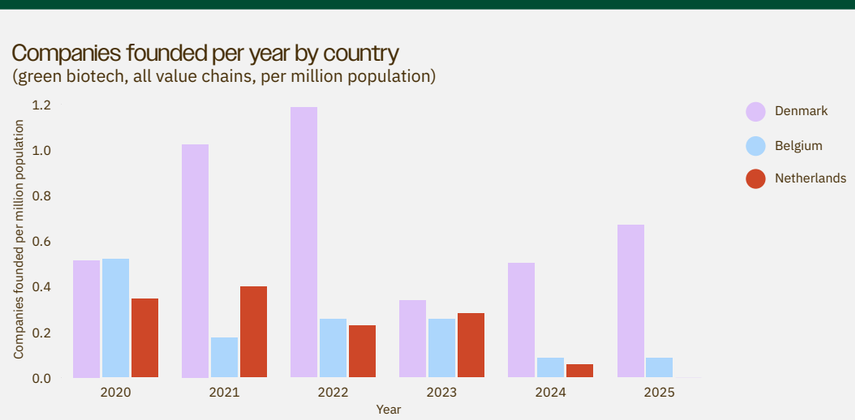


Case study Belgium: Building continuous venture creation around world-class science

For more than 30 years, VIB has built permanent commercialisation and venture-building capabilities that have enabled a continuous pipeline of spin-outs. Rather than treating valorisation as the final step of individual research projects, VIB has built venture creation as a permanent institutional capability. The relevant lesson for the Netherlands is organisational: successful venture creation requires dedicated people, capabilities and long-term continuity, not only periodic programmes or funding calls.

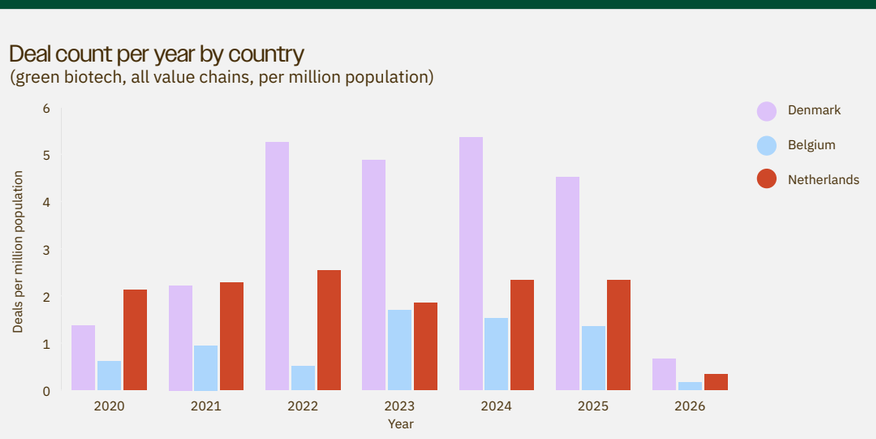


Figure 5. New Food Biotech Ventures per Million Inhabitants: International Comparison (2020 to 2025).
Source: PitchBook, Invest-NL analysis.



Companies founded >= 2020 with in-scope green biotech category (value chains combined), grouped by HQ country; Excludes companies with >= 1000 employees (4 removed; exception: Koppert (NL), Bi-PA (BE), Biobest (BE) kept). 64 companies founded >= 2020 in scope.

Figure 6. Food Biotech Investment Activity per Million Inhabitants: International Comparison (2020 to April 2026).
Source: PitchBook, Invest-NL analysis.



All green biotech deals (value chains combined) with deal year > = 2020 linked to in-scope companies, grouped by HQ country; Excludes companies with >= 1000 employees (4 companies removed; exception: Koppert (NL), Bi-PA (BE), Biobest (BE) kept). 469 deals dated > = 2020 in scope.

Value chain:

A

Seed breeding and genetics



Dutch leadership increasingly depends on data, AI and enabling technologies

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Key take-outs

- **Starting point:** The Dutch breeding ecosystem has a leading position in seeds and genetics (~5% market share, with spikes of ~33% in vegetable seeds[1]), built on strong incumbents, a world-class knowledge base and global market access. Maintaining this position requires continuous renewal as competition intensifies and breeding becomes increasingly driven by AI, data and other enabling technologies. Long development cycles, high capital intensity and access barriers make it difficult for start-ups to emerge as full-stack breeders.

- **Aspiration**: **'Defend & Extend'**. The Netherlands extends its leadership in climate-resilient crops and regenerative agriculture and becomes a global leader in AI-driven breeding. The upside for NL is +€3 billion annually by 2040 (from 4.5% market share for NL in base case to 6.5% when doubling down).

- **Scaling conditions:** The next wave of competitiveness will be driven by the integration of genetics, phenotyping, AI, data infrastructure and new breeding techniques. The greatest opportunity lies in developing "complementary focus areas" that strengthen the existing ecosystem and accelerate innovation. Ecosystem renewal therefore depends primarily on start-ups that strengthen the breeding process through AI, genomics, phenotyping and breeding software.

- **Recommendations:** (Fertile Ground) strengthen long-term Public-Private Partnerships around enabling technologies (such as systems biology including photosynthesis, data & AI, NGT/biotechnology, production systems); build a targeted valorisation and venture function; deploy (public) instruments where propositions are sufficiently validated and investable. (Foundation) organise shared infrastructure and validation access for SMEs, start-ups, ornamentals, protein crops and specialty crops; (Flywheel) use established breeders for co-development, validation, strategic investment and market access; no separate late-stage public funding track is required.

[1] Groeimarkten voor Nederland

The opportunity

Extend today's globally leading position in seed breeding into climate-resilient crops and regenerative agriculture

Starting point

The Netherlands has an exceptionally strong starting position in seed breeding and plant genetics. Its internationally recognised breeding ecosystem is one of the global leaders in the sector, combining globally active breeding companies, world-class research institutions and a highly specialised innovation ecosystem. The sector includes leading companies such as Rijk Zwaan, Bejo and Enza and forms part of an industry generating approximately €3 billion in annual turnover. A key source of competitive advantage is the extensive pool of genetic material and breeding knowledge that have been built over decades.

The Dutch ecosystem combines scientific excellence with strong public-private collaboration and close interaction between breeders, growers, technology suppliers and applied research. Universities such as WUR and TU Delft are complemented by specialised technology companies such as KeyGene, while geographic clusters such as Seed Valley connect breeding companies, suppliers and knowledge institutions. Together, this creates a highly internationalised and export-oriented ecosystem with particular strengths in high-value segments such as vegetable seeds, seed potatoes, propagation material and specialised breeding technologies.

The Dutch leadership position has been built over decades through continuous innovation, strong IP positions and a tradition of precompetitive collaboration between companies and knowledge institutions.

Plant breeding, propagation material and plant biotechnology are characterised by long innovation cycles and development timelines of ten years or more. As a result, stable public framework conditions, long-term public-private partnerships and predictable regulation are critical factors for maintaining competitiveness and attracting investment. Recent initiatives such as CropXR[2] demonstrate continued investment in next generation breeding, focused on resilient crops and the integration of biology and data science.

Aspiration

By 2040, the Netherlands has extended its leadership in climate-resilient crops and innovations that enable regenerative agriculture, while becoming a global leader in AI-driven breeding, next generation breeding technologies, and digital and data-driven breeding. The Netherlands wins in climate-resilient crops and develops innovations that facilitate the transition towards more regenerative agricultural systems. At the same time, it maintains its leadership in the high value segments of the global seed market, where performance, resilience and quality are the key differentiators rather than scale alone.

Beyond increased market value, advances in seed breeding and genetics raise yields per hectare, easing pressure on land needed to feed a growing population, while improved resistance to pests, diseases and drought cuts pesticide use, water withdrawals and synthetic fertiliser needs. These gains scale with practice, not genetics alone: how much is realised depends on the farming systems and soil management that accompany each variety.

Market dynamics

Technological developments and growth outlook

Market outlook and value at stake

The global market for seed breeding and genetics is expected to continue its structural growth over the coming decades, driven by rising food demand, climate change, and the increasing need for more productive and resilient agricultural systems. By 2040, the market is projected to reach approximately €120 to €140 billion, growing at around 7% annually. For the Netherlands, this represents a significant economic opportunity. If the country successfully strengthens and extends its leadership position, the sector could generate around €9 billion in annual value by 2040, compared with approximately €6 billion under a business as usual scenario. This would further reinforce a sector that is already recognised as one of the Netherlands' strategic growth markets.

At the same time, the competitive landscape is evolving rapidly. The sector is becoming increasingly concentrated as the number of trading companies declines and large growers and retailers source more directly at scale. Dutch breeding companies remain among the most innovation intensive players globally, collectively reinvesting approximately 15% to 30% of revenues into R&D across a sector generating roughly €3 billion in annual revenues. However, international competition is intensifying. Countries such as China are investing heavily in next generation breeding capabilities, including genomics, artificial intelligence and digital breeding infrastructure, as part of broader efforts to strengthen food security and technological leadership. These developments are likely to further increase competitive pressure in global seed and genetics markets over the coming decades.

Technological developments

Technological developments are reshaping the seed breeding sector, with innovation increasingly driven by the combination of biological and digital capabilities. Gene editing technologies such as CRISPR have become an important addition to the breeding toolbox, while genomics, phenotyping and AI-driven selection are becoming core capabilities. Competitive advantage therefore increasingly depends on combining genetic insight, large-scale phenotyping data and advanced analytics. At the same time, important knowledge gaps remain around gene function and gene regulatory networks, making continued investment in fundamental plant science essential to fully realise the potential of these technologies.

This shift is also increasing the importance of computational power. Advanced breeding programmes require large scale data processing, modelling and prediction, making access to computing infrastructure an increasingly important competitive factor. The emergence of new breeding techniques such as gene editing and precision breeding, further strengthens the convergence of biological and digital innovation. Together, these developments are redefining the basis of competition in the sector, from traditional breeding expertise alone towards the integration of biology, data, AI and computation.

[2] CropXR is a Dutch public-private partnership funded by the NGF, that brings together companies and research institutes to develop next-generation breeding technologies for climate-resilient crops.

Figure 7. Market Outlook and Dynamics for Seed Breeding & Genetics. Source: Invest-NL analysis. Revenue of top NL players, Fortune Business Insights, Food2040, McKinsey, Strategy&

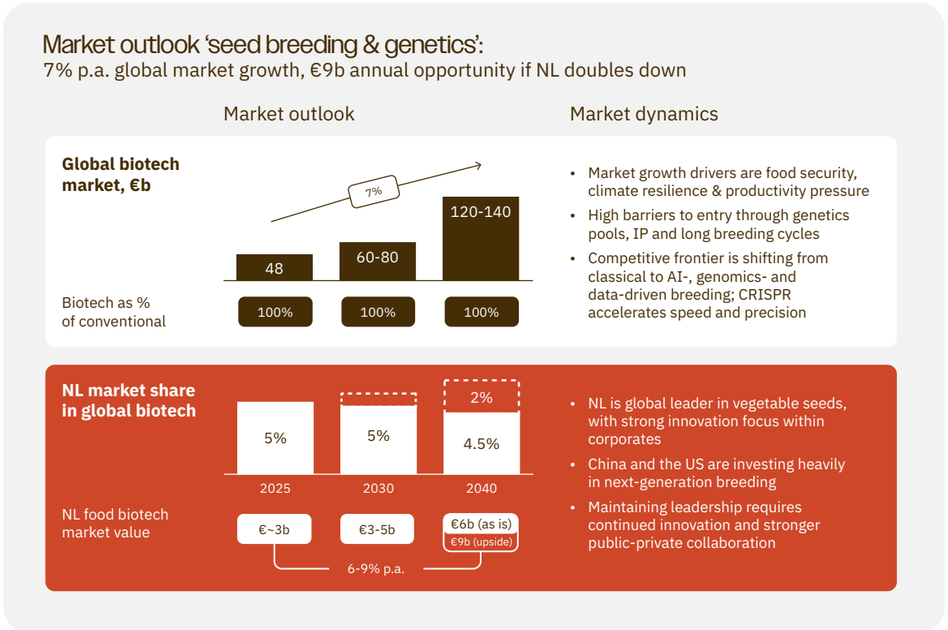


Figure 8. Illustrative Organisations in the Dutch Seed Breeding & Genetics Ecosystem



Table 3. Distinct market and innovation dynamics across seed segments

	Floriculture	Field crops	Vegetable seeds
Market structure	Highly fragmented	Large global market; highly consolidated	Smaller, high-value market; specialised players
Typical players	Many specialised breeders	Large multinationals	Specialised companies, incl. Dutch family-owned players
Volume & margins	Relatively limited industrial scale	High volume, lower margins	Low volume, high margins
Innovation focus	Complex traits and diverse varieties	Yield, robustness & input efficiency	Taste, resistance, shelf life & quality
Innovation dynamics	Challenging due to biological complexity and large genomes	Scale-intensive; significant advantages from consolidation	High innovation intensity; shorter cycles for some crops
Key characteristic	Complex & fragmented	Scale-driven	Innovation- & value-driven

Plant breeding has always been a long-term endeavor. Technologies such as gene editing can dramatically accelerate what is possible, but the real challenge now is turning scientific capability into better crops in farmers' fields. That requires technology, regulation, investment, and market adoption to move together.

- **Ferdinand Los, CEO, Hudson River**

Scaling conditions

Table 4. Key scaling conditions for seed breeding & genetics.

Scaling condition		Current situation
1	**Market demand**	Strong global demand for resilient, productive crops
2	**Capital**	Less constrained than other value chains because of strong incumbents, but venture models remain difficult for long-cycle technologies
3	**Infrastructure**	Growing need for phenotyping, data and compute infrastructure
4	**Regulation**	NGT framework is an important enabler, but implementation and access remain important
5	**Talent**	Increasing need for AI, data, genomics and interdisciplinary skills
6	**Ecosystem collaboration**	Strong incumbent-led ecosystem, but renewal around enabling technologies is fragmented

Long breeding cycles, limited access to genetics and infrastructure bottlenecks constrain ecosystem renewal

To assess the conditions for scaling, the analysis looks across the stages from science to market adoption, covering the six dimensions: market demand, capital, infrastructure, regulation, talent, and Dutch ecosystem strength. Bottlenecks in any of these can constrain scale-up, and their interaction can create systemic barriers.

Several stakeholders noted that the combination of long breeding cycles, concentrated IP positions and high infrastructure requirements creates relatively high barriers for new entrants. This limits the number of independent start-ups and increases dependence on incumbent driven innovation.

1 Market demand

Demand for advanced seed breeding and genetics is expected to remain structurally strong over the coming decades.

Growing climate pressures, increasing food security concerns and the need to maintain agricultural productivity are driving demand for crops that are more resilient, productive and resource efficient. Breeding innovations that improve resistance to drought, pests and diseases, while maintaining or increasing yields, are becoming increasingly important for farmers and food systems worldwide. This creates a strong long-term market pull for advanced breeding solutions and next generation genetics.

The adopted framework around New Genomic Techniques (NGTs) has the potential to further accelerate innovation and adoption. However, the future impact of NGTs extends beyond regulatory approval alone. Important questions remain around intellectual property rights, patent frameworks, freedom to operate, public acceptance, and ensuring that smaller breeders retain access to technologies and genetic material. Addressing these issues will be critical to ensuring that the benefits of advanced breeding technologies can be broadly adopted across the sector and translated into long-term economic and societal value.

While concerns about increasing concentration of intellectual property and access to patented technologies are justified, patents do not inevitably lead to monopolies or restricted innovation. Initiatives such as the International Licensing Platform for Vegetable Breeding (ILP) demonstrate that collaborative licensing models can preserve incentives for innovation while safeguarding access to enabling technologies. Through transparent and fair licensing arrangements, breeders can obtain access to patented traits and technologies under predefined conditions, reducing barriers for smaller companies and supporting continued competition. The core issue is how access to enabling technologies is organised. Strengthening and expanding mechanisms that facilitate fair access to patented technologies can therefore help ensure that innovation remains both commercially rewarding and broadly accessible across the breeding ecosystem.

> The crops we need in twenty years are being developed today. With the developments in AI, data science, new breeding techniques and a stabilizing regulatory landscape, this is the moment for long-term investments in breeding and biotechnology to strengthen food security, resilience and the competitiveness of agriculture.
>
> - **Marc Bots, Research & Breeding Director, Bejo**



Laboratory research at Bejo supporting plant biotechnology and crop breeding.

2 Funding flows and gaps

Long development timelines limit the fit with traditional venture capital models.

The seed breeding and genetics sector is characterised by exceptionally long innovation cycles and high capital intensity. Developing new varieties can take up to 10 to 15 years, depending on the crop, making the sector structurally less suited to traditional venture capital models that rely on shorter investment horizons and faster exits. Long-term innovation is therefore still largely financed by incumbent companies, many of which are family owned. While this provides continuity and allows sustained investment in breeding programmes, it also limits new market entry and reduces overall ecosystem dynamism.

A key challenge is that the largest funding gap exists in precompetitive and fundamental research. This is particularly the case for enabling technologies such as systems biology, including photosynthesis research, data and artificial intelligence, phenotyping, modelling, new genomic techniques and biotechnology, transformation and regeneration technologies, plant health, and production systems. To maximise impact, these capabilities should be organised and made accessible across the ecosystem, including breeders, growers, start-ups, scale ups and supply chain partners. Long-term public-private partnerships are therefore particularly important. They enable risk sharing, support long-term investment horizons and ensure continued innovation in areas where private incentives alone are insufficient.

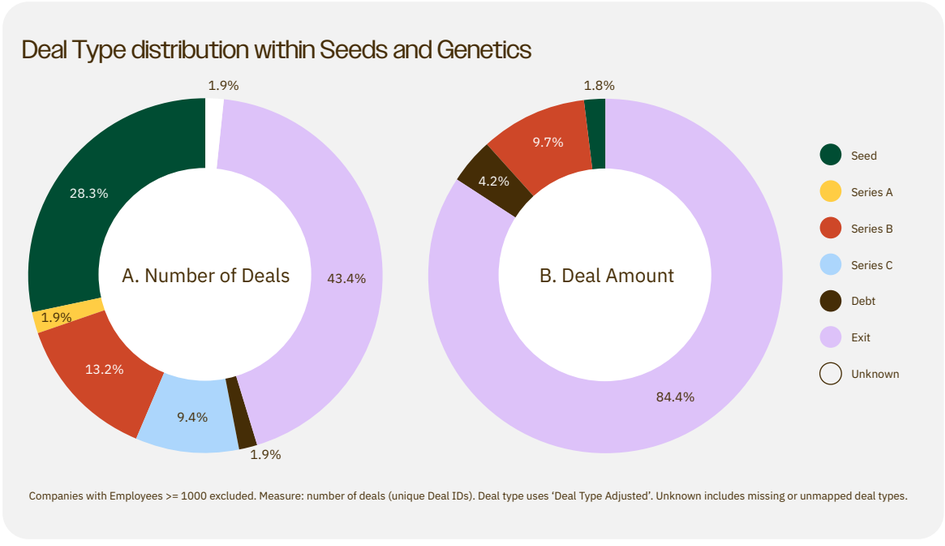
The innovation ecosystem is primarily driven by specialised spin outs and start-ups rather than the creation of entirely new breeding companies. Spin outs are often highly specialised, founder-led companies focused on specific traits or technologies, with business models typically centred on licensing innovations to larger breeding companies or distributors. Start-ups similarly tend to focus on enabling technologies, because full breeding programmes require substantial capital, access to elite genetic material and development timelines spanning more than a decade. This reflects the structure of the sector: while barriers to entry are high for companies seeking to become full-scale breeding companies developing new varieties across a broad range of crops, there is significant room for start-ups developing technologies that support specific parts of the breeding process and complement established breeding companies.

Although start-ups can play an important role in accelerating breeding cycles and enabling the development of new traits, their ability to capture value is often constrained. Access to elite germplasm and genetic pools remains a critical bottleneck, limiting their ability to independently commercialise innovations. As a result, start-ups frequently adopt service provider models, develop traits in partnership with established seed companies, or, in rare cases, initiate their own breeding programmes. Typical exit pathways therefore consist of licensing agreements, co-development partnerships, acquisition by larger seed companies, or the evolution into specialised service providers within the breeding ecosystem.

The key value inflection points for emerging companies occur during field trials, obtaining regulatory access, establishing go-to-market partnerships with seed companies and demonstrating a clear return on investment for farmers. Development timelines and the timing of these value creation moments vary significantly across crops. Fast cycle crops such as tomatoes and cucumbers allow for more rapid iteration and validation, while slower cycle crops such as cabbage and carrot require substantially longer development pathways before commercial value can be realised.

Early-stage accelerator support does not address the main gap. Emerging companies need a route from technology and knowledge to validation, a first customer or co-development relationship, investability and ultimately a viable commercial model.

Figure 9. Investment Profile of Dutch Seed Breeding & Genetics Ventures. Source: PitchBook, Invest-NL analysis.



Companies with Employees >= 1000 excluded. Measure: number of deals (unique Deal IDs). Deal type uses 'Deal Type Adjusted'. Unknown includes missing or unmapped deal types.

3 Infrastructure

Compute power, phenotyping and data infrastructure are becoming strategic assets in breeding

Infrastructure is becoming an increasingly important determinant of competitiveness in seed breeding and genetics. As breeding programmes become more data intensive and increasingly rely on genomics, phenotyping, modelling and AI-driven decision making, access to advanced data and compute infrastructure is emerging as a critical enabler. Large scale data processing, predictive modelling and computational breeding capabilities are becoming essential components of modern breeding programmes.

At the same time, access to physical infrastructure remains indispensable. Greenhouses, field trial capacity, phenotyping facilities and pathogen testing infrastructure are required to validate, develop and scale new traits and breeding technologies. Stakeholders consistently highlighted that shared access to these facilities is becoming increasingly important, as the costs of developing and maintaining such infrastructure are often too high for individual start-ups and smaller companies to bear independently.

This challenge is particularly acute for SMEs, start-ups, ornamentals, protein crops, soft fruit, specialty crops and new cultivation systems. In these segments, private investment alone is often insufficient to provide the required infrastructure, while access to greenhouse facilities, field trials, phenotyping platforms, processing capacity and IP and freedom-to-operate support remain a significant bottleneck.

Several stakeholders also emphasised the growing importance of shared biological datasets, phenotyping infrastructure and computing capacity as ecosystem assets. Fragmented access slows innovation and limits the ability of smaller companies to compete. International competitors are increasingly investing in coordinated AI, breeding and data infrastructure platforms, creating scale advantages that individual actors cannot easily replicate. Multiple interviewees warned that the Netherlands risks losing ground if investments continue to be spread across fragmented, short-term projects and initiatives rather than being organised around long-term, shared infrastructure.

A stable and predictable investment climate is another prerequisite for infrastructure development. Reliable access to energy, physical space, permits and innovation incentives is essential to support long-term investment decisions and maintain the competitiveness of the Dutch breeding ecosystem.

4 Regulation & market access

Regulatory clarity around NGTs will strongly shape Europe's breeding competitiveness

Market access in seed breeding is strongly influenced by the regulatory acceptance of new breeding techniques (NGTs), the ability to enter international markets, and adoption throughout the agrifood value chain. Based on the breeding cycle length, companies depend on long-term visibility and predictable framework conditions when making investment decisions.

Access to genetic material is an additional concern. Stakeholders highlighted increasing restrictions on the free exchange of genetic resources, as well as practical and regulatory barriers that can limit the availability of genetic material for breeding programmes. These developments may reduce access to key inputs for innovation and create additional complexity for breeders.

Historically, European regulatory frameworks constrained the adoption of new breeding techniques and created significant investment uncertainty. The emerging EU framework for New Genomic Techniques could materially improve the competitive environment for European breeding if it provides a workable route for NGT-1 applications. At the same time, several stakeholders noted that the broader shift from an open innovation model, traditionally supported through plant breeders' rights, towards stronger patent protection could create new challenges around access to technology and the exchange of genetic material, particularly within the Dutch breeding ecosystem.

Stakeholders consistently emphasized that predictability and stability of regulation are at least as important as regulatory speed. Given the long development timelines in breeding, regulatory clarity directly affects private investment decisions, long-term strategic planning, and the global competitiveness of the sector. Regulatory approval alone, however, does not guarantee market success. Consumer acceptance remains a critical factor. Scepticism towards gene editing and biotechnology could slow adoption, particularly in export markets and retail channels that are sensitive to public opinion. Building public trust through transparency, evidence-based communication and clearly demonstrated consumer benefits will therefore be essential to unlocking the full value of NGT driven innovation.

5 Talent

Future breeding leadership requires stronger integration of biology, AI and computational expertise

The future breeding workforce requires a combination of plant science, microbiology, data science, AI and computational modelling capabilities. These profiles remain scarce globally and are becoming increasingly strategic for ecosystem competitiveness. Public-private collaboration supports both innovation and the training and retention of interdisciplinary talent. Several stakeholders emphasized that the Netherlands has strong scientific education, but that much more practical exposure to industrial scaling, AI applications and entrepreneurial execution is needed.



Bejo's greenhouse facilities in Melderslo, Limburg, the Netherlands (2026). An example of Dutch expertise in advanced horticulture, vegetable breeding and agricultural innovation.

> Innovation only creates value when it reaches the market. Close collaboration between technology developers, growers, retailers and consumers is essential to turn new ideas into successful products.
>
> **- Jelte van Kammen, CEO Harvest House**

6 Ecosystem collaboration

The Netherlands benefits from a dense cluster of breeding companies and knowledge institutions

The Netherlands benefits from a dense concentration of breeding companies, knowledge institutions and applied research organisations. The capabilities are present; the challenge is to connect and organise them around the technologies that will determine future competitiveness.

At the same time, stakeholders noted that the ecosystem remains relatively fragmented across initiatives, programmes and funding structures. Various collective efforts are already underway, including initiatives through Plantum to explore shared programmes, resource pooling and improved access to critical infrastructure such as greenhouses and field trial capacity. Initiatives such as CropXR and the Breeding Accelerator demonstrate the potential for stronger coordination around enabling technologies. Stronger integration around strategic priorities, shared infrastructure and key enabling technologies will therefore be critical to maintaining the Netherlands' international leadership position.

Recommendations

Long-term innovation and stronger valorisation around strategic breeding technologies

The priority for seed breeding is to ‘Defend & Extend’: safeguard the competitiveness of today’s globally leading breeding sector while creating the conditions for the next generation of breeding, genetics and enabling-technology companies to emerge and scale in the Netherlands.

Fertile Ground

Strengthen ecosystem renewal around enabling technologies

1. Build long-term public-private programmes around the technologies that will determine future breeding competitiveness.

Lead: Knowledge institutions and industry/sector representatives together with the Government.

The Netherlands should concentrate and connect existing public-private efforts in a limited number of sufficiently funded, long-term programmes around pre-competitive enabling technologies in which it has a strong scientific and industrial base and where long development cycles make sustained private investment difficult. Priorities include systems biology and photosynthesis, data and AI, NGT and biotechnology, phenotyping, modelling and prediction. The technology roadmap should also consider how these capabilities can support climate-resilient and currently underutilised crops and contribute to a more diverse, resilient and healthy food system.

These programmes should combine fundamental and pre-competitive research with clear industry involvement. Alongside established public-private programmes, smaller mission-driven coalitions of complementary front-runners should be used where these offer a faster route from technology to application and new business creation. Companies should help define priorities, validate applications and co-invest, while government provides the continuity needed beyond individual funding cycles. Existing initiatives such as CropXR provide a foundation; the proposed Breeding Accelerator can connect and extend these capabilities into a longer-term national programme.

First steps: Use the Breeding Accelerator to align and extend existing initiatives around a shared multi-year technology roadmap and co-investment model. Identify which activities should be continued, connected or consolidated before considering additional programmes or funding.

2. Build a dedicated valorisation pathway for (enabling) breeding technologies.

Lead: Biotech Booster and a consortium of knowledge institutions, sector organisations and venture-builders with the support of breeding companies, growers and investors.

The key missing link is a structured route from knowledge and sector needs to validated application, first customer or co-development relationship, and ultimately to investable venture, licence, platform or shared capability. Such a structured route should include the following:

- **Strategic agenda-setting:** identify and regularly update priority challenges together with science, breeding companies, growers, food companies and public stakeholders;
- **Access to venture-studio capabilities** to scout technologies, shape business and licensing routes, bring in Entrepreneurs in Residence, and prepare venture, platform or licence cases;
- **A supporting network** connecting field sites, greenhouses, propagation facilities, pathogen facilities, processing lines and grower groups;
- **Access to capital through** a network of investors including corporate co-funding, ROMs, Invest-NL and the European Commission; and
- **Practical support** such as expertise in IP/FTO, regulation, data governance, venture building and collaborative portfolio management.

First steps: Within the existing Biotech Booster programme, strengthen the breeding and plant-biotech portfolio with the required sector-specific expertise and select a first cohort of technologies. For each case, determine jointly with sector and knowledge partners whether venture creation, licensing, co-development or a shared platform is the most appropriate route.

Foundation

Accelerate translation from discovery to commercial breeding applications

3. Turn the new NGT framework into a competitive advantage

Lead: government on framework conditions and the industry and sector organisations on implementation and market adoption.

The new European NGT framework can shorten development pathways and expand the range of traits accessible through modern breeding. The Netherlands should move quickly to translate the framework into clear and workable conditions for companies and researchers.

Regulation alone is not enough. Competitive implementation also requires clarity on IP and licensing, access to genetic material, freedom to operate, public acceptance, phytosanitary reliability and international market access. Particular attention should



Greenhouse crop trials, illustrating how plant phenotyping and controlled growing conditions support biotechnology-enabled breeding and the development of improved crop varieties.

be given to ensuring that smaller companies can access enabling technologies while preserving incentives for companies to invest in innovation.

First steps: Use existing NGT implementation structures to translate the European framework into practical guidance on regulation, IP and licensing, access to genetic material and international market access, with clear ownership across government and industry.

4. Organise shared access to breeding infrastructure, compute and biological data.

Lead: Knowledge institutions, supported by the government and industry.

Competitive breeding increasingly requires access to phenotyping, field trials, greenhouses, compute capacity and biological datasets. The Netherlands should organise these capabilities as a more accessible shared infrastructure, with particular attention to start-ups, SMEs, ornamentals, protein crops and specialty crops. This should include both physical infrastructure and shared approaches to data access, standards and governance.

First steps: Map existing capabilities and their utilisation, identify the most important access barriers for start-ups and SMEs, and develop transparent, affordable and financially sustainable access and pricing models for the highest-priority facilities and datasets, with particular attention to start-ups and SMEs.

Flywheel

Leverage strong incumbents with established routes to market

The sector already benefits from globally leading breeding companies, established routes to market and substantial private R&D investment. The policy priority is to use established breeders for co-development, validation, licensing, strategic investment and market access.

For seeds, the national agenda should concentrate on continuous ecosystem renewal, shared enabling capabilities and access for the next generation of specialised companies. A separate late-stage funding track is less relevant in this value chain.



Robotics and sensing in greenhouse tomato production, complementary technologies for advanced growing systems.

Value chain:

B

Biological agricultural inputs



Scaling requires system change across the value chain

Go directly to

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Key take-outs

- **Starting point:** The Netherlands leads in biocontrols for greenhouse horticulture and integrated growing systems. This position rests on WUR's knowledge base, innovative growers, Koppert as anchor company, short value chains that make the Netherlands a strong validation platform, and precision agriculture capabilities. However, this position is narrower and less mature than in seeds: strength concentrates in high-tech horticulture and biocontrols, while biostimulants, biofertilizers and open-field applications see less adoption and company formation.

- **Aspiration:** 'Build the Pipeline'. The Netherlands should aim to become a European leader in high-tech biocontrol systems for controlled and high-value crops, and use this position to roll out this knowledge in open field agriculture, accelerating the transition towards integrated growing systems that are less dependent on chemicals. The upside is both economic and societal: strengthening Dutch companies and knowledge positions in a growing global market, while reducing reliance on chemical pesticides and supporting more resilient production. Achieving this requires aligning agricultural, food and health policy around the transition towards bio-based and integrated growing systems.

- **Scaling conditions:** Biological inputs face a combination of regulatory, technical and adoption barriers. EU approval pathways remain slow and poorly adapted to biological products, while variable performance, narrower use cases and long validation timelines make business cases harder to prove. At farm level, adoption often requires changes in growing practices, supported by practical validation, advisory capacity and mechanisms to reduce transition risk. Without improvement, validation, market entry and growth risk moving to faster markets such as Brazil and the US.

- **Recommendations:** Key levers are to (Fertile Ground) build a stronger biocontrol venture pipeline around priority grower needs and strengthen knowledge and advisory capabilities; (Foundation) create faster regulatory pathways and crop-specific validation platforms; and (Flywheel) de-risk adoption through value-chain commitments and temporary risk sharing, while testing the case for a sector-led greenhouse innovation fund.

The opportunity

From Dutch strength in greenhouse biocontrol to European leadership in high-tech biological growing systems

Starting point

The transition towards biological inputs should be understood as part of a broader shift towards bio-based and more resilient agrifood systems. For biologicals, the transition goes beyond replacing chemical inputs. It involves developing healthier production systems built around biocontrol, microbiome-driven approaches and integrated growing practices. Demand will scale faster if agricultural, food and health policies are better aligned around this transition.

The Netherlands does not currently have a broad biological-inputs industry comparable with its seed sector. Its strongest position is more specific: biocontrol in controlled and high-value growing systems. In greenhouse horticulture, biological pest control is already embedded in practice, performance can be monitored closely and solutions can be tested and refined across diverse crops and relatively short production cycles.

This position is reflected in the sector's Hightech Teelt 2040 agenda, which frames green cultivation as part of a broader high-tech transition combining biological solutions, resilient cultivation systems, data, AI and robotics. Initiatives such as 100% Groen Geteeld demonstrate both the willingness of growers to transition and the importance of practical validation, coordinated support and collaboration between growers, suppliers, advisors and knowledge institutions (see the case study on p. 64–65).

The Netherlands' crop diversity, organised grower networks and short value-chain linkages create a strong environment for generating rapid feedback and validating solutions across different crop contexts.

Key strengths include:

- Global leadership in greenhouse horticulture
- A strong biocontrol anchor company in Koppert
- A world-class agricultural knowledge base, including WUR
- An established industry association in Artemis, representing companies active in biocontrol and biostimulants
- Short feedback loops between growers, suppliers and advisors
- Practice-based innovation platforms such as 100% Groen Geteeld

These strengths are complemented by capabilities in monitoring, camera systems, data-driven cultivation and targeted application technologies. Such technologies can support biological crop protection by making pest pressure, product performance and intervention timing more visible and manageable.

Together, these assets give the Netherlands a credible basis for building a stronger international position in biocontrol, even though its current company base remains limited. Beyond Koppert, few Dutch biological-input ventures have developed into sizeable international companies, and the Dutch position is less distinctive in biostimulants, biofertilizers and open-field applications. The main gap lies in the progression from research and early ventures through practical validation, regulatory approval, market adoption and scale. Without action, Dutch innovations may continue to be developed domestically while validation, commercialisation and growth increasingly take place in faster-moving markets such as Brazil and the US.

Biofertilizers and biostimulants are relevant for the Dutch nitrogen and nutrient-efficiency challenge, but should not be positioned as the primary Dutch technology-development bet. Part of the solution may come from non-biotech routes such as circular fertilisers, which can valorise existing manure streams. Where these solutions are not yet cost-effective, sufficiently concentrated or suitable for specific crops and contexts, biofertilizers and biostimulants could become more relevant. However, the Netherlands does not yet have the same clear leadership position in these segments as it has in greenhouse biocontrols.

Aspiration

By 2040, the Netherlands is Europe's leading ecosystem for high-tech biocontrol systems in controlled and high-value crops, with a broader base of world-leading companies, SMEs and enabling technology providers. Greenhouse horticulture functions as Europe's leading validation and learning platform for biological crop protection, where solutions, advisory models, monitoring tools and risk-sharing approaches are tested under practical conditions and then translated selectively to open-field crops. A place where biological crop protection solutions move from research to practical validation and adoption faster than elsewhere in Europe, and where Dutch companies capture a disproportionate share of a growing global market.

> Disease and pest control will become the next major headache for agriculture.
>
> – **Joris Roskam, Agrifirm**

If the Netherlands doubles down, it can grow its market share in biological inputs while strengthening food security, strategic autonomy and the resilience of Dutch and European agriculture. The societal upside is equally important: Biocontrol can reduce reliance on chemical crop protection. Nutrient-efficiency and soil-health benefits depend on the specific biological product and farming practice. Realising that upside is a matter of adoption, not just technology: it hinges on whether biologicals complement or replace conventional inputs, since nitrogen pollution and nutrient runoff will persist unless synthetic fertiliser use falls alongside them.

Table 5. What do we mean by biological agricultural inputs?

The term biological agricultural inputs is used as an umbrella term for three categories that differ strongly in function, regulation, adoption dynamics and Dutch competitive position:		
Category	**Function**	**Examples**
Biocontrols	Manage pests and diseases	Natural enemies (macro-organisms), beneficial micro-organisms, pheromones and natural substances
Biostimulants	Improve plant resilience, growth, stress response or nutrient efficiency	Seaweed extracts, humic substances, microbial or non-microbial stimulants
Biofertilizers	Improve nutrient availability or nutrient uptake	Nitrogen-fixing or phosphate-solubilising microbes

Market dynamics

Pest resistance, soil health & residue pressure drive demand for biologicals but adoption transition is complex

The transition to sustainable crop protection is not about replacing one product with another. It is about giving growers new tools that fit a more resilient agricultural system.

- **Erik Hertel, Founder VitalFluid**

Market size: strong global growth, driven by narrowing chemical options, resistance and soil health needs

The global market for biological inputs for agriculture, including biocontrols, biofertilizers and biostimulants, is expected to grow at a double-digit rate, from approximately €16 billion in 2025 to €110–160 billion by 2040. This implies a CAGR of around 16%. Over the same period, biological inputs are projected to increase their estimated share of the broader crop-input market from approximately 6% today to 9% by 2030 and 26% by 2040. Market growth is driven by several reinforcing forces.

- First, resistance to conventional chemical active ingredients is increasing across weeds, fungi and insects, making biologicals more relevant as part of integrated pest management.
- Second, retailers, consumers and export markets are increasingly pushing for lower-residue and lower-impact production systems, especially in high-value crops and European value chains.
- Third, chemical crop protection options are narrowing as regulation phases out or restricts certain active ingredients, increasing the need for alternatives.
- Fourth, soil health and long-term crop resilience are becoming more important as farmers face climate stress, degraded soils and pressure to reduce environmental impact. In nutrient management, biological inputs could also play a role in improving nutrient efficiency, soil health and plant resilience.

For the Netherlands, this is relevant in the context of the nitrogen challenge, but biofertilizers should be seen alongside other non-biotech routes such as circular fertilisers. Circular solutions, such as membrane technologies, are attractive because they can extract nutrients from existing manure streams, while biofertilizers and biostimulants may be more relevant where circular fertilizers are not yet cost-effective, agronomically sufficient or applicable to specific crop contexts.

Adoption patterns: high-value and controlled crops lead, open-field adoption is more complex

Today, adoption is strongest in horticulture and high-value crops, especially fruit, vegetables and greenhouse production. These segments have a higher value per hectare, greater sensitivity to residue limits and more controlled production conditions, making biological solutions easier to justify and implement. Row crops are also becoming a larger opportunity, particularly in the US and Latin America, but adoption is more complex due to larger scale, lower margins and less controlled growing conditions.

The opportunity differs between closed and open cultivation systems. In greenhouse horticulture, the strongest near-term opportunity lies in combining natural enemies with natural substances, supported by monitoring and targeted interventions. Over time, micro-organisms may become more relevant as organic substrates and microbiome-based growing systems develop further. In open-field agriculture, the use of natural enemies is more difficult due to less controlled conditions, while natural substances and micro-organisms are more likely to play a larger role, particularly as soil health and microbial activity become more important in crop resilience.

Supply-side innovation: technology is improving

On the supply side, advances in microbiomics, fermentation, formulation and encapsulation are improving product stability, shelf life and field reliability. Some biologicals can increasingly function as direct replacements for chemical products in specific use cases, while others remain part of integrated systems combining biology, monitoring, prevention and advisory support.

Dutch position: strong in greenhouse biocontrols, but market share is not guaranteed

The Netherlands is well positioned in part of this market, especially greenhouse horticulture and related biocontrols. Its estimated share in the global biological inputs market is ~4% today, with a stronger position in horticulture biocontrols. Without additional action, this share could decline to around ~1% by 2040 as faster-moving markets scale more rapidly. If the Netherlands doubles down, its market share could instead increase to approximately 6% by 2040, representing a potential Dutch market value of €8 billion. Realising this upside of an additional €7 billion requires addressing regulatory uncertainty, farmer transition risk and the need for practical validation at scale.

Figure 10. Biological Agricultural Inputs: Global Market Outlook and Dutch Opportunity. Source: Invest-NL analysis. Revenue of key NL companies, MarketsandMarkets, Fortune Business Insights, Food2040

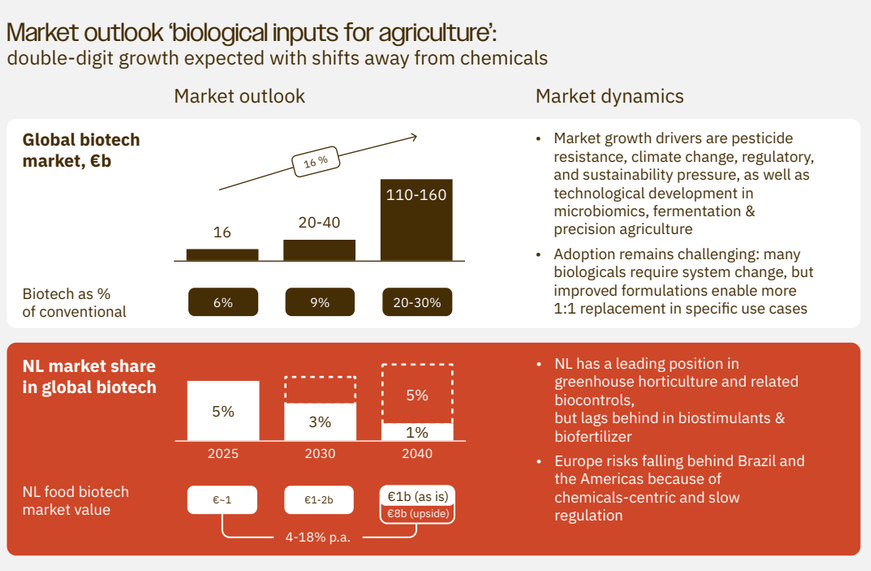


Table 6. Indicative global market size and growth of biological agricultural inputs, by segment (€ billion).
Sources: MarketsandMarkets, Fortune Business Insights

Market € billion	2025	2030	2040	CAGR
Biocontrols	9	21	90-110	17%
Biofertilizers	2	4	10-20	13%
Biostimulants	4	7	15-25	12%



VitalFluid's plasma-activated water system, developed for use in crop protection.

Figure 11. Illustrative Organisations in the Dutch Biological Agricultural Inputs Ecosystem



Case study: Brazil shows that biologicals scale when adoption is actively organised

Why Brazil scaled

Brazil's biologicals market scaled because strong farmer need was matched by an organised adoption system. The country's tropical climate, high pest pressure, resistance to conventional chemistry, large-scale open-field agriculture and multiple crop cycles per year created urgency and faster learning loops. But the more relevant lesson for Europe is that Brazil translated this urgency into market development. Biologicals became part of a broader national agenda: Brazil launched its National Bioinputs Program in 2020 to expand and strengthen the use of bioinputs in agriculture. The market has since continued to grow strongly: Kynetec/FarmTrak reports that sales of biological pesticides reached €690 million in the 2024/25 crop year, an 18% increase versus the previous season.



How Brazil scaled

Brazil scaled biologicals by organising demand generation close to the farmer. Adoption was supported through advisory visits, field demonstrations, practical validation and early success stories, helping to break the perception that biologicals are structurally less effective than chemical alternatives. Regulation was an important enabler within this broader system: faster and more tailored pathways improved time-to-market for lower-risk biological products. At the same time, Brazil's experience shows that speed needs to be combined with quality control and legal clarity. Early market growth came with concerns around product quality and standardisation; as the market matured, stronger brands, strategic acquisitions and quality control helped professionalise the sector. The 2024 Bioinputs Law introduced a dedicated framework for the production, registration, commercialisation and use of bioinputs, including definitions and quality-related requirements.

Lessons for Europe and the Netherlands

Europe also has a strong need for biological alternatives, driven by the phase-out of chemical crop protection products, stricter residue requirements, water-quality concerns and pressure to reduce pesticide use. Brazil shows that need alone is not enough. Adoption accelerated because growers could see products working in practice, received active support in how to apply them, and operated in a market where regulation, advisory capacity and commercial incentives moved in the same direction. This is the relevant lesson for Europe: biologicals should not be treated as individual product substitutions, but as a market transition that requires organised proof, trust and demand. The Dutch greenhouse sector is well positioned to generate that proof, because controlled conditions, intensive monitoring and close interaction between growers, advisors and suppliers make biological performance easier to test, improve and demonstrate before selected models are translated to more variable open-field conditions.

Scaling conditions

Table 7. Key scaling conditions for biological agricultural inputs.

Scaling condition		Current situation
1	**Market demand**	Demand is growing, but adoption often requires integrated crop management and places transition risk on growers
2	**Capital**	Long validation and regulatory timelines create a missing middle and constrain venture progression
3	**Infrastructure**	Strong greenhouse capabilities, but practical validation and microbial scale-up infrastructure remain fragmented
4	**Regulation**	EU framework is slow and poorly adapted to biological products
5	**Talent**	More integrated crop-management, advisory and data capabilities are needed
6	**Ecosystem collaboration**	Strong actors are present, but the pathway from innovation to validation and adoption is fragmented

Ill-fitting regulatory framework and transition complexity result in long timelines, putting pressure on business cases and investability

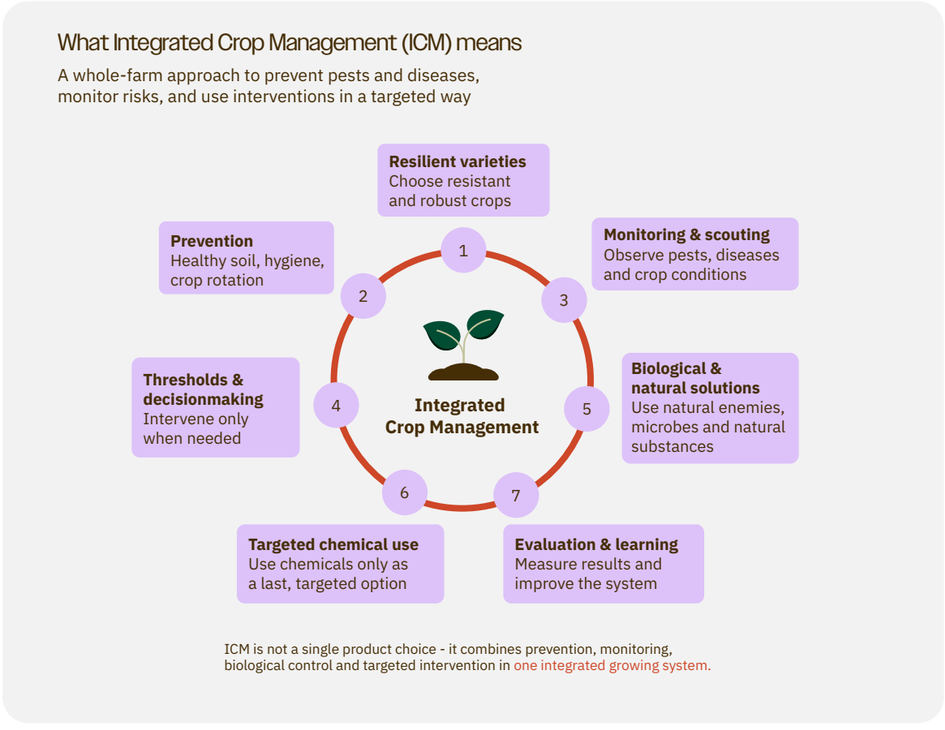
1 Market demand

Farmers increasingly need alternatives to chemicals, but adoption remains operationally complex

Market demand for biological inputs is increasing, driven by regulatory pressure on chemical crop protection, retailer requirements, resistance development and growing demand for lower-residue and more sustainable production. However, market pull does not automatically translate into adoption. Unlike conventional chemical crop protection, many biological solutions cannot simply be substituted one-for-one into existing cultivation practices.

Adoption often requires a shift towards integrated crop management (ICM), combining prevention, monitoring, biological control and targeted chemical intervention. This requires growers to adapt cultivation practices and build experience with new protocols, while advisors and distributors play an important role in translating biological products into practical growing strategies. Some biologicals increasingly function as more direct drop-in replacements and can therefore provide a lower-risk route to adoption.

Figure 12. What Integrated Crop Management means



The economics of this transition remain challenging. Additional costs and performance risks often fall primarily on growers, while part of the benefits accrue elsewhere in the value chain. Dutch initiatives such as Beter voor Natuur & Boer and On the way to PlanetProof show how retailer requirements, certification and value-chain agreements can strengthen downstream demand. However, a sufficient green premium is not yet consistently available to compensate growers for the additional costs and risks of transition.

Scaling adoption therefore requires credible evidence that solutions work under relevant cultivation conditions, sufficient advisory capacity and mechanisms to share transition risk across the value chain. This is particularly important outside frontrunner greenhouse horticulture, where experience with integrated biological systems remains more limited.

> The Netherlands has built a world-leading position by combining scientific excellence with close collaboration across the agrifood value chain. This proven Dutch Diamond model remains our greatest competitive advantage.
>
> – **Liesbeth Luijendijk, WUR**

2 Capital

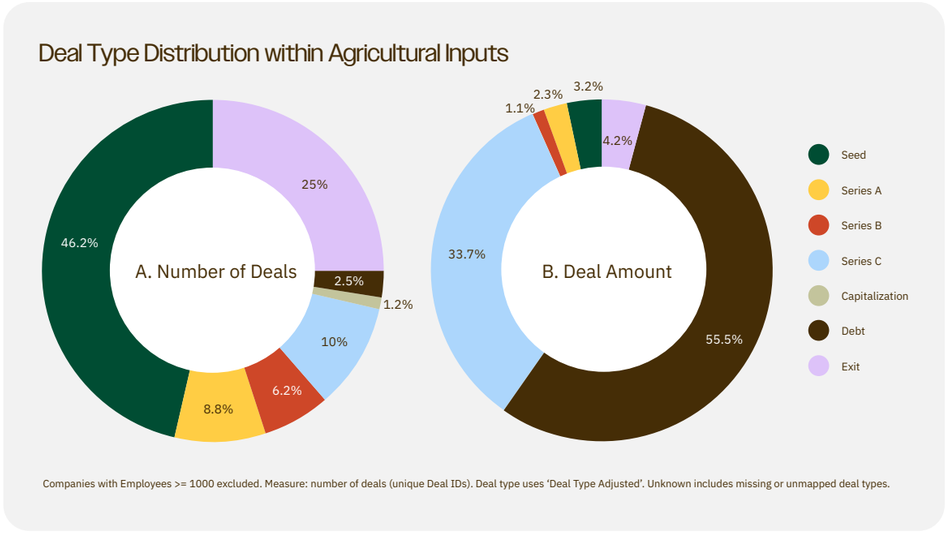
Biologicals face structural funding gaps and limited start-up formation

Biological inputs face a difficult funding environment because value creation takes a long time to prove. Companies must demonstrate technical efficacy, navigate lengthy regulatory pathways and build sufficient evidence of market adoption before revenues can scale. This creates long periods between early technology development and commercially relevant milestones, making the sector challenging for conventional venture capital.

The challenge is particularly acute in biocontrol. Products can be crop-, pest- and geography-specific, limiting the addressable market of individual solutions, while development and registration costs remain significant. Field performance can also depend on local growing conditions and cultivation practices, making future commercial returns more difficult to predict.

Private financing is therefore particularly difficult before technical, regulatory and commercial risks have been sufficiently reduced. Several biological companies depend heavily on public funding, grants or strategic partnerships during early development. Deal activity is concentrated at seed stage, but relatively few companies progress into Series A and B. Most funding is concentrated in a small number of later-stage rounds and debt financings, suggesting that many biological companies struggle to secure the validation and scale-up capital required to progress through the growth pipeline.

Figure 13. Investment Profile of Dutch Biological Agricultural Inputs Ventures. Source: PitchBook, Invest-NL analysis.



3 Infrastructure

Ventures struggle to access affordable labs, field trials and fermentation infrastructure

For biologicals, practical validation infrastructure matters most: greenhouses, field trials, monitoring systems and grower networks where products can be tested under commercial conditions. For biocontrols, the Dutch greenhouse ecosystem is an advantage. Growers, suppliers, advisors and researchers are close together, which enables faster feedback and iteration. However, this advantage is not yet organised as a scalable validation infrastructure. Testing remains fragmented across initiatives, and results are not always comparable or easy to translate into broader adoption.

For microbial products, scale-up infrastructure is more challenging. Ventures need access to suitable fermentation capacity, formulation capabilities and facilities that fit agricultural, often non-sterile, production processes. Several companies indicate that the Dutch infrastructure is not always well matched to these needs, which can push development and scale-up abroad.

Monitoring and data infrastructure should also be treated as core infrastructure. Biologicals require evidence of performance under variable conditions, and growers need tools to see whether products are working. Without standardised data collection, decision-support tools and comparable validation protocols, it remains difficult to build trust with growers or investors.

More broadly, infrastructure development should be approached as ecosystem-building. This includes not only physical assets such as greenhouses and pilot facilities, but also digital infrastructure, data-sharing platforms and coordinated grower networks. Public support should focus on accessibility, interoperability and long-term ecosystem viability, rather than standalone investments.



Biological crop protection in greenhouse peppers, illustrating how beneficial organisms can help control pests and reduce reliance on chemical pesticides.

4 Regulation

Current European regulation is poorly adapted to biological products

Regulation is the most consistently mentioned bottleneck for biological inputs. A first problem is the lack of legal clarity: biological categories such as biocontrol are not yet clearly defined in law, which creates uncertainty for companies, regulators and investors. European crop protection regulation is still largely designed around chemical products, while biologicals have different risk profiles, modes of action and development dynamics. As a result, approval processes are often too slow, costly and uncertain for products with smaller market potential than conventional chemical crop protection.

This creates a direct investment barrier. Estimated registration timelines of 8–10 years in Europe make it difficult for start-ups and scale-ups to justify development, especially when comparable approval routes in markets such as Brazil or the US are significantly faster. Several companies therefore keep R&D or headquarters in the Netherlands, but prioritise validation, registration and market entry outside Europe. This risks shifting practical learning and value creation away from the Dutch ecosystem.

France is mentioned as a relevant reference point. Its biocontrol policy combined a dedicated government-backed biocontrol list, priority treatment of biocontrol dossiers and incentives for distributors to bring pesticide-reducing alternatives to market. The lesson is that regulatory clarity, dedicated capacity and commercial incentives can reinforce each other in creating more predictable market conditions for biological product categories.

The issue is not only the final approval timeline, but also the lack of room to test and learn earlier. Controlled experimental space for not-yet-approved biologicals could allow companies and growers to build evidence under practical conditions before full market authorisation. This is particularly important because biologicals require local validation and grower experience.

5 Talent

Scaling biologicals requires advisory capabilities and practical grower support

Scaling biologicals requires different capabilities than conventional crop protection. Chemical products are often applied as relatively direct interventions, while biologicals depend more on timing, monitoring, prevention, growing conditions and system design. Adoption therefore requires changes in both products and farming practice.

Advisors and distributors are therefore critical. They translate biological products into practical growing strategies and help growers understand when and how to apply them. However, much of the current advisory system is still shaped around chemical crop protection, with licensing, training and performance expectations focused on product application rather than integrated biological systems.

The capability gap is greatest outside frontrunner greenhouse horticulture, where growers often have less experience with scouting, resilience-based crop management and biological performance indicators. Training should therefore focus on integrated crop management rather than narrow product advice, combining fertilisation, scouting, natural enemies, monitoring, data interpretation and targeted chemical intervention where needed.

6 Ecosystem collaboration

The Netherlands has a strong position in horticulture based biological solutions

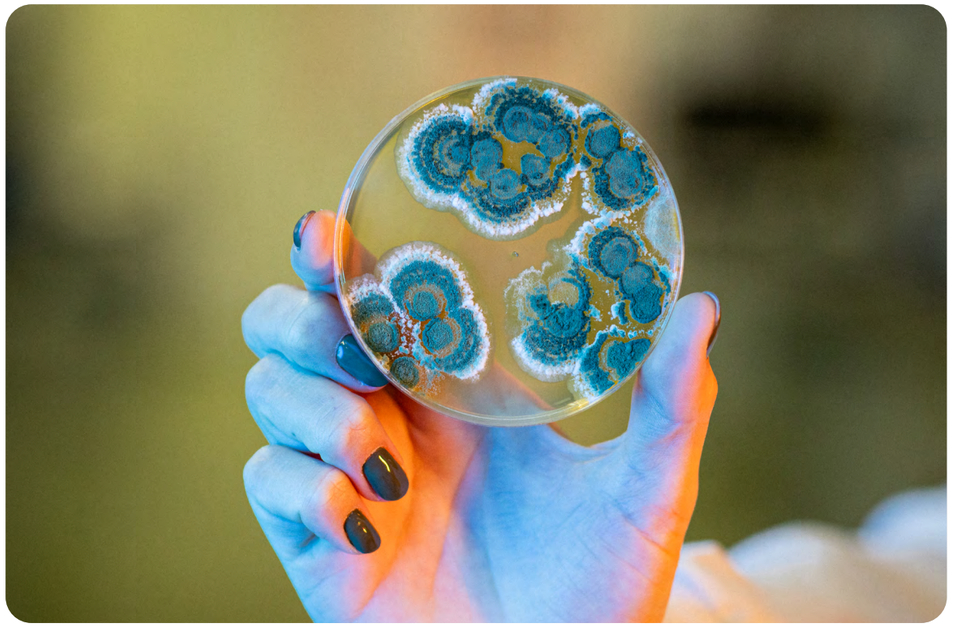
The Netherlands has a strong biological-inputs ecosystem, particularly around greenhouse horticulture, with leading companies, innovative growers, knowledge institutions, technology suppliers and specialised advisors. The main challenge is not the absence of relevant actors, but how effectively they are connected from innovation through validation to adoption.

Stakeholders point to fragmentation across initiatives, facilities and support programmes. Research, product development, practical validation, grower adoption and financing are often supported through different organisations, making it difficult for emerging companies to navigate a continuous pathway towards market.

A key opportunity is to organise the ecosystem more systematically around concrete grower challenges. Priority crop-pest and disease combinations can provide a common starting point for researchers, entrepreneurs, companies, growers and technology providers, helping to connect innovation earlier to practical validation and market needs.

The Dutch greenhouse horticulture sector provides a particularly strong environment for this approach. Initiatives such as 100% Groen Geteeld illustrate how growers, suppliers and other ecosystem partners can organise around concrete challenges and jointly generate practical evidence for adoption.

> The issue is not deregulation, but regulation that fits biological products.
>
> **- Peter Maes, Koppert**



Microbial research at Koppert supporting the development of biological crop protection.

Recommendations

Faster validation pathways, more early-stage funding to fill the pipeline, and accelerating sector initiatives

The priority for biological agricultural inputs is to ‘Build the Pipeline’. The immediate focus should be biocontrol and integrated crop management for high-value horticulture, where the Netherlands can build on leading companies, advanced growers and greenhouse validation capabilities. The recommendations in this section therefore focus primarily on strengthening the Dutch biocontrol pipeline: from venture creation and validation to regulation, adoption and scale. Biostimulants, biofertilisers and other biological inputs remain relevant to the broader agricultural transition, but they require different evidence, regulatory pathways and market-development approaches and are not the primary focus of this agenda. Where specific opportunities emerge, they should be assessed separately based on Dutch capabilities and market potential.

The Crop Protection Covenant provides an agreed framework whose delivery arrangements are still being developed. The recommendations below therefore focus on strengthening its implementation and on gaps that are not yet sufficiently addressed, particularly financing the validation gap, structuring public-private risk sharing and turning proven solutions into investable propositions. The Crop Protection Covenant is an important implementation route for several of these recommendations, but the actions should not depend on its final design and should also be pursued through sector-led and public-private mechanisms where needed.

Fertile Ground

Build companies and capabilities

1. Build a stronger biocontrol venture pipeline around priority grower needs

Lead: Biotech Booster, as it further develops its sector-specific venture-building capabilities, working with Artemis, relevant sector organisations, knowledge institutions, growers and investors.

Build a stronger connection between concrete grower needs, public research and venture creation. Priority crop-pest and disease challenges should be translated into a focused pipeline of technologies and ventures, with support extending beyond proof of concept into efficacy testing, regulatory preparation, practical validation, grower economics and early commercial proof. The objective is to increase the number of biological innovations that become investable and scalable businesses. Venture building should be matched by milestone-based early-stage funding, ensuring that promising ventures can reach a meaningful technical and commercial proof point rather than stalling between small grants. If established, NADI could provide a strong vehicle for this approach. This should complement the Covenant’s knowledge and innovation programme by adding a stronger venture and investability layer.

First steps: Identify priority crop-pest and disease gaps and map the Dutch ventures, technologies and research projects that could address them.

2. Strengthen biologicals knowledge, advice and education

Lead: Ministry of Agriculture, Fisheries, Food Security and Nature (LVVN) through the Crop Protection Covenant, working with Groenpact and MBO/HBO institutions on education and with sector organisations, advisors and biologicals companies on practical training and knowledge transfer.

Successful adoption of biological crop protection requires different capabilities from conventional chemical crop protection. Biological crop protection, integrated crop management, monitoring and biological performance assessment should therefore become a more structural part of agricultural education and professional advisory services. This should strengthen both the capabilities of current growers and advisors and those of the next generation entering the sector. Existing initiatives such as the Green Growing Expertise Center can provide a practical foundation for this. This recommendation is already well aligned with the Crop Protection Covenant, which explicitly includes knowledge transfer to MBO/HBO education, advisor training and practical grower support.

First steps: Map current curriculum and advisor-training coverage and agree a common set of practical biological/ICM capabilities that should be strengthened.

Foundation

Make regulation and validation work

3. Create a faster, more predictable and fit-for-purpose regulatory pathway for biologicals

Lead: Ministry of Agriculture, Fisheries, Food Security and Nature (LVVN) as policy owner, working with Board for the Authorisation of Plant Protection Products and Biocides (Ctgb) and Ministry of Economic Affairs and Climate Policy (EZK) to translate lessons from the new regulatory sandboxes into structural improvements in the Dutch regulatory pathway and to drive required changes at EU level.

Future-oriented regulation should maintain the same high safety standards and scientific rigour, while better reflecting the specific risk profiles and modes of action of biological products. The current European crop-protection framework is largely designed around chemical products, resulting in requirements and timelines that do not fit most biologicals. At EU level, the priority should be to shape the ongoing reform of the EU plant protection products regulation (Regulation 1107/2009). The European Commission has proposed biocontrol-specific changes, including a legal definition of biocontrol, priority treatment of applications, provisional authorisation and stronger mutual recognition. The Netherlands should support reforms that create faster and more proportionate routes while maintaining high safety standards.

At national level, LVVN and Ctgb should not wait for EU legislation to change. Ctgb already has a specialised Green Team, a Sustainability Desk that prioritises qualifying greener products, pre-application support and dedicated assessment guidance for biopesticides. These capabilities should be strengthened through sufficient dedicated capacity, earlier and more structured pre-submission guidance, predictable handling of priority biocontrol dossiers and more active use of existing routes such as mutual recognition and minor-use extensions where legally possible. The recently initiated biocontrol regulatory sandboxes should be used to test how practical evidence can be generated earlier and how existing regulatory flexibility can be used more effectively, with lessons translated into structural improvements in guidance and assessment practice. LVVN should ensure that Ctgb has sufficient public capacity to perform these functions where they cannot reasonably be financed through applicant fees alone.

First steps: LVVN, Ctgb and EZK should use the new biocontrol regulatory sandboxes to identify the main sources of avoidable delay and uncertainty and translate the lessons into an action plan covering capacity, biological expertise, pre-submission guidance, prioritisation and timelines, flagging which bottlenecks can be addressed nationally and which require EU-level action.

4. Build crop-specific validation and learning platforms

Lead: Sector organisations, working with growers and biologicals companies to run trials and with the Ministry of Agriculture, Fisheries, Food Security and Nature to establish common validation principles and connect evidence across crops and sectors.

Build on initiatives such as 100% Groen Geteeld to create repeatable, crop-specific approaches for validating biological solutions under practical conditions. The focus should be on generating comparable technical, agronomic and economic evidence across growers and cultivation contexts.

Common protocols should cover product performance, applicability, cultivation conditions, farmer ROI and relevant enabling technologies such as monitoring and precision application. Results should be captured through standardised data collection so that evidence can be compared across trials and used by growers, suppliers, advisors, regulators and investors. Greenhouse horticulture can serve as the most advanced validation environment. Successful validation approaches should subsequently be adapted to selected Dutch open-field crops.

Invest-NL could support the further development of initiatives such as 100% Groen Geteeld by helping design financing models that bridge the gap between practical validation and commercial investment. This could include public-private structures that allow promising solutions to progress once sufficient technical, agronomic and economic evidence has been generated.

This recommendation builds directly on the Crop Protection Covenant, which already calls for practice-based innovation, testing of ICM approaches in real cultivation settings and sector-specific identification of gaps and alternatives. The additional step is to make this validation more systematic and comparable across crops: using common protocols, standardised data and explicit agronomic and economic evidence, including farmer ROI. This should also create a clearer financing pathway through the validation gap, helping promising solutions move from research and pilots towards commercial adoption and investability.

First steps: develop one common validation framework and select an initial set of greenhouse and crop-specific open-field use cases where biological alternatives have high potential.

Flywheel

Turn validation into adoption and market pull

5. De-risk adoption across the value chain

Lead: Sector organisations should bring growers, retailers, processors and other buyers together to set crop-specific commitments, with the Ministry of Agriculture, Fisheries, Food Security and Nature enabling temporary public risk sharing where justified and Invest-NL supporting the design of investable risk-sharing structures and mobilisation of private capital.

Once solutions have been validated, the next challenge is to enable commercial adoption without placing the full transition risk on growers. For selected validated solutions, growers, suppliers, downstream buyers and public actors should agree how additional costs, performance risks and wider benefits are shared. Approaches such as True Value Language (TVL) could help make these wider benefits visible and provide a common basis for discussing value creation across the chain. Explore integrated value-chain risk-sharing models in which downstream buyers provide commercial commitments while public instruments temporarily absorb part of the verified transition risk. This can align incentives across the value chain.

Depending on the use case, arrangements could include longer-term purchase agreements, co-financing, result-based payments, performance guarantees, offtake commitments or value-based pricing. The choice of instrument should follow from the economics of the specific crop and solution. Result-based financing is only appropriate where outcomes can be measured and reasonably attributed; temporary public risk-sharing may be justified during initial adoption but should decline as evidence and market confidence increase.

The Crop Protection Covenant already points in this direction, including through sector-specific economic incentives, a stimulation fund and the exploration of a public-private risk fund. However, these instruments are only outlined at a high level and implementation should not depend solely on the Covenant. A key next step is to translate them into concrete risk-sharing structures for specific crop and adoption cases, where Invest-NL could support financial design and the mobilisation of private capital and value-chain commitments.



First steps: select two or three measurable adoption cases, quantify the costs and risks to growers against the benefits accruing elsewhere in the chain, and agree performance indicators, contractual commitments and public-private financing solutions.

6. Test the case for a sector-led greenhouse innovation fund

Lead: The greenhouse sector should lead concept development and demonstrate sector commitment.

Within the greenhouse sector, an early-stage concept is being explored for a fund in which growers and value-chain partners invest alongside public and private financiers. Growers could also provide practical validation environments and act as launching customers for the innovations financed. Such a model could connect venture funding more directly to sector needs, practical validation, early adoption and market pull for technologies relevant to high-tech greenhouse horticulture, including biological inputs. This concept could complement the financing instruments foreseen in the Crop Protection Covenant.

First steps: Conduct a feasibility assessment, potentially with Invest-NL as a partner, covering the innovation pipeline, sector capital commitments, launching-customer demand, fund size, governance, investment criteria, financial structure, private-capital mobilisation and the additionality of public participation.

Case study: 100% Groen Geteeld, tackling biological adoption challenges through practice-based system validation



Greenhouse-grown peppers, illustrating the commercial growing systems in which biological crop protection is applied (Source: Harvest House).

From product substitution to system change

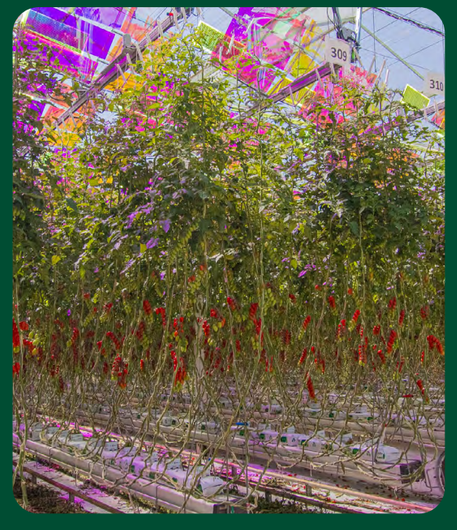
100% Groen Geteeld shows how the Netherlands can turn the complexity of biological crop protection into an ecosystem advantage. The initiative was developed in Dutch high-tech greenhouse horticulture, where chemical crop protection options are declining and growers increasingly need workable alternatives. Its core lesson is that biologicals do not scale through product substitution alone. They require an integrated growing system in which biology, technology, cultivation practice, data and advisory support are developed together.

Practice-based validation at commercial scale

The initiative aims to grow crops profitably in a resilient cultivation system using green, biological and technological solutions. It treats the whole growing system as the unit of change: not only crop protection products, but also climate, substrate, water, plant resilience, crop-monitoring, registration, escalation protocols and grower decision-making. The programme is practice-oriented, multi-year and implemented at real commercial scale, with growers in the lead, supported by development partners and open, non-competitive knowledge sharing. Early programme results indicate that this approach can materially reduce the use of chemical crop protection: the second-year update reported an average 64% reduction in active chemical substance per hectare. At the same time, the programme remains explicit about remaining barriers, including cost, robustness, availability of solutions, regulation and the need for escalation options when biological control is not yet sufficient.

Strategic lesson for the Netherlands

The strategic value of 100% Groen Geteeld is not only the reduction achieved in individual pilots. Its larger value is that it shows how greenhouse horticulture can serve as a practical validation platform for integrated biocontrol systems. The model brings together growers, suppliers, advisors, technology providers and knowledge institutions around concrete cultivation challenges. If scaled with standardised data collection, economic evaluation and risk-sharing mechanisms, it can become a repeatable model for accelerating adoption in controlled and high-value crops, and to open-field agriculture where conditions allow.



Case study: St. Louis, USA



Illustrative image: diversity in vegetable breeding.

Over the past 25 years, St. Louis has deliberately built a world-class agtech and bioscience cluster as a driver of regional economic growth. At its core is the Danforth Plant Science Center, the world's largest independent non-profit plant research institute, supported by Washington University, a strong talent pipeline, and a dense network of start-ups, investors and support organisations.

A defining feature of the ecosystem is the role of Bayer Crop Science. Since Bayer's acquisition of Monsanto in 2018. Beyond serving as a corporate anchor, Bayer has become a major source of entrepreneurial talent. Several successful agricultural biotechnology start-ups, including Benson Hill, CoverCress and NewLeaf Symbiotics, emerged from the broader Bayer and Monsanto ecosystem. The ecosystem is further strengthened by BioSTL, the non-profit organisation responsible for start-up creation, workforce development and ecosystem coordination. Through its investment arm BioGenerator, BioSTL has invested more than $50 million in over 130 companies, helping attract nearly $3 billion in follow on funding. Other key organisations include Danforth Technology Company, Arch Grants, Yield Lab and the 39 North innovation district, which provides shared infrastructure for start-ups, scale ups and established companies.

Key Lessons

Fertile Ground

Venture creation is actively organised

One of the most distinctive characteristics of St. Louis is that start-up creation is treated as a deliberate activity rather than a by-product of academic excellence. The Danforth Technology Company was established specifically to commercialise research generated at the Danforth Center and actively supports spin-out creation. BioGenerator plays a similar role by identifying entrepreneurial opportunities, supporting company formation and providing early-stage capital. Both organisations make extensive use of Entrepreneur in Residence models, bringing experienced commercial leadership into young ventures at an early stage. Beyond formal programmes, the ecosystem benefits from a large pool of experienced industry professionals. Former Bayer and Monsanto employees frequently become founders, executives, advisors or early employees in new companies, helping bridge the gap between science and commercialisation.

Foundation

Commercialisation infrastructure extends beyond laboratories

The St. Louis ecosystem demonstrates that physical infrastructure alone is insufficient. While facilities such as BRDG Park, the Helix Center and BioGenerator Labs provide access to laboratories and research facilities, equal attention is given to commercialisation infrastructure. Field validation is considered an essential step for plant science companies. Missouri's large agricultural base and proximity to major corn and soybean production regions provide unique testing opportunities. Through the Early Adopter Grower Innovation Community (EAGIC), BioSTL actively identifies growers willing to test new technologies, matches them with start-ups and helps structure collaborations. The report explicitly highlights that having infrastructure in place is not enough; organising and facilitating these relationships is vital for successful scale-up.

Flywheel

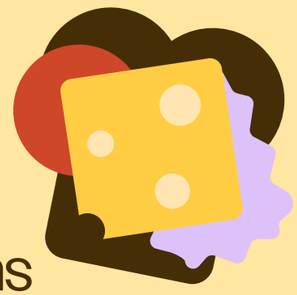
Long-term ecosystem orchestration creates alignment

A third lesson is the importance of long-term coordination. The ecosystem traces its roots to a coalition established by William Danforth and a group of civic, business, academic and philanthropic leaders more than two decades ago. This coalition evolved into BioSTL, which today brings together more than 50 corporates, universities, investors, philanthropic organisations and public stakeholders around a shared regional economic-development agenda. This coordination extends beyond start-up support. BioSTL also helps organise policy advocacy through the national Innovation Advocacy Council, workforce development and collaboration between industry and grower associations. The result is a high degree of alignment across the ecosystem, reducing fragmentation and enabling collective action around shared priorities.

Value chain:

C

Biotech ingredients and food applications



Commercialisation and industrial scale up are the defining challenge

Go directly to

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Key take-outs

- **Starting point:** The Netherlands has a pioneering reputation in biotech food ingredient innovation, home to world-class fermentation science, anchor corporates, and a dense start-up ecosystem, but has yet to convert that upstream strength into a consistent commercialisation track record.
- **Aspiration: ‘Scale the Winners’.** By 2040, the Netherlands is Europe’s leading hub for biotech ingredient commercialisation, the place where fermentation-derived ingredients, upcycled waste streams and cultivated meat move from lab to commercialisation faster than anywhere else, delivering €~8 billion annually for the Netherlands while having a positive impact on emissions, agricultural land use and healthy diets.
- **Scaling conditions:** The defining challenge is the chicken-and-egg dynamic between proven lab-scale technology and commercial scale: regulatory timelines extend time-to-market, unproven offtake demand limits investor appetite, limited access to shared fermentation infrastructure forces costly captive builds, and a workable FOAK financing pathway is still missing, each barrier reinforcing the others in a cycle that no single actor can break alone.
- **Recommendations:** Strengthen venture creation by increasing the availability of commercially oriented founders and leadership teams (Fertile Ground); provide access to a limited number of excellent and complementary shared facilities (Foundation); address the FOAK funding gap through a mix of financial instruments and stakeholders (Flywheel); and accelerate learning and market adoption through stronger corporate-start-up collaboration and progressively stronger customer commitments (Foundation and Flywheel).

The opportunity

Extend pioneering role in biotech ingredient innovation to being a commercialisation hub

Dutch consumers show among Europe's highest openness to food innovation, for example 63% support authorising cultivated meat once proven safe[3], though awareness and access to biotech food products remain limited.

The Netherlands has a pioneering reputation in biotech food ingredients. Several industry shaping innovations were founded here, such as cultivated meat. This shapes the Netherlands' role as a global agri-food hub, combining strong positions in agriculture, food processing, and ingredient manufacturing, which are critical parts of the emerging biotech value chain.

The ecosystem benefits from several structural advantages:

- **Strong agrifood, biotech and knowledge base.** The Netherlands combines world-leading expertise in food science, fermentation, synthetic biology and industrial biotechnology with a dense network of universities and research institutes. Wageningen University & Research is a key anchor, complemented by internationally recognised capabilities at TU Delft, Leiden, Utrecht, Amsterdam, Eindhoven and Maastricht.
- **Dense innovation ecosystem, but incomplete integration across the scale-up pathway.** The Netherlands combines start-ups, scale-ups, corporates, investors and research institutes in a relatively small geographic area. Foodvalley, Planet B.io, Leiden Bio Science Park, Pivot Park and several regional clusters facilitate collaboration across the innovation chain from research to commercialisation. The Dutch ecosystem is consistently recognised as one of Europe's strongest start-up ecosystems and has particular strength in agrifood innovation.
- **Existing presence of leading food, ingredient and agri corporates.** The Netherlands is home to major multinational companies across the food value chain, including FrieslandCampina, dsm-firmenich, Corbion, Cosun, Unilever and numerous specialised ingredient manufacturers. These companies provide potential customers, strategic investors and scale-up partners for emerging biotech ventures. Dutch retailers increasingly influence product introductions, sustainability standards and consumer adoption.
- **High quality infrastructure and logistics network.** Through the Port of Rotterdam, Schiphol Airport and a dense logistics network, the Netherlands provides access to European and global markets. The Food 2040 initiative explicitly identifies this combination of logistics, technology and knowledge infrastructure as a key source of international competitiveness.
- **Strong foundation for industrial biotechnology.** Beyond food applications, the Netherlands has a broader industrial biotechnology base, including expertise in fermentation, bioprocess engineering, enzyme development and biomanufacturing, creating spillovers between health, industrial biotech and food applications.

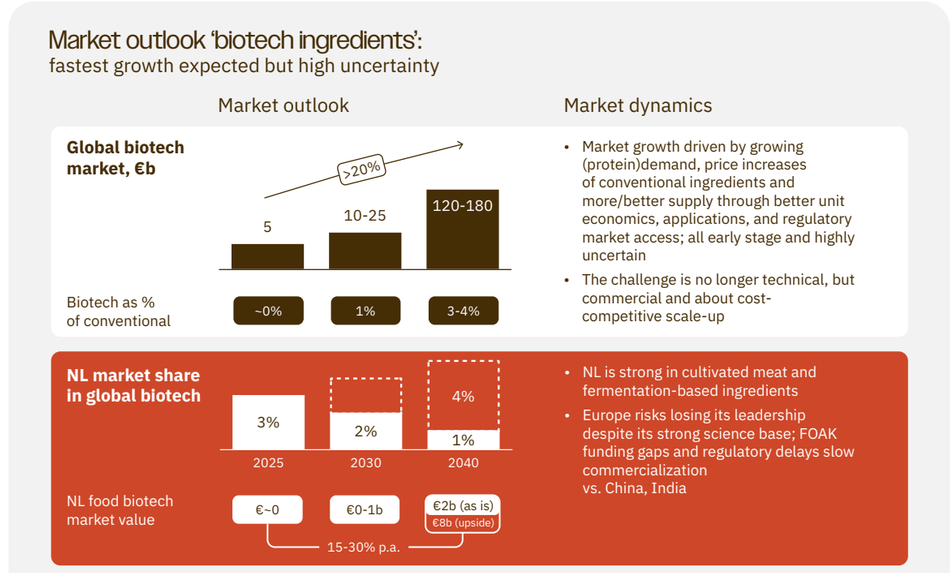
Together, these capabilities provide a strong foundation across the innovation and scale-up journey. The opportunity is to extend this existing ecosystem into the final stages of commercialisation and industrial scale-up.

Yet the Netherlands and Europe face a structural commercialisation gap. While they perform strongly in early-stage research and ingredient innovation, this strength does not consistently translate into industrial-scale production and market deployment. As a result, promising companies and technologies often enter the market elsewhere, limiting domestic value creation, strategic autonomy and long-term competitiveness. If the Netherlands does nothing, its market share is expected to decline from today's 3% to ~1% by 2040.

The strategic relevance of biotech ingredients also lies in Europe's exposure to vulnerable food and feedstock supply chains. Many conventional ingredients depend on globally traded agricultural commodities, animal-based inputs or climate-sensitive crops, making European food manufacturers exposed to price volatility, geopolitical disruption and climate-related supply shocks. Biotech ingredients cannot replace these supply chains overnight, but they can diversify supply, reduce dependence on specific imported commodities and create more controllable production routes closer to European markets. This makes commercialisation capacity strategically relevant, not only economically and environmentally, but also for food system resilience and European autonomy.

Aspiration: By 2040, the Netherlands could become one of Europe's leading hubs for biotech ingredient commercialisation, with Dutch companies capturing around €8 billion in annual revenues from a global market projected at €120-180 billion. Biotech ingredients can reduce dependence on land-intensive production and diversify supply chains, with environmental benefits depending on the product and production route.

Figure 14. Biotech Ingredients: Global Market Outlook and Dutch Opportunity. Source: Invest-NL analysis. Revenue of top NL players, Fortune Business Insights, Food2040, McKinsey, Strategy&



[3] Good Food Institute Europe

Figure 15. Illustrative Organisations in the Dutch Biotech Ingredients Ecosystem.



Market dynamics

Cost competitiveness, appealing food applications and food manufacturer adoption will drive industry growth

The global market for biotech food ingredients and food applications is projected to reach €120-180b by 2040 (3-4% penetration of conventional[4], >20% CAGR). The market growth projection is highest, but demand today is very small and hence the outlook has high uncertainty. The main segments include precision fermentation, biomass fermentation, upcycled (plant-based) ingredients and cultivated products, with fermentation expected to drive most of the near-term growth[5]. Key end markets include meat and seafood alternatives, dairy and egg replacements, cacao and coffee substitutes, and high-value functional and specialised nutrition applications such as healthy ageing, metabolic health, infant, clinical and sports nutrition, where functionality and demonstrated health benefits can support higher willingness to pay[6].

The main supply challenge is reaching price or value parity with conventional products by improving strain performance, feedstock efficiency, downstream processing and production scale. Compared to other biotech areas such as life sciences, food ingredients are characterised by limited pricing power, making this a key priority. In addition, more regulatory approvals and increased capacity will enable more propositions to reach the market.

Demand dynamics differ substantially across product categories. For consumer-facing innovations such as alternative proteins, food manufacturer adoption and consumer acceptance remain critical to market growth. By contrast, many drop-in B2B ingredients, including specialty oils, fats and functional ingredients, already serve established markets with existing demand. Commercial success depends on meeting customer requirements on quality, cost, regulatory approval and reliable supply. Demand drivers are application innovation (more and better products entering the market), price & volatility increases in conventional markets (e.g. because protein demand will outgrow conventional supply), and sustainability or health driven demand for alternatives.

Across categories, successful commercialisation starts with a compelling purchase motive rather than the technology itself. Food manufacturers rarely change ingredients simply because an alternative is more sustainable. New ingredients need to solve a sufficiently important customer problem, for example by improving taste or nutrition, reducing cost-in-use, improving processing or shelf-life performance, reducing exposure to volatile inputs, or enabling a differentiated product proposition. This makes early application-market fit as important as technical performance. Ventures that start from a clearly defined customer problem and design their technology, production route and target market around it are more likely to reach commercial traction.

For many food biotech applications, the core challenge has shifted beyond demonstrating proof-of-concept in the laboratory towards achieving reliable, cost-competitive industrial production. While biological feasibility has been demonstrated for many applications, significant technical challenges remain around process integration, reproducibility, fermentation performance, downstream processing and reliable operation at demo and FOAK scale. Commercialisation therefore depends on solving both technical scale-up challenges and market adoption simultaneously. This makes cost reduction the central innovation theme: optimising the fermentation performance through titer, rate and yield, improving input/feedstock efficiency, (downstream) process optimisation and scale.

Digitalisation and advanced process control are key enablers, with technologies such as photonics, sensors and AI enabling real-time monitoring, improved stability and faster optimisation towards automated production. The Netherlands has a strong position in enabling technologies and knowledge infrastructure, with leading capabilities in bioprocessing, fermentation, photonics and integrated agrifood innovation ecosystems. The table below provides an overview of the different innovations and current status.

The Netherlands has already proven it can invent food biotech. Now it must prove it can industrialise it. Governments should accelerate approvals, de-risk first-of-a-kind plants and back the first customers, so the factories, jobs and resilient supply chains are built here, not elsewhere.

- **Lars Langhout, CEO, NoPalm Ingredients**

[4] McKinsey, Ingredients for the future: bringing the biotech revolution to food; and Strategy&, Future of Food 2.0 (other sources such as Protein Project project a higher penetration)
[5] BCG 2023, Protein Project 2025
[6] Good Food Institute

Table 8. Technology overview, Invest-NL analysis

Technology pathway	Core principle	Typical applications	Tech maturity	Key bottlenecks
Precision fermentation	Engineered microorganisms produce specific molecules	Dairy proteins, enzymes, fats, functional ingredients	Medium	Low yields, high downstream costs, CAPEX
Biomass fermentation	Growth of microorganisms as a protein-rich biomass	Mycoprotein, microbial protein (yeast, fungi)	Medium to high	Scale-up, texture, CAPEX
Upcycling / side-stream fermentation	Conversion of waste streams into ingredients	Organic acids, feed, functional ingredients	Medium	Feedstock variability, consistency, CAPEX
Cultivated meat	Animal cells grown in bioreactors	Meat, seafood	Low to medium	Cost, scale, media, bioreactors, CAPEX



The Revyve production facility.

Scaling conditions

Table 9. Key scaling conditions for biotech ingredients & food applications.

Scaling condition		Current situation
1	**Market demand**	Corporate interest exists, but commercial demand emerges only after application-level validation
2	**Capital**	FOAK projects fall between venture capital and conventional project finance
3	**Infrastructure**	Relevant capacity exists, but access, fit, affordability and continuity across scales remain constraints
4	**Regulation**	Novel Food approval is long and capital intensive
5	**Talent**	Industrial scale-up, bioprocess engineering and commercial leadership are scarce
6	**Ecosystem collaboration**	Strong individual capabilities, but commercialisation and corporate-start-up pathways remain fragmented

Complex FOAK funding, access to infrastructure, long regulatory processes and sub-optimal start-up-corporate collaboration

1 Market demand

Today's market is small, the pace of future adoption is highly uncertain

Ease of integration is equally important. For many established food manufacturers, a new ingredient must fit within existing formulations, quality systems and production processes with limited operational change. Even a technically superior ingredient can struggle to gain adoption if it requires substantial process modifications, additional CAPEX or changes across multiple internal functions.

What drives market adoption in the stages after the lab:

- Initial focus on high value niche markets such as infant nutrition, sports nutrition, specialty ingredients and cosmetics, where willingness to pay is higher and volumes are lower
- Partnerships with established food manufacturers and brands to accelerate market access and consumer acceptance
- Demonstration of clear advantages beyond sustainability, including functionality, nutrition, taste, consistency or supply chain resilience
- Low-friction integration into existing formulations and manufacturing processes, with limited additional CAPEX or operational change for the customer
- Cost reductions through scale up, process optimisation and shared production infrastructure
- Regulatory clarity and predictable approval pathways to reduce uncertainty for both producers and downstream customers.
- Customer sequencing matters. Smaller and medium-sized food manufacturers can often move faster in testing, co-development and initial commercial adoption, while large multinational customers are critical for eventual volume but typically have longer qualification

cycles and significantly higher quality, regulatory and operational requirements. Ventures therefore benefit from building early commercial proof with agile customers while engaging larger strategic buyers in parallel for future scale.

2 Capital

Existing financing models are not suited for FOAK food biotech projects

The Dutch food biotech funding base is active at early stages but faces structural gaps at scale-up. Average deal sizes have declined since the 2021 peak and public investors, including Invest-NL and the regional development agencies (ROMs), play an increasingly important role in financing rounds.

The most significant financing challenge emerges at scale-up, where food biotech companies face a structural mismatch with venture capital: long development timelines, steep capital requirements and delayed commercial validation. The critical bottleneck is the first-of-a-kind (FOAK) commercial facility, where technology risks remain significant, volumes are insufficient for large offtake agreements, and the absence of predictable revenues rules out conventional debt, trapping many companies between pilot success and commercial deployment.

Recent European projects illustrate the capital intensity of food-biotech industrialisation. First commercial and scale-up projects typically require tens of millions of euros per company, with public risk-bearing commitments in recent cases ranging from around €20 million to almost €80 million. Solar Foods, Enifer, Formo and MATR Foods also show that these projects are rarely financed through grants alone: equity, venture debt, public loans and other risk-sharing instruments are combined to bridge the gap to commercial deployment.

At the same time, the challenge is not simply a lack of public financing instruments. Several existing Dutch instruments could in principle support innovative and sustainable scale-up projects, but their eligibility criteria, policy boundaries and state-aid requirements do not always fit the characteristics of emerging biotech companies. This can leave potentially relevant public capital effectively out of reach. For example, benefits that fall across departmental policy domains may not be fully recognised within individual schemes, while capital-intensive biotech start-ups can face restrictions under the EU ‘undertaking in difficulty’ rules precisely because of their long development timelines and accumulated losses before commercialisation.

Recent funding market corrections have driven a shift towards more investable business models. Investors increasingly favour focused technology propositions, capital-efficient scale-up pathways and earlier commercial validation rather than growth-at-all-costs strategies. Key shifts since the peak in 2021:

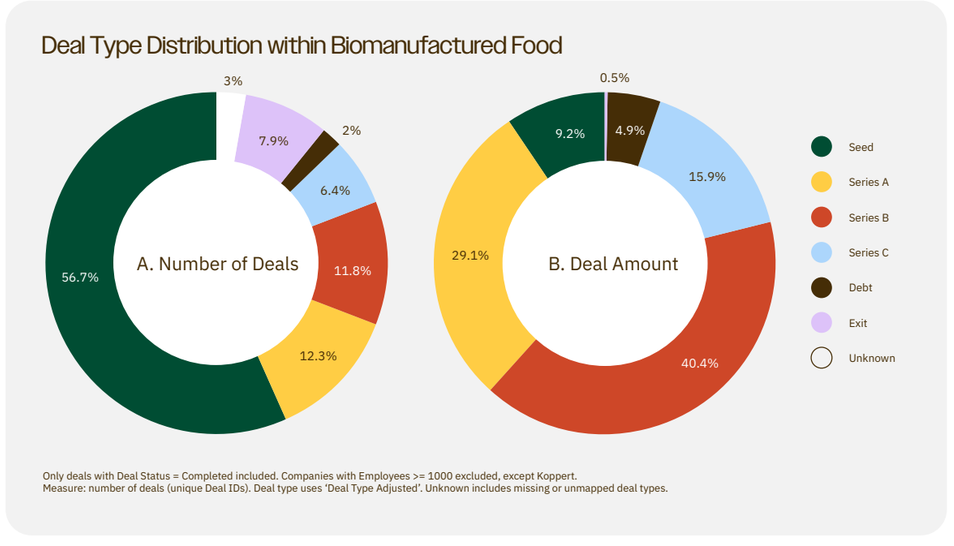
- From ‘full stack’ B2C propositions covering both the biotech (ingredient) innovation and consumer brand to more focused B2B models
- More capital efficient business models: using shared pilot facilities, partnering with contract manufacturers (in particular in precision fermentation), or building brownfield instead of greenfield.
- Drive early adoption in high value (niche) segments, such as sports nutrition, infant nutrition or (outside of food) cosmetics where the Netherlands has a strong position

The investment landscape is dominated by early-stage company formation: more than half of all transactions occur at Seed stage. Capital is concentrated in Series A and Series B rounds, while relatively little funding is available for later-stage growth rounds such as Series C, where companies prepare for large-scale manufacturing and international expansion. Debt financing remains almost absent and exits are limited. his pattern is consistent with the scale-up financing constraints reported by stakeholders.



Revyve product – Functional food ingredient made from upcycled yeast.

Figure 16. Investment Profile of Dutch Biotech Ingredients Ventures. Source: PitchBook, Invest-NL analysis.



3 Infrastructure

Europe has scale-up capacity, but access remains a bottleneck

Biotech scale-up typically moves through four stages: lab, pilot, commercial demonstration and industrial scale. Shared infrastructure is particularly valuable in the earlier stages, when companies need temporary access to specialised equipment and operating expertise rather than dedicated assets.

Overall pilot capacity is not the main constraint. Companies struggle to access the right infrastructure at the right time and at an affordable cost. Where pilot capacity exists, it is often underused because of high costs or not being fit for purpose for specific companies or processes. Specialised equipment and process configurations can also be unevenly distributed across Europe, creating additional cost and logistical barriers. In turn, this makes business models of these shared facilities fragile. This means that building additional shared facilities alone is insufficient. The priority should be to improve access to and utilisation of existing capacity, while selectively filling genuine infrastructure gaps. Structural solutions for operating expenditure, accessible pricing and coordinated use are equally critical.

Several relevant scale-up infrastructure initiatives are emerging in and around the Netherlands. These include NIZO in Ede/Wageningen, Bio Base Europe Pilot Plant in Ghent, the Biotechnology Fermentation Factory in Ede and Cultivate at Scale (CaS) in Maastricht. Together, these initiatives strengthen the regional infrastructure base for food-grade fermentation, cell cultivation and downstream processing. However, they should not be seen as one-off infrastructure projects. Their value will depend on continued development, accessible pricing, operational funding, utilisation and the ability to evolve with industry needs, including food-grade processes, downstream processing and continuous fermentation.[7]

Clustering demonstration and commercial activities can enable shared industrial utilities and permitting, helping companies accelerate deployment, reduce costs and de-risk investments. The Netherlands should therefore support locations that enable companies to scale together and strengthen the country's industrial biotech ecosystem.

- **Bram Kerssemakers**
  Program manager Protein Port

Other countries take a more coordinated approach to supporting access to scale-up infrastructure. Belgium invested early in the Bio Base Europe Pilot Plant in Ghent, accepting that such facilities require ongoing efforts to attract projects and maintain utilisation. Denmark complements this with a national voucher scheme that reimburses up to 50% of the cost of using pilot facilities across Europe. Rather than expecting every facility to be commercially self-sustaining, these approaches reduce barriers for start-ups to access critical infrastructure, improve utilisation of existing facilities, and accelerate commercialisation.

As technologies mature and demand becomes predictable, dedicated brownfield expansions and, where needed, greenfield production facilities become essential to achieve operational efficiency, supply security and long-term competitiveness. Public support should therefore cover the full industrialisation pathway rather than focusing exclusively on shared infrastructure.

[7] See pilots4u.eu for an overview

4 Regulation & market access

Long novel food approval timelines delay commercialisation and investment

Food safety is non-negotiable. The frustration is driven by the duration and unpredictability of the approval process. EFSA novel food trajectory takes 2-6 years or longer, which provides an additional 1-3 years and more uncertainty compared to the US. This leads to many ventures prioritising the US for market entry. Limited regulatory guidance compounds this: incomplete dossiers reduce approval rates, slowing commercialisation for everyone.

For functional ingredients, regulatory approval often extends beyond Novel Food authorisation. Companies may also require EU-authorised health claims following EFSA assessment before they can communicate health benefits to consumers. Obtaining these claims is another lengthy and uncertain process that directly affects market adoption, pricing power and commercial viability, particularly in nutrition-focused applications such as infant, longevity, medical and sports nutrition.

- Sandboxes are proven instruments to streamline regulatory pathways. Sandboxes are experimental environments where industry players and authorities cooperate to streamline processes while maintaining high quality standards. The UK set up a sandbox environment where the key objective is to come to a uniform list of requirements for cultured meat novel food dossiers. The food authority remains in control of the process but uses proprietary scientific know-how of start-ups. A key design choice is that this is set up as a dialogue between the regulator and ventures.
- The Netherlands approved cultivated meat tastings: an important step for market development, consumer interactions and investability. Similar tasting initiatives for fermentation-derived food products that have already received regulatory approval could further improve consumer familiarity, accelerate product development and support broader market adoption.

The regulatory novel food framework is not fit for purpose for biotech ingredients and needs a reform. For example, the intake assessment is too conservative for these novel niche ingredients which limits the inclusion possibilities in a wide variety of food applications and thus offtake.

- **Yvonne Dommels, Nutrition & Regulatory Affairs Director, The Protein Brewery**

5 Talent

Industrial biotech scale up capabilities remain scarce in Europe, and expensive in The Netherlands

Scaling biotech processes requires specialised talent that is scarce and expensive. The Netherlands has world-class scientists but lacks experienced industrial-scale process engineers, operators and regulatory specialists. As long as few commercial scale-ups succeed locally, this gap widens: if ventures migrate, the hands-on capability to industrialise builds elsewhere. The ability to attract and retain foreign talent is therefore critical for the success of the ecosystem.

6 Ecosystem collaboration

The Dutch ecosystem combines strong science, start-ups and food corporates in one dense cluster

The Netherlands has a strong starting position in biotech ingredients and fermentation. Wageningen University & Research and TU Delft are internationally recognised leaders in fermentation science, bioprocess engineering and industrial biotechnology, generating a strong pipeline of talent, intellectual property and start-ups. The country also benefits from a unique concentration of food multinationals, including Unilever, FrieslandCampina and dsm-firmenich, which provide deep application expertise, potential development partners and routes to industrial scale production. In addition, the Netherlands retains a globally visible first-mover position in cultivated meat, combining pioneering research, venture creation and specialised investors within a highly concentrated ecosystem.

Biotechnology is inherently capital-intensive and hardware-dependent, making scale-up especially challenging for start-ups. Without accessible financing and scale-up facilities, promising companies could move elsewhere, taking talent and economic value with them.

- Martin Vilters, StartLife

A more integrated commercialisation ecosystem can also attract companies from abroad. Proximity to food manufacturers, ingredient companies, application expertise, investors and scale-up partners can make the Netherlands an attractive European base for international biotech ventures entering the commercialisation phase. These companies in turn add talent, technology and commercial activity to the ecosystem, creating a reinforcing effect between ecosystem strength and international attraction.

At the same time, several structural barriers limit the translation of these strengths into large-scale commercial success. Collaboration between start-ups and food corporates often occurs too late, with different incentives and decision timelines slowing the development of strategic partnerships. Earlier access to application knowledge, product specifications and commercial offtake signals would significantly reduce market risk and accelerate scale-up. Cost competitiveness remains another major challenge. High energy prices, labour costs, grid congestion and limited access to large-scale fermentation capacity make Europe and the Netherlands less attractive locations for manufacturing. This also creates a longer-term resilience and food-security risk. In addition, long-term access to affordable feedstocks is uncertain due to competition for biomass, restrictions on the use of agricultural side streams and the limited integration of farmers into emerging fermentation value chains. Together, these factors increase production costs and make achieving price parity with conventional ingredients more difficult.

Energy costs, grid capacity, suitable sites, labour and feedstock availability remain material location conditions. They are not addressed through the five agrifood-biotech interventions in this report and require alignment with wider Dutch and European competitiveness policy. The recommendations below therefore focus on the biotech-specific barriers that can be addressed through venture creation, regulation, infrastructure access, finance and customer commitments.

The science is increasingly working. The real challenge is financing the journey to commercial scale. Venture capital alone isn't enough; scaling food biotech also requires non-dilutive capital that helps companies cross the industrialisation gap.

- Corjan Van den Berg, Co-founder Revyve



Laboratory research in food biotechnology at Vivici.

Recommendations

Accessible shared infrastructure, blended finance and stronger ecosystem orchestration to accelerate scale up

The priority for biotech ingredients is to ‘Scale the Winners’: turn Dutch innovation into globally competitive companies, focusing on high-value, differentiated ingredients and applications where the Netherlands has a sustainable right to win rather than cost-driven bulk production. Industrial scale-up should be embedded in competitive European value chains, with production located where the economics are strongest.

Fertile Ground

Strengthen commercialisation capability and market readiness

1. Build commercially oriented ventures with a credible route to market.

Lead: Biotech Booster, as it further develops its venture-building and valorisation capabilities in agrifood biotech, working with knowledge institutions and TTOs to build the pipeline and with corporates and investors to strengthen commercial validation and investability.

The objective is to create biotech ingredient ventures with a credible path to market. Commercial thinking should therefore enter venture development earlier: founders need to start from a clearly defined customer problem, understand target specifications and willingness to pay, and test whether the intended production route can ultimately deliver at competitive cost and relevant scale. Valorisation programmes should bring commercial founders, ingredient expertise and potential customers into venture development earlier, so technical development and product-market fit progress together.

First steps: Strengthen Biotech Booster’s agrifood-biotech capabilities and connect its technology pipeline to existing agrifood venture-building expertise, together with StartLife. Select an initial portfolio of technologies and establish clear roles and stage-gates across the participating organisations.

Foundation

Build the path from science to commercial demonstration

2. Create a faster and more predictable regulatory pathway for biotech food ingredients.

Lead: The responsible Dutch ministries, working with relevant Dutch regulatory authorities and industry to improve guidance nationally and advocating at EU level for more predictable Novel Food procedures and regulatory learning approaches.

Regulatory uncertainty remains one of the main barriers to commercialisation. Companies face lengthy approval timelines, limited predictability and high compliance costs, particularly under the Novel Food framework. This increases capital requirements and extends time-to-market. Two actions stand out:

- Accelerate and improve predictability of Novel Food approvals without lowering food safety standards. Expand pre-submission guidance and regulatory support for SMEs
- Establish regulatory sandboxes that allow controlled testing, consumer validation and pilot deployment while approval processes are ongoing

Sandboxes can create valuable regulatory learning, improve dossier quality and shorten commercialisation timelines without compromising safety standards. Similar approaches are already being explored in the UK and increasingly discussed at European level. Ultimately, EU should offer a regulatory pathway that safeguards high food safety standards while allowing innovative companies to commercialise at internationally competitive speed, reducing the risk that companies move first market entry and subsequent scale-up outside Europe.

First steps: Strengthen pre-submission guidance and regulatory expertise, while pushing for more predictable Novel Food procedures at EU level.

3. Organise shared scale-up facilities as one accessible infrastructure layer.

Lead: The responsible Dutch ministries should ensure national coordination and sustainable public financing conditions, working with facility operators, ROMs, knowledge institutions and industry to align capabilities and access, and with Invest-NL where investment or financing solutions are required.

Shared pilot and demonstration infrastructure can reduce capital requirements for start-ups, accelerate learning cycles and improve capital efficiency across the ecosystem. It can also play an important role in independently validating technical, operational and economic scale-up assumptions, generating evidence that companies and financiers can use in subsequent investment decisions. The priority is to make existing and future capacity accessible, complementary and financially sustainable.

Access to equipment alone is not sufficient. Many ventures also lack the operational capability to transfer and industrialise a process. The infrastructure pathway should therefore connect shared facilities to specialised commercial operators and CDMOs that can take responsibility for process transfer, repeated scale-up campaigns and operational performance across multiple ventures. Unlike a facility provider alone, such operators have a commercial interest in successful, repeatable production and can carry part of the execution risk.

Shared facilities should therefore be coordinated as a national infrastructure layer rather than developed as standalone projects, with strong connections to complementary infrastructure elsewhere in Europe where relevant. Dutch companies should have access to the best available European infrastructure, with domestic investment focused on capabilities that are missing or strategically important. Where relevant, facilities should also support independent scale-up validation through a common framework for technical and techno-economic evidence, while allowing for technology-specific validation pathways.

This requires alignment on capabilities, user access, pricing models, investment priorities, data governance and interoperability standards. Pricing and funding models should enable start-ups and scale-ups to access facilities at internationally competitive rates, supported where appropriate through vouchers or innovation funding, rather than relying solely on fully commercial CRO/CMO economics. CAPEX decisions should be accompanied by credible plans for long-term OPEX and utilisation.

First steps: Improve access, affordability and utilisation of existing facilities and pilot a shared scale-up validation framework with selected facilities, companies and financiers, while identifying critical capability gaps and sustainable operating models.

Flywheel

Unlock commercial scale-up through demand creation and risk sharing

4. Build a financing pathway for FOAK and early commercial facilities.

Lead: Invest-NL should lead the development of financing solutions and bring technology developers, industrial operators, off-takers and public and private financiers together around investable projects, working with the Ministry of Economic Affairs and Climate Polic and European public financiers on risk-sharing instruments and with private investors and lenders as projects become sufficiently de-risked.

The next priority should be to make better use of existing public financing instruments. Several instruments could in principle support biotech scale-up, but eligibility criteria, policy silos and state-aid requirements can prevent companies from accessing them. The Ministry of Economic Affairs and Climate Policy and the Ministry of Agriculture, Fisheries, Food Security and Nature should therefore review where existing instruments can be better aligned with biotech business models, including cross-domain impact and barriers such as the Undertaking in Difficulty test, before developing additional instruments for gaps that remain. The financing gap also reflects a mismatch between generic funding instruments and the way biotech companies develop.

Capital alone will not solve the FOAK gap: projects first need to become sufficiently bankable, and public risk-sharing should focus on projects with credible long-term economics and strategic value for the Netherlands or wider European value chain. The preferred route should be to form a core project consortium in which the technology developer, an industrial operator and one or more off-takers each carry part of the risk. Where feasible, operators and off-takers should invest alongside the project rather than provide contracts alone. This provides a stronger market signal and distributes technology, execution and commercial risk more naturally across the value chain.

Public instruments should address only the residual, demonstrable financing gap after credible technology, execution and market commitments are in place, rather than substitute for them. Blended finance, guarantees, patient capital and project finance can then be tailored to the risks that the consortium cannot efficiently carry. Potential interventions include:

- FOAK project finance facility combining public and private capital
- Government-backed guarantees for first commercial facilities
- Blended finance structures that absorb part of the technology and construction risk
- Patient growth capital with longer investment horizons than traditional VC
- Project development support (e.g. Project Development Assistance) and feasibility funding to improve bankability of scale-up projects

Closing this gap will require financing capacity at a fundamentally different scale from traditional innovation funding, as individual FOAK projects can require tens to hundreds of millions of euros.

First steps: Map where existing Dutch and European financing instruments fail to reach biotech scale-ups and develop a common scale-up and FOAK validation standard to strengthen projects before financing. Use both to build a financing pathway with new instruments where genuine gaps remain.

5. Build commercial proof and translate demand into financeable commitments

Lead: Food manufacturers and ingredient companies should lead commercial validation and co-development, supported by sector organisations in connecting ventures to suitable launch customers and Invest-NL and other financiers in translating credible commercial evidence into financing structures.

Scale-up requires commercial evidence alongside technical proof. Fully bankable offtake agreements are often unrealistic before commercial production has been demonstrated. Large food manufacturers face their own qualification, supply and launch risks and are therefore reluctant to commit firm volumes years in advance.

The ecosystem should therefore build commercial evidence progressively: from application testing and paid trials, to joint development agreements, customer qualification, conditional volume commitments and, where appropriate, bankable offtake. Financiers should recognise these intermediate commercial proof points rather than treating a fully binding long-term offtake agreement as the only credible evidence of demand.

Where bilateral commitments alone do not provide sufficient demand certainty, demand aggregation can complement this pathway for more standardised ingredients. Corporate purchasing coalitions, launch-customer programmes or public procurement pilots can provide additional revenue visibility where multiple buyers have sufficiently similar specifications. Such mechanisms are less suitable for highly application-specific ingredients that require extensive customer qualification.

Existing industry coalitions such as AB4S can be used to pilot this approach around selected priority molecules, bringing producers, corporate buyers and financiers together to define the commercial proof points and demand commitments required to unlock scale-up investment.

First Steps: Pilot this approach for two or three scale-up projects, using existing industry coalitions such as AB4S where relevant to aggregate demand around priority molecules.

> Breakthrough science only changes the food system when entrepreneurs can turn it into products that reach the market. Building Europe's food biotech engine means giving founders access to the capital, customers and ecosystem they need to scale.
>
> **- Jaap Strengers – Future Food Fund**

Case study: lessons learned from fifteen years of StartLife



Founded by Wageningen University & Research in 2010, StartLife has spent fifteen years supporting hundreds of ventures turning agrifood science into companies. This rich experience reveals three lessons for the Dutch ecosystem.

Rooted on the Wageningen campus, staffed by agrifood experts and technical graduates, and closely affiliated with the university, StartLife has built a world-class network of regional partners, mentors, coaches, investors and global corporates. This network supports StartLife's programmes such as 'Accelerate', which focuses on what comes after the technology: product-market fit. This stage is frequently the bottleneck for deep-tech entrepreneurs, who naturally concentrate on technology development at the expense of commercial viability. StartLife addresses this through intensive sprint sessions dedicated to market validation, corporate readiness and investor readiness, ensuring that a start-up's scientific breakthrough is translated into a business solution that industry is willing to pay for.

By maintaining strong relationships with specialised venture capital firms, StartLife ensures its programmes reflect the rapidly changing investment landscape. Similarly, long-term collaborations with leading agrifood multinationals such as PHW Group, Cosun, Kraft Heinz and Corteva allow it to align the expectations of both start-ups and corporate partners. Working closely with these established industry players gives StartLife a deep understanding of corporate innovation needs, constraints and priorities, whilst enabling it to support the growth ambitions of early-stage start-ups.

Increasingly, these programmes are built around biotech ventures. Whether the science is a novel crop trait or precision fermentation, the pathway shares the same themes: a complex product, a long road to market and a demanding investor landscape. More than half of recent cohorts are now biotech ventures, with a particularly strong concentration in biotech ingredients.

Over recent years, the vulnerabilities in the global food system have moved from academic concern to lived reality. The need for localised, resilient and climate-positive solutions has rarely been more urgent. Addressing this challenge requires strengthening the pathway from scientific discovery to commercial adoption. Over fifteen years, StartLife has identified three structural gaps that continue to constrain innovation and scale-up.

For many ventures, the bottleneck now lies in adoption. Breakthrough solutions are already being developed in Wageningen and across the Dutch ecosystem, from cellular agriculture to CRISPR-Cas gene editing and advanced bio-inputs. Biotechnology inherently demands patient capital, complex regulatory navigation and intensive infrastructure, which lengthen the path to market and complicate conventional investment and commercial frameworks. Without the right support structures to manage these complexities, world-class innovations stall before they ever reach the market.

Valorisation requires an ecosystem that structurally connects research with commercialisation. Current support solutions like Green TTT and Biotech Booster, alongside National Growth Fund initiatives like CropXR and Cellular Agriculture Netherlands, are significant steps in the right direction. Fully closing the valorisation gap means embedding dedicated venture-building infrastructure, specialised regulatory mentorship, and industry-validated testing tracks directly into the frameworks of research institutions. By doing so, StartLife can enable targeted, solution-focused research that shortens the path from lab to market. This transformation requires deep collaboration across the entire value chain, from regional innovation hubs to European consortia, as well as support from the next phase of the National Growth Fund. For StartLife, this means continuing to do what it does best: supporting start-ups by connecting science with entrepreneurship, and fostering an ecosystem where innovation leads to real-world impact.

Source: StartLife; for more info on StartLife's programmes, visit StartLife.nl



Appendix 1

Cross-cutting analysis

Challenges by scaling stage

The Netherlands has a strong science foundation and a strong presence of industry leaders, creating a unique market adoption ecosystem. The density of scientific expertise, horticulture and specialised suppliers has helped create clusters such as Seed Valley.

Stakeholders identified two distinct scale-up gaps. The first lies between research and pilot validation, where access to affordable and fit-for-purpose infrastructure can constrain progress. The second lies between successful validation and commercial deployment, where financing requirements rise sharply. The first is primarily an access and validation challenge; the second a financing and industrialisation challenge.

Bottlenecks are concentrated in six ecosystem dimensions

The key challenges along the six ecosystem dimensions are captured here, with additional emphasis on capital. More details along the other five dimensions are captured in the subsequent value chain-specific chapters. Regulation poses challenges in all three value chains. Capital and infrastructure are bottlenecks in biological agricultural inputs and ingredients, but less so in seed breeding.

1. Market demand: End markets are expected to grow, but market growth does not automatically translate into adoption. Biological inputs often require changes in farming practices, while food applications must meet customer requirements on price, taste, functionality and reliable supply.

2. Infrastructure: Much of the required pilot infrastructure exists in or around the Netherlands. The main challenge is affordable access to fit-for-purpose facilities, expertise and demonstration capacity; specific gaps remain for some applications.

3. Regulation: Regulation was one of the most consistently raised bottlenecks across stakeholder interviews. There is broad agreement that safety standards should remain high; the issue is whether regulatory pathways are sufficiently predictable and suited to emerging biological technologies. The pain points touch several layers.

- First, European crop-protection regulation is poorly adapted to many biological products.
- Second, in all value chains the process is slow, e.g., Novel Food authorisation can take two to six years or longer, creating substantial timing uncertainty for companies and investors.
- Third, capacity remains a constraint, including at competent authorities such as Ctgb. Stakeholders also point to limited scope for regulatory experimentation, including the use of sandboxes.

Progress is visible: the Netherlands allows controlled tastings of cultivated meat, while the emerging EU framework for New Genomic Techniques could materially improve the environment for NGT-1 applications.

4. Talent: Dutch founding teams are generally strong in science and technology, while commercial and industrial capabilities are less consistently available. Stakeholders particularly point to gaps in customer development, industrial scale-up and experienced operators. These gaps become more important as companies move from technical validation towards commercial deployment.

Figure 17. Illustrative Stakeholders Across the Dutch Agrifood Biotech Ecosystem.



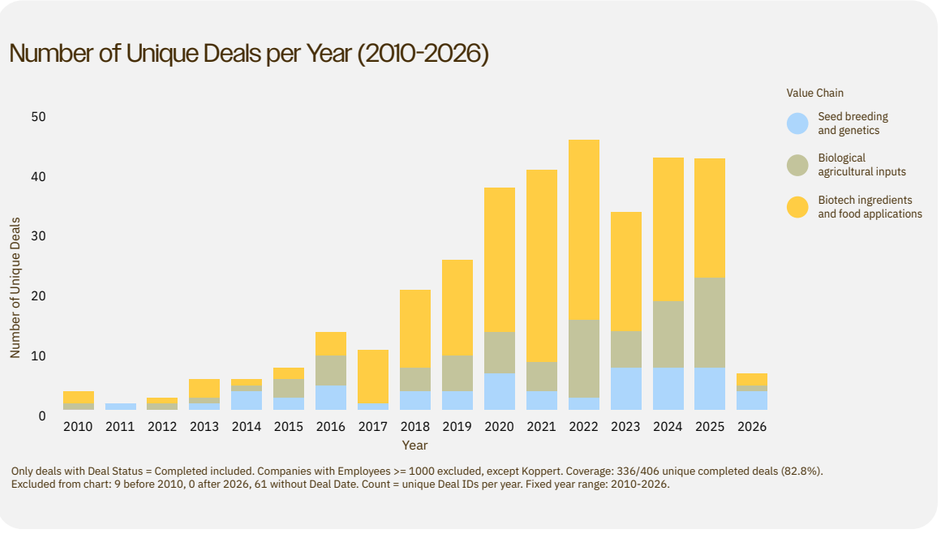
5. Ecosystem collaboration: The Netherlands has a uniquely high density of organisations and experts across the value chain, with short geographic and relational distances. However, strong networks do not yet consistently translate into integrated pathways for companies moving from research to validation, commercialisation and industrial scale.

6. Capital: structural scaling gaps across Dutch agrifood biotech. In the current environment, food biotech is a difficult asset class for investors: high capital intensity, 10–15 year development timelines, significant technological and commercial risks, and limited pricing power compress expected returns. These characteristics are a poor fit for the fund lifecycles and exit expectations of conventional closed-end venture capital. Unlike life sciences, which also face long development timelines, agrifood biotech lacks a mature secondary market and a track record of large exits. As a result, capital remains locked up for longer periods, fewer new funds are launched, and investors increasingly shift towards later-stage opportunities that better match their fund lifecycles.

The Dutch data points to three structural challenges. First, venture creation remains limited. While the ecosystem contains several globally competitive companies, the number of newly founded ventures remains modest and concentrated in a small number of technology domains, particularly ingredients. Biological agricultural inputs in particular show a thinner and less mature pipeline, with relatively few start-ups entering the market. This raises questions about the long-term renewal capacity of the ecosystem and the size of the future scale-up pipeline.

Second, many companies struggle to progress from early-stage funding towards industrial deployment. Deal activity has increased significantly over the past decade, indicating continued investor interest in food biotechnology. However, funding remains concentrated in seed and Series A rounds, while relatively few companies successfully attract the larger growth rounds required for commercial scale-up.

Figure 18. Annual Agrifood Biotech Investments by Value Chain (2010 to 2026). Source: PitchBook, Invest-NL analysis based on data available through April 2026.



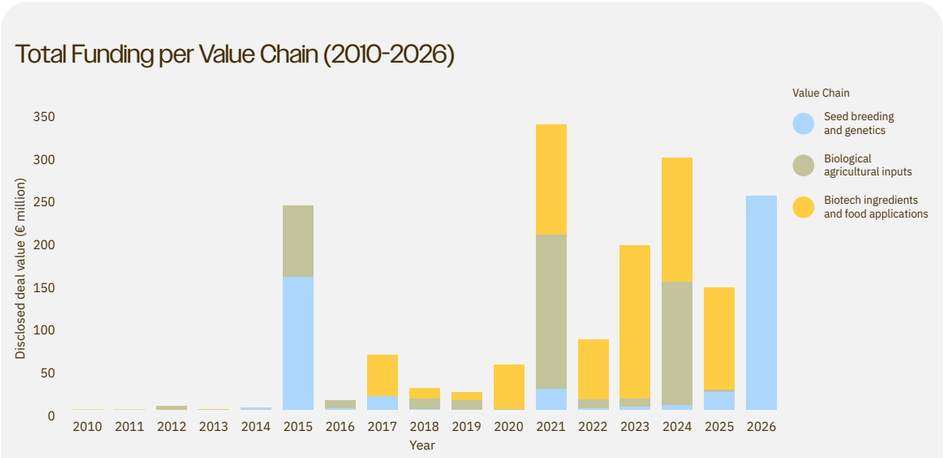
This suggests that the ecosystem is more effective at funding innovation than at financing industrialisation. This challenge is increasingly recognised at the European level, as reflected by initiatives such as the Scale Up Europe Fund, which aims to strengthen the availability of growth capital for scaling technology companies. Yet for food biotech, the challenge extends beyond growth equity alone, particularly when companies move towards industrial-scale manufacturing.

Third, investment activity remains concentrated in a limited number of companies and transactions. Several funding peaks are driven by a small number of large rounds rather than by a broad and continuously renewed company base. As a result, ecosystem growth remains dependent on a handful of success stories rather than a large portfolio of scaling ventures.

We saw many start-ups that had raised €50 million or more, while no in-depth market validation had yet taken place. That is a mindset problem across the entire ecosystem.

- **Gijs van de Molengraft**
  Venture developer Gritd

Figure 19. Venture Funding in Dutch Food Biotech in Euro by Value Chain (2010-2026). Source: PitchBook, Invest-NL analysis.



The bottleneck stage differs by value chain. In seed breeding, there is no structural late-stage funding gap; large, often family-owned incumbents invest heavily in R&D and provide established routes to market. Biological inputs face a pipeline progression problem: while early ventures and product ideas emerge, too few companies move beyond seed stage into validated, investable and scalable businesses. Biotech ingredients present a different challenge: early-stage funding is reasonably available, but growth and industrial-scale financing remain difficult. Existing instruments do not yet form a workable financing pathway for FOAK facilities, where technology, customer and financing risks remain closely linked.

The data bears this out: funding is episodic and concentrated in a few large deals (e.g., Solynta, Koppert). Biological agricultural inputs remain significantly underdeveloped, with very few start-ups, few deals, and limited dedicated investor activity. The 2021–2024 increase in funding for biotech ingredients was largely driven by a handful of large ventures rather than by a structurally broad and continuously renewing investor base.

Appendix 2

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Appendix 3

Analytical Framework

Research approach

The deep dive combines qualitative and quantitative analysis across the Dutch and international food biotechnology ecosystem. More than 150 interviews and stakeholder discussions form the qualitative base, including start-ups, scale ups, corporates, investors, universities, infrastructure providers, policymakers, and sector experts.

The quantitative analysis focuses on company formation, funding dynamics, investment trends, and ecosystem development within the Dutch food biotechnology landscape. Case studies are the third building block to identify lessons learned from leading biotechnology ecosystems globally. Generative AI was used as a drafting and editing aid. The authors remain responsible for the analysis, interpretation of sources and conclusions in this report.

Analytical framework

The analysis evaluates each value chain across four development stages:

- Science: research, technology development and discovery
- Valorisation: company formation, pilots and early market validation
- Scale-up: commercialisation and industrialisation
- Market adoption: deployment at scale

Across these stages, the analysis considers six recurring ecosystem conditions: market demand, capital, infrastructure, regulation, talent and ecosystem collaboration. This framework helps identify where structural bottlenecks emerge, how they differ across value chains, and which capabilities are most critical for long-term competitiveness and industrial scale up.

Data sources

PitchBook served as the primary data source for company and investment information. As PitchBook coverage is incomplete, particularly for smaller private companies, some deal amounts, financing stages and transactions may be missing.

Company selection

Companies were identified through value chain specific keyword searches, defined by Invest-NL, and complemented with additional Dutch companies identified through manual review. Companies were included regardless of financing status, except those classified by PitchBook as *Corporation* (i.e. without prior PE, VC, angel or accelerator backing), which were excluded.

To focus on start-ups and scale ups, companies with 1,000 or more employees were excluded. Employee counts are based on point in time PitchBook data and are frequently unavailable. Companies with missing employee data were therefore retained. The following companies were manually included despite exceeding the employee threshold: Koppert (Netherlands), Bi PA (Belgium), Biobest (Belgium), CP Kelco (United States), and Zymergen (United States).

The analysis includes companies headquartered in the Netherlands, Belgium and Denmark. Country attribution is based on company headquarters rather than the location of operations, customers or investments.

Data processing

PitchBook investor types and deal types were harmonised into broader analytical categories. For companies outside the Netherlands, agrifood Biotech relevance and value chain assignment were determined using a Large Language Model (OpenAI GPT 4o). Where companies were linked to multiple value chains, the LLM selected the primary value chain classification. AI assisted coding tools were also used during data preparation, analysis and figure generation. All methodologies, outputs and interpretations were reviewed by the authors.

Visualisation

Figures include investment deals announced up to April 2026. Where multiple investors participated in a financing round, both deal counts and investment amounts were allocated equally across participating investors. All monetary values are presented in nominal euros and are not adjusted for inflation.

Country comparison

For the Netherlands, the analysis is based on a manually validated list of agrifood Biotech companies and their value chains. For all other countries, company selection was performed using AI based filtering.



Appendix 4

About the authors

Contributing author

Nora Ottink supported Invest-NL in the development of this report as an external contributor. She spent most of her career at McKinsey, including 8 years as a Partner focused on growth in agrifood. Today, she focuses on scaling innovations to future-proof our food system, from food biotechnology to regenerative agriculture. Her aspiration is to embed a better playbook for scaling in agrifoodtech, drawing on her experience with food manufacturers, retailers, and consumer insights to bridge the gap between technology and market adoption.



About the Invest-NL team

This report was co-authored by **Diederik Greeve**, **Willemijn van der Elst**, and **Michiel Strijland** of Invest-NL. Together, they work on strengthening the Dutch food biotechnology ecosystem through market development, strategic analysis, and ecosystem building. This report builds on Invest-NL's earlier publications, including *Fermentation: What Investors Need to Know About This Technology* and *Navigating EU Novel Food Regulation: An Investor's Guide*.

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