



Delivered by
Innovate UK
and BBSRC

Catalysing the transition to net zero food production

Delivering Impact





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Foreword by Katrina Hayter

Challenge Director – Transforming Food Production Challenge

The ever-mounting pressures on productivity, efficiency, sustainability, and the ecological footprint of food production are catalysing the need for innovation within the agri-food sector, both domestically in the UK and on a global scale.

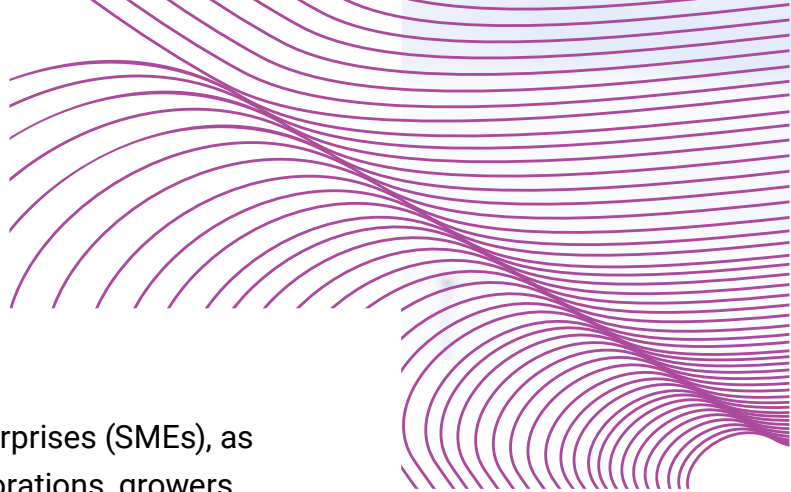
Amid this context, the UKRI Transforming Food Production (TFP) Challenge, delivered by Innovate UK and BBSRC, set to tackle these global challenges of our food system and with the central aim of driving the transition to net zero. A diverse array of mechanisms were employed to achieve this goal, starting with Collaborative R&D and the Science and Technology into Practice competitions. These focused on developing new technologies and supporting their adoption across the **traditional agriculture sector**.

The TFP Challenge also included the **Future Food Production Systems** competition which supported innovative approaches to food production, including alternative proteins and vertical farming. Furthermore, **international** competitions provided bilateral funding opportunities for UK SMEs to partner with Canadian companies, allowing them to test and trial new innovations in the rapidly expanding precision agriculture markets in North America.

To drive **business growth** and scale-up, we worked closely with the venture capital community through Investor Partnership competitions. These aligned non-dilutive TFP grant funding with private equity investment, thereby catalysing new deal flow for high growth potential UK companies. This strategy was guided by a net zero investment thesis.

The projects showcased in this Delivering Impact brochure provide some of the best examples of new innovations that will accelerate a more resilient food sector able to transition to net zero. All have cutting-edge technology at their heart, designed to drive innovation in the way food is produced and delivered to benefit our environment and society. Whether that is in the form of on-farm robotics and machinery, the use of artificial intelligence and digital monitoring, alternative food production methods, or data-led analysis and decision-making, the impact of each of these projects has been significant for the future direction of their market.

Collaboration is key for driving innovation. By harnessing the collective knowledge and expertise of a diverse spectrum of stakeholders, including technology providers in universities and small to



medium-sized enterprises (SMEs), as well as major corporations, growers, farmers, and retailers, we recognise the pivotal role of collaboration. It not only leads to the generation of groundbreaking ideas, but also ensures their effective implementation across the agricultural sector and food supply chain.

With the TFP Challenge drawing to a close in March 2024, having seen an impressive investment exceeding £68 million, the showcased project case studies serve as a testament to the enduring influence of this initiative. They underscore the remarkable accomplishments of the projects that benefited from our financial backing and support. In a world where food production methods and consumption patterns are undergoing significant transformation, these projects offer a glimpse into the future of the food

industry. They exemplify how the industry is poised to tackle everyday challenges, ensuring a sustainable and promising future for all stakeholders involved.

The valuable insights and expertise gained over the last five years are being put to good use. Defra's £270m **Farming Innovation Programme**, delivered by Innovate UK, is leveraging the TFP Challenge team's experience and deep industry knowledge to guarantee the effective delivery of this programme. This will play a crucial role in enhancing the future efficiency, resilience and sustainability of our agri-food sector.



Transforming Food Production Challenge

92



Projects funded

£104.6m



Full project costs

£68.3m



Amount of grant funding committed

£394m



Total co-investment





**316 Organisations
funded**

218 

Business

75 

Research, Public Sector, Charity
Mostly academic institutions

23 

Research & Technology
Organisation (RTO)



“The opportunity brings with it the chance for Entocycle to benefit from substantial new revenue streams with new global connections”

Entocycle

“We now have 2,000 products deployed across nine different countries”

SPOTTA

“We can bring efficiencies throughout the full supply chain and maximise the effectiveness of the whole solution from the lab through to feed and animal health, and ultimately to the consumers”

DEVENISH™

“This research was the first of its kind and by far the largest assessment of animal performance data in the UK sector”



“The impact has been growth to our team from eight to forty employees”

 Brilliant Planet

“The TFP Challenge grant and external investment truly kick-started our growth”

YNEVAL®

“The grant and investment funding from the TFP Challenge was an important stamp of approval in the eyes of our investors and brought stability and certainty to the company”

 Dogtooth

“We can now complete a major installation of hundreds of cameras within two to three weeks rather than over several months”



Peacock
TECHNOLOGY

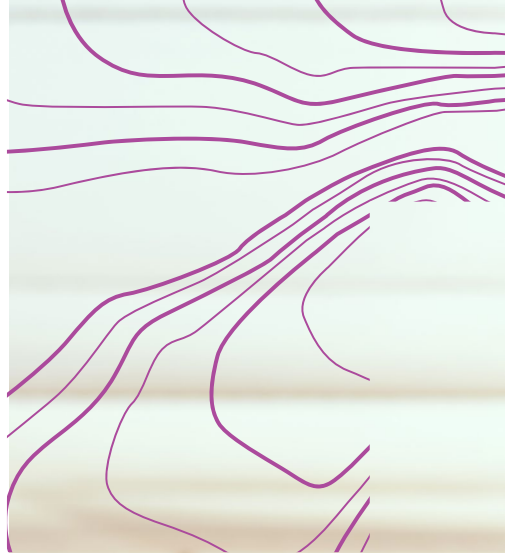
“The Investor Partnership was pivotal to meet this innovation opportunity in the novel food space. It has been a gamechanger for our business”

uncommon

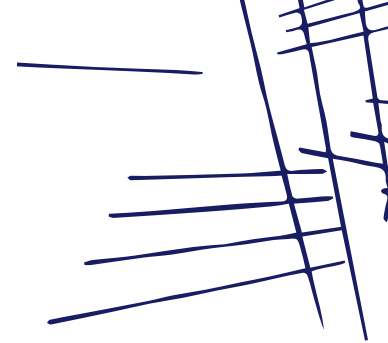
“We hope one day that our approach will be the standard bearer in lower emissions farming”



CCm Technologies



Evaluating efficacy of novel green fertilisers using carbon capture technology



Meet the innovator

CCm Technologies Ltd is an award-winning cleantech company, focused on resource optimisation, including Carbon Capture and Utilisation (CCU). CCm's cutting-edge technology supports key net zero and environmental goals by converting captured CO₂ and nutrients from other waste streams, such as ammonia and phosphate,

into value-added materials like low-carbon fertilisers with multiple uses across global agriculture and food. It makes a particularly significant contribution to the reduction of Scope 3 carbon emissions of customers including multi-nationals active across the agri-food supply chain that CCm are working with.

Driving innovation

In 2020, CCm successfully secured grant funding through the TFP Challenge Science and Technology into Practice competition, to evaluate the effectiveness of novel green carbon-captured fertiliser pellets through a range of studies in farming environments.

When CCm applied for funding, six years of academic and commercial field trial data demonstrating the performance of combinable crop yield had been collected. This was alongside initial indications that the pellets were producing nutrient and soil improvement efficiencies. CCm had



**“We hope one day that
our approach will be the
standard bearer in lower
emissions farming”**

initial commercial agreements in place for the deployment of its carbon capture to fertiliser production technology. The TFP Challenge funding provided an opportunity to significantly improve knowledge of product benefits and potential emissions reduction impact on farm.

With the funding, CCm established work streams for product and process research and development, particularly around nutrient use efficiency and the methods for reducing losses to the atmosphere and through leaching. This data is key to securing the approvals necessary for CCm to engage and expand the customer base for their fertiliser products.



©CCmTechnologies Ltd

Accelerating the journey to net zero

CCm have been able to measure even greater efficiencies within the make-up and use of the fertiliser pellets, as well as extending the reach and activities of the project itself.

Alex Hammond, Head of Partnerships, commented: “The work carried out by Cranfield University at Luton Hoo Estate has revealed the improved nutrient efficiency of CCmGrowth® fertiliser products. Practically, this means fewer crop nutrients can be applied to land whilst still delivering equivalent crop yields versus conventional fossil fuel-derived fertilisers. This has enhanced the commercial benefits of CCm fertiliser and the development of new intellectual property.

“CCm is now focused on scaling the manufacturing process to ensure we can

meet commercial demand for our product and, importantly, that the emissions reduction potential of the product can be implemented on farm” Alex continues. “We’ve been fortunate to have attracted interest from several global food manufacture and retail groups who have significant ambitions for integrating low-carbon fertilisers as a solution for Scope 3 emissions reduction, whilst providing on farm food production efficiencies. We hope one day that our approach will be the standard bearer in lower emissions farming.”

CCm have also been able to become a bigger voice around the table in terms of regulation and discussions with farmers and other key stakeholders too.

Alex added: “The Innovate UK backing has given us greater access to validated,

in-field data to inform conversations being held with Defra and the Environment Agency around regulatory changes required for the scale up of low-carbon, waste-based fertilisers. This project has also increased CCm’s farmer engagement through a number of farm open days and sector relevant media to promote the product and its benefits.”





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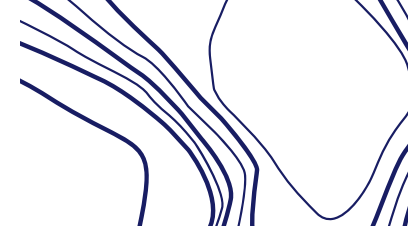
Future horizons

CCm are continuing their expansion, both in terms of market opportunity, but also in their R&D work for improved product and process efficiency. Alex commented: “We’re continuing to build robust data sets around the wider scope of fertiliser use in the field, examining nutrient use efficiency, ammonia and N_2O loss, long-term carbon sequestration and links with increasing local biodiversity. This is helping us build a bigger and more accurate picture of local UK landscapes and will help us tailor fertiliser formulations and application rates for farmers and crops in the UK.”

CCm’s reach is also expanding, given the product and solution has such a commonality in global farming. While remaining UK-based, CCm will be expanding their interactions with customers from overseas – offering new UK export opportunities – as well as potentially licensing the technology to production partners in other global regions.

Conception to consumption

Aligning farmers to consumers using modern data, decision support and precision agriculture techniques



Meet the innovator

Dunbia is one of the UK's leading beef and lamb processors and is supplied regularly by up to 40,000 British and Irish farmers. Influential throughout the supply chain, Dunbia focus on using technology and data to innovate processes, inform decision making and deliver a more efficient and sustainable livestock sector.

As with many natural production systems, a great deal of variety exists in the livestock sector, with animal size, age,

health and quality attributes often quite disparate, bringing a range of efficiency levels in terms of animal feed use, rearing, processing and ultimately value. Bringing new insights to monitor and positively impact animal growth, as well as enhanced consistency of product quality, in finishing livestock to market specifications, will help to ensure a range of environmental and economic improvements are realised across the supply chain.

Driving innovation

Dunbia received funding through the first Collaborative R&D competition run by the TFP Challenge in 2019. Alongside project partners Breedr and Scotland's Rural College (SRUC), Dunbia's project focused on the development, testing and adoption of an innovative technology platform which improves the monitoring of livestock performance, enabling farmers to more effectively manage their herds than previous manual recording techniques would allow.



Michael McWhinney, Research & Development Manager at Dunbia, commented: "With more than 12,000 animals involved in our study, this research was the first of its kind and by far the largest assessment of animal performance data in the UK sector. Our strategy is to encourage the adoption of new technology among farmers, which demonstrates the benefits of data insights and benchmarking, helping to raise standard farming practices, processes and ultimately meat quality throughout the beef supply chain."



©Dunbia



Accelerating the journey to net zero

Following their successful application, Dunbia rolled out the technology to 65 participant farmers, with the project thriving despite the COVID-19 pandemic hitting the UK. Michael said: “The pandemic resulted in restricted in-person interaction with the farms involved and whilst this initially had a negative impact on project progress, it turned out to be a real positive as it pushed all of us to engage more with the technology and resulted in more data being recorded by farmers themselves, leading to greater interest in the project outputs and implementing best practice in day-to-day activities. It also meant that our team could focus more on assessing and benchmarking the extensive project data collected by farmers. The result was a

much closer interaction and greater trust between Dunbia and our farmers.”

The technology gave farmers valuable insights into optimum animal age and critical animal health information resulting in informed decisions on input usage, particularly feed, that are associated with rearing and finishing poorer performing animals. Alongside each of these efficiency improvements to production, which could result in around £1.5m in total to farmers, there is also an environmental benefit by adopting a LEAN approach in the finishing of animals and use of resources.

The grant funding Dunbia received allowed them to focus on related continuous improvement projects

and enhance their service offering to different stakeholders across the supply chain. “The funding from the TFP Challenge allowed us to build the business offering, with around 25 people directly involved in the project scope at any time,” adds Michael. “The backing for the project enabled us to develop a wider skill set within the business. The TFP Challenge team has also provided valuable expertise throughout, enabling us to get guidance on rescoping the project during the challenges of COVID, completing reporting that has raised the standard of our own internal assessments, and brought a closer alignment between R&D, our net zero targets and our on-farm work.”

**“Helping to significantly
reduce emissions from
the beef sector”**



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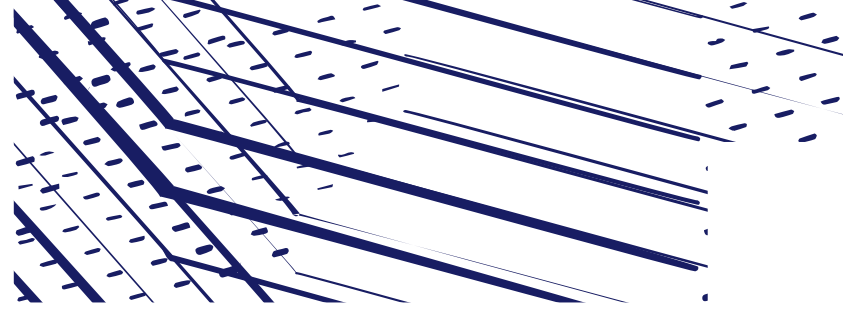
Future horizons

With 62 of the farming research partners still using the new technology after the project has completed, alongside new participants, Dunbia are maximising the benefits from the project outcomes as business expands. Key insights that help to enhance meat quality and livestock performance are being disseminated across the supply chain to benefit farmers, retailers and consumers alike.

There is also a bigger focus on the emissions side, with Michael adding: “PlanFourZero, our roadmap for building a more sustainable food system, is helping to significantly reduce emissions from the beef sector. In the UK, we’re working with more than 500 beef producers, using on-farm data from Innovate UK-funded projects, to inform decisions on waste elimination, using LEAN tools to optimise performance across the supply chain at all stages, predicting optimal animal condition and rewarding farmers for their consistency in meeting high standards.”

Dairyvision

Towards net zero dairy farming
through AI and machine vision



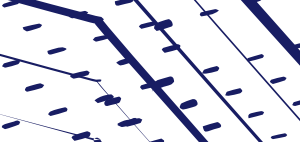
Meet the innovator

Peacock Technology are technology specialists, bringing advanced engineering, data, AI and robotics into industries with automation challenges, including the UK agri-tech sector. Based in Scotland, Peacock's expert team are working towards global solutions for the application

of novel technology and analysis in the livestock industry.

Within the dairy sector, the ongoing battle to be able to effectively monitor, assess and react to changing animal health and productivity is a significant challenge for farmers. With previous efforts for the use of basic CCTV being not only costly

but impractical in truly monitoring the cows, a more innovative and effective solution was needed that would help farmers make decisions and interventions to improve and maintain the welfare of animals, alongside attaining the commercial benefits of a healthier herd.



Driving innovation

In early 2021, Peacock was awarded funding from the TFP Challenge Science and Technology into Practice Collaborative R&D competition to advance their software and move the digital technology forwards towards deployment at scale in the market.

Peacock already had experience and market knowledge of the dairy industry when they submitted their funding application. Their aim was to move from their consultancy and pilot stage, through to a greater focus on further R&D around the vision technology products themselves, allowing them to look at robotic automation and vision-based livestock monitoring in real world trials for customers.

“We can now complete a major installation of hundreds of cameras within two to three weeks rather than over several months”



©Peacock Technology

Accelerating the journey to net zero

With funding secured, Peacock initially looked at camera use within the dairy barns, looking at how improved vision hardware could limit the physical restrictions of installation of the technology, and thereby enable artificial intelligence algorithms to be used in vision-based monitoring of the animals.

Robert Boyce, Sustainability Director, commented: “Our new AI-based method for the monitoring of the animals requires multiple cameras in the dairy barns, and traditional CCTV infrastructure is not suited for this, as it would involve a huge amount of cabling, with every camera having to be individually wired back to a central processing equipment. The time and cost of such cabling for each camera was prohibitive: so, through the development of custom electronics and

software we were able to daisy-chain multiple cameras in a single circuit, meaning that we can now complete a major installation of hundreds of cameras within two to three weeks rather than over several months.”

With the automation and analysis software now in place and on its own path of development, with improved effectiveness for monitoring both cow health and fertility, Peacock began to turn their attention to scaling the business.

“Previously, we had been primarily focused on UK-based consultancy business generated via client referrals and word-of-mouth, with no proprietary products and no concerted sales and promotional activity,” Robert continues. “With the TFP Challenge funding, we not only avoided furloughing any staff during

the COVID lockdown which was still underway at the start of the project, but we also began to grow our wider expertise across sales, installations and logistics – becoming a totally different business in the process.”

Peacock have also kept a focus on the wider impact of the technology. They are now working closely with other parts of the dairy sector and supply chain, helping to generate business for other local providers as part of a broader focus on sustainability and productivity in the dairy community. They now have plans to roll-out the automated vision technology to smaller farms too, providing cutting edge support that will help the sector as a whole in its aims to realise net zero emissions.

Future horizons

Peacock secured further funding through the TFP Challenge Series A Investor Partnership competition, with Robert adding: "As the business and project matured, we were then able to secure a Series A investment raise with the help of the TFP Challenge Investor Partnership competition, which provided external private equity investment alongside the non-dilutive TFP Challenge grant funding. This has been a game changer for us and has allowed us to significantly scale our team, evolving the business further and enabling us to expand into an international setting and establish international pilot sites."

Trial sites have since been established in the USA, EU and China. Robert commented: "Every country has its own nuances for analysis, monitoring and animal health when it comes to dairy farming, but ultimately share the same goals. That has made it possible for us to build our connections and opportunities by showcasing the benefits of our robotics and AI technologies that can be seen by farmers in all parts of the world."



AGRI-SATT

Agricultural growth using remote-sensing, Internet of Things (IoT), satellite and autonomous telecommand technology

Meet the innovator

Founded in 2013, Brilliant Planet is an innovative science and engineering enterprise, backed by several of the world's leading climate technology specialists. Headquartered in London, much of Brilliant Planet's fieldwork takes place in Morocco, where vast quantities of microalgae are grown on desert land, without using fresh water, by harnessing a natural process that mimics natural algal

blooms and contributes to alternative protein sources with potential applications in food and aquaculture production.

With net zero ambitions paramount for the UK and beyond, and the need to create a sustainable and resilient food sector with alternative food sources a key part of the story, Brilliant Planet's technology offers a number of benefits.

Driving innovation

In 2020, Brilliant Planet successfully secured grant funding through the TFP Challenge Future Food Production Systems Collaborative R&D competition, to assess the efficiency of digital processes and move from a pilot operation to industrial scale production, with the ultimate goal of approval and commercialisation.

The project was looking to develop alternative sources of omega-3 fatty acids and proteins, suitable for use within aquaculture feed for high-value molluscs, crustaceans, and fish, as well as for the possibility of replacement ingredients for vegetarian food sources.

“The impact has been growth to our team from eight to forty employees”

When they entered the funding application stage, Brilliant Planet already had around eight years of pioneering R&D under their belt, looking at the impact of IoT-informed technology on their equipment and the operational environment of their pilot plant in Morocco, as well as considering the impact of weather on initial results and overall productivity.

Having secured funding from the TFP Challenge, Brilliant Planet aimed to tackle the automation and remote accuracy of their systems, as well as areas such as energy use, reactions to weather and new technology concepts – all with the view of moving towards a commercially-viable and effective production facility.



Accelerating the journey to net zero

Having secured the funding, Brilliant Planet set about tackling areas of review and patenting, as well as growing their team and completing lab research to enhance the efficiency of their remote sensing technology.

Raffael Jovine, Co-Founder and Chief Scientist, commented: “The funding gave us the opportunity to review and progress key patents from our early work around the extraction and production aspects of the process, ensuring we could hone and protect some of the central innovations within the project and its progress.”

“It also allowed us to expand our research and system operations to include areas we might not otherwise have tackled so soon,” Raffael continues. “From our UK-based lab work, we were able to collate data around seasons, wind, clouds, and water use, improving the accuracy and effectiveness of our processes. We were then able to influence our operational costs, product throughput and diversification as a result. The impact has been growth to our team from eight to forty employees, and our business capabilities, as well as further

collaboration with partners at the University of Southampton around the energy use of the technology.”

Brilliant Planet have also been able to use their progression and results to secure further funding from external investors, supporting their continued scale and technological innovation.

Raffael added: “Since the initial TFP Challenge funding, we have been opened up to a number of investment communities from across both the environmental and food sectors.



Future horizons

As Brilliant Planet develop their innovations further, their valuable carbon negative status has also given them an opportunity to engage with markets. Raffael commented: “The environmental benefits of the algae system are significant, especially with the development of our new analysis technology, energy reduction and seawater use, which has provided us with valuable carbon credits to sell within the market in the short term as we develop. With food market regulation requirements still high, requiring time to work through applications for novel food sources such as ours, this provides us with another avenue to maintain our growth and development.”

They are also continuing to look at new areas, including starches and proteins that can be generated within the microalgae environment, as well as broadening the international connections and opportunities for the project.

Based mainly from the United States and France, we have secured around \$13m of funding to develop our sensor and photo physiology technology, as well as carbon-capture and beta-carotene extraction. The initial Innovate UK backing and TFP Challenge grant funding was critical in helping our standing and reputation for approaching these private equity investors.”

The insectrial revolution

Stimulating the establishment of a world-leading sustainable insect industry in the UK



Meet the innovator

Launched in 2017, Entocycle are the UK's leading provider of insect farming technology, using novel techniques for rearing black soldier flies with applications across the agri-tech sector. The method of insect farming developed by Entocycle not only produces a low-carbon protein source for aquaculture and animal feed, but also an organic fertiliser and a way of removing the wider problem

of food waste, which is fed to the insects as part of the process.

Finding ways to reduce the greenhouse gas emissions associated with livestock farming is a key priority to help realise net zero ambitions. Insect protein provides a natural solution with the potential to reduce reliance on imports of soya- and fish-meal that have been

associated with issues such as deforestation, overfishing and biodiversity loss. Add to this that around a third of food produced is either lost or wasted, it is clear there are substantial opportunities to increase the sustainability of food production – with insects providing a natural circular economy solution.



Driving innovation

Entocycle secured funding in 2020 through the TFP Challenge, via the Future Food Production Systems Collaborative R&D competition. Entocycle's project aimed to demonstrate the key food waste, fertiliser and animal feed benefits of insect protein, while also showcasing the use of automation and digital monitoring technology to optimise the health and productivity of the black soldier fly colony.

Keiran Whitaker, Founder and CEO of Entocycle, commented: "This project's aim focused on our ground breaking and highly-automated technology approach that removes manual human processes and inaccuracies. This shows the journey of food waste through the insects themselves and into animal feed and bio-fertilisers, giving valuable proof points for the profitability, safety, scalability, and efficacy of the use of insects in this way across the farming sector."



"The opportunity brings with it the chance for Entocycle to benefit from substantial new revenue streams with new global connections"



Accelerating the journey to net zero

Since securing the TFP Challenge funding, Entocycle have pursued their growth plans, successfully securing further private capital to support their business expansion. Keiran commented: “Having gone through the application process, securing the grant funding was very useful when entering a further funding round. With our existing track record and the further R&D we had undertaken on our digital processes under the TFP Challenge project, we were able to extend our efforts to move towards licencing our technology to other insect producers globally.”

Their development in this area has seen Entocycle partner with global technology processor Bühler in a significant joint venture. The companies will work together to overcome some of the infrastructure barriers and help standardise a number of processes associated with insect farming, in what will be a large-scale co-operative venture. The opportunity brings with it the chance for Entocycle to benefit from substantial new revenue streams with global connections.

Given the nature of this new industry, being directly linked to human and animal

food consumption, Entocycle have the challenge of gaps in legislation that novel solutions face. “The funding from the TFP Challenge came at a good time, when animal feed and food waste solutions were big topics for future farming,” adds Keiran. “Having the backing from Innovate UK has certainly helped give us the credibility to have a seat around the table when it comes to pushing for legislative change. This is key for us to unlock a substantial market by bringing confidence and awareness, and ticking the necessary boxes linked with insect use.”



Future horizons

Entocycle are continuing to work on shaping the growing insect protein market and adding new opportunities to hone their hardware and software product offering and processes. They are also continuing to expand the distribution of their neonate counter, the Entosight Neo, to existing black soldier fly farms, providing higher feed conversion rates and greater productivity for customers.

Keiran added: “There’s still plenty of work to do. We will continue to make big strides in markets in the same way that animal feed has developed for us, always with a focus on the benefits of novel technologies and techniques to help change the future food landscape.”

ABS-PFAB

Advancing bioprocess sustainability for poultry feed from algal biotechnology

Meet the innovator

Based in Belfast, Devenish are specialists in sustainable animal feed solutions, using cutting-edge research and scientific analysis to focus on the nutritional value of traditional and alternative feed, as well as the wider impact on human nutrition, soil, plant, animal, and environmental health.

When it comes to nutritional benefits of different foods, the omega-3 fatty acids from oily fish, such as docosahexaenoic acid (DHA), are a key part of a healthy diet,

supporting cardiovascular health and brain function. However, mass consumption comes with potential negative impacts for the ocean ecosystem of large-scale human fishing activity.¹ With over 80% of the population often not eating the necessary levels of fish in their diet to meet this need for omega-3 and other nutrients, alternative sources are essential – and that's where the Devenish solution comes in.

Driving innovation

Devenish successfully applied for grant funding in 2020 through the TFP Challenge UK – Canada bilateral partnership competition, which brought together leading innovators from both countries to share knowledge, expertise and R&D work towards novel food solutions.

Partnering with Mara Renewables, a Canadian biotechnology company focusing on sustainable microalgal solutions, Devenish worked to assess the opportunity for using the benefits of algal products in chicken feed, with the aim of increasing the omega-3 DHA fatty acid



content of chicken meat – thus offering a nutritional alternative to oily fish for consumers.

Their research through the project involved testing different algal oil products from Mara to identify how the beneficial omega-3 fatty acids accumulated in chicken meat to prove the potential for the opportunity, as well as understanding the different demands from the market and various stakeholders.

1 www.nutraingredients.com/Article/2023/09/15/omega-3-sustainability-pressing-environmental-political-and-social-issues-driving-change-in-the-industry





Accelerating the journey to net zero

Since the funding, the Canadian partnership with Mara has proven highly valuable to the results and opportunities that have emerged from the project. Matthew Sharman, Group Science and Technical Manager at Devenish, commented: “The TFP Challenge funding allowed us to undertake valuable R&D with a Canadian partner, while also giving us the opportunity to access Mara’s range of algal oil omega-3 DHA products to test and analyse the nutritional benefits of these products in meat through their incorporation into chicken diets. Aligned to the regulatory

work that had already been undertaken in Canada, we were able to generate several key data sets that provided answers to various important issues we had been addressing.”

The result has not only been a successful knowledge-sharing partnership, but also a new joint venture between the two companies. Matthew added: “Humanativ, the new joint venture, has allowed us to work even closer together and develop a concept for chickens that stretches across the full end-to-end of production. With Mara’s expertise in precision fermentation to

produce microalgae-based nutrients and our experience in the poultry sector, we can bring efficiencies throughout the full supply chain and maximise the effectiveness of the whole solution from the lab through to feed and animal health, and ultimately to the consumers.”

The project has also made some valuable new connections to help their further R&D efforts, both with regulatory agencies worldwide and through a collaboration with the Norwich Institute of Healthy Ageing – looking at the human benefits of increased access to omega-3 fatty acids in foods.



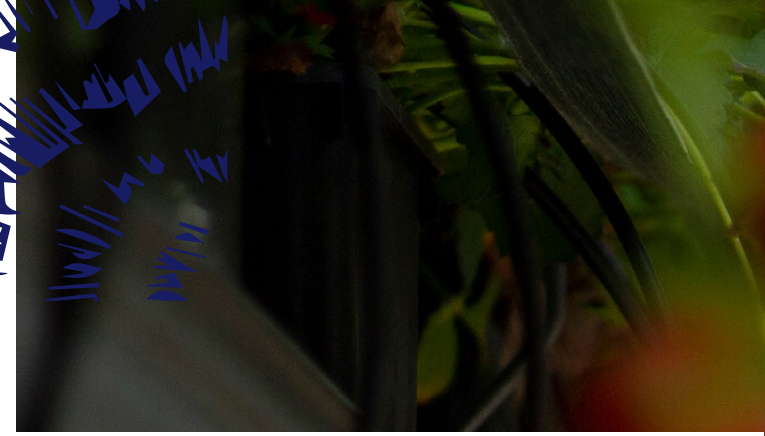
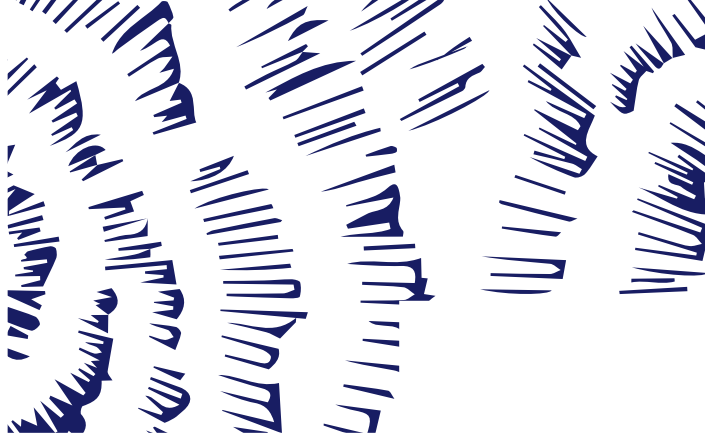
“Devenish have generated a lot of intellectual property through the partnership which is now being commercialised for wider use”

Future horizons

The focus for Devenish in this space has now turned to the continued growth and development of the Humanativ joint venture. Devenish have generated a lot of intellectual property through the partnership which is now being commercialised for wider use.

Scaling up production to meet demand is a key aim going forwards, as well as engaging more closely with producers and customers alike.

Demeter



Meet the innovator

Dogtooth develops and sells cutting-edge fruit harvesting robots. Their robots perform fully autonomous picking and packaging, as well as providing valuable data related to potential yield, quality and ripeness to allow more effective crop monitoring and analysis for growers.

As labour shortages continue to negatively impact the horticultural sector, growers are increasingly looking to technology that can complement their existing workforce and provide added insight to support their wider business decision making.

Driving innovation

In 2021, Dogtooth secured a combination of grant funding and external investment through the TFP Challenge Series A Investor Partnership competition. This was Dogtooth's largest funding round to date and the grant funding was instrumental in unlocking investment from round lead 24 Haymarket and other institutional investors.

For Dogtooth, the grant funding and investment came at a key time as they looked to take their next step with a fourth generation of robots that would work faster and more reliably and bring the company's offering closer to commercial viability.



Accelerating the journey to net zero

Duncan Robertson, Founder and CEO of Dogtooth, explained: “The venture capital market can be highly competitive, so we were keen to explore the TFP Challenge Series A Investor Partnership competition as a route to capturing innovation funding aligned to venture capital to support our business growth aspirations. The grant and investment funding from the TFP Challenge was an important stamp of approval in the eyes of our investors and brought stability and certainty to the company, which were extremely valuable to our continued R&D efforts.”

With this progression, Dogtooth were able to demonstrate robotic fruit picking at commercial scale, allowing potential customers to see the real value of the technology and its capabilities in a real-world setting.

“Typically, growers and farmers are sceptical about the introduction of new technology, but we’ve now been able to engage with our customers at much greater scale,” Duncan continues. “We have moved the needle not only on robotic harvesting, but also the wider data analysis and insights that the technology offers to growers, and customers are now working closely with us to further enhance our technology for commercial operation.”

Dogtooth’s fleet now comprises 70 fourth generation robots, which are being used to harvest millions of berries per year across five customer sites in the UK and Australia, with new developments meaning capacity continues to increase year-on-year.



“Dogtooth’s fleet now comprises 70 fourth generation robots, which are being used to harvest millions of berries per year across five customer sites in the UK and Australia”



©Dogtooth

Future horizons

Dogtooth are continuing to develop their proposition, helping to cement the UK's position as a global market leader in robotic fruit-picking technology and attracting orders from UK growers for their faster fifth generation robots, which will be operated by customer personnel. The company have also been developing their fruit quality control technology - which distributes picked fruit automatically amongst punnets according to supermarket criteria, providing significant efficiency benefits and yield forecasting solutions.

Duncan concluded: “We will continue to lead the way. Our customers have seen what we can do and want to come with us on the journey towards widespread adoption of robotic automation on their farms. With the contacts and regulatory guidance that came hand in hand with the funding from the TFP Challenge and our investment partners, we're now ready for further funding rounds to support our continued business growth.”

Artificial Intelligence for Artificial Insemination (AI4AI)

Technology standardising semen quality assurance across the supply chain, raising conception rates and reducing green-house gas emissions

Meet the innovator

Dyneval are emerging as leading experts in the field of semen analysis in the dairy sector, bringing together more than 30 years' experience among their team that combine deep-tech science with agri-tech expertise.

Poor conception rates are a considerable challenge for dairy farmers, resulting in an

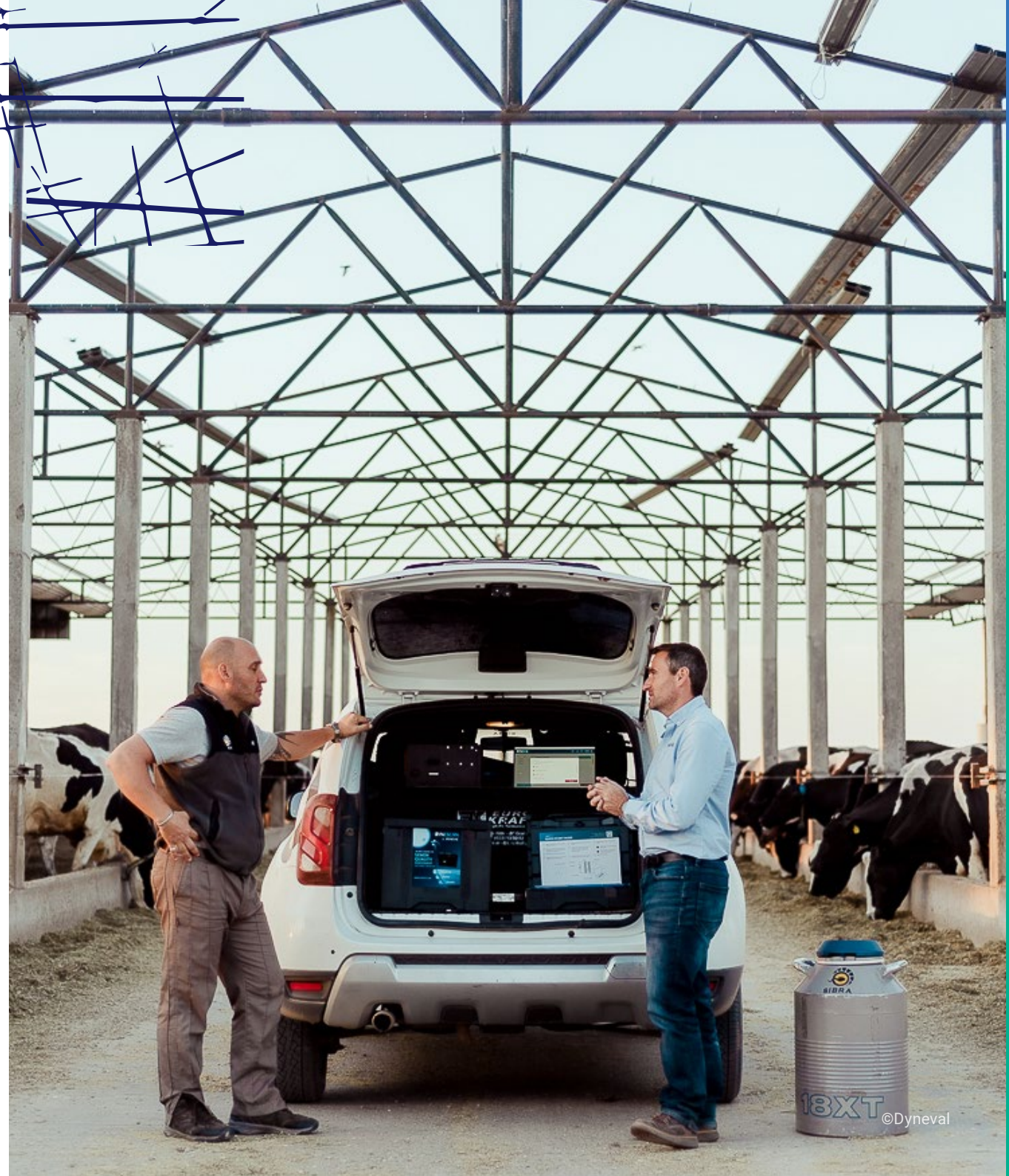
estimated annual cost of approximately £37,000 a year for the average dairy farmer in the UK. Until recently, vets and farmers were unable to assess semen quality reliably on the farm because visual assessment is prone to errors and subjectivity. Dyneval's automated equipment and cloud data solution, usable by anyone, anywhere, brings

a real benefit to efficient reproduction and insemination, creating a greater resilience and sustainability to farmers. Using the Dynescan, independent vets have shown that semen able to maintain motility for more than two hours yields conception rates 7.8% higher.

Driving innovation

Dyneval were successful in the TFP Challenge Series A Investor Partnership competition in 2021, receiving a combination of external investment and non-dilutive grant funding. Their aim was to develop their initial concept from the prototype stage into a market-ready product, including undertaking a range of developments to enhance their software and data.

They also sought to grow the business and the team, and completed some valuable R&D exercises in market understanding and engaging with vets and farmers to show the value and opportunity of the data, as well as the insights it provides to dairy farmers.





Accelerating the journey to net zero

Since Dyneval received the TFP Challenge funding and aligned equity investment, their business development plans have really come to fruition. Dr Tiffany Wood, CEO of Dyneval, commented: “The TFP Challenge grant and external investment truly kick-started our growth, and we soon moved from a single prototype through to an initial manufacturing batch which was tested on-farm. The design was then improved to deliver a robust and portable instrument, meeting international regulatory standards, for which manufacture can be scaled to meet market demand. We’ve also grown in number from two founders to a talented team of specialised staff and secured further private investment, all the while

developing the commercial insights that the data we gather can provide to benefit dairy farmers.”

Through the development of the software, Dyneval have focused on the return on investment for users in having a tool that helps them more accurately understand and improve their conception rates, creating a new parameter called the Sustained Motility Lifetime (SML) which can be used to guide the timing of insemination. Using the funding secured through the Series A Investor Partnership, Dyneval completed the development of a cloud platform for the data and insights, enabling customers to use either a mobile phone or laptop version of the semen analysis system on the go.

Tiffany continued “Fertility is a fundamental issue for the sustainability of livestock production and male fertility has been overlooked historically at the farm level. We’re working further to make global connections and secure sales, that will allow farmers across the world retain more profit and lower their carbon footprint by as much as 2.9%, based on achieving the 7.8% improvement in conception rate.”

Future horizons

Dyneval's focus is now for the analysis system to be used all the way between lab and farm, and to do so they are continuing to refine the data inputs and user information it provides. Whilst the fundamental focus of Dyneval's work is on the UK farming sector, the commonality with the insemination problems faced by farmers across the world means there are also opportunities for Dyneval to make new connections overseas.

"In developing markets with different challenges, such as African nations like Rwanda, governments are looking for greater food security through improved pregnancy rates and protein production from cattle farming, and the Dynescan is able to help ensure the supply chain is secure at every stage from production to insemination," Tiffany continues. "Meanwhile, production efficiency is a real focus for beef producing Latin American countries like Argentina, who are under pressure to reduce pastoral emissions."



IoT monitors for agricultural insect pests, delivering a 70% reduction in insecticide use

Meet the innovator

Spotta are specialists in using advanced sensing technologies for the identification and monitoring of insect pests and the damage they cause across a number of key areas – including forestry, agriculture and commercial business buildings.

In farming terms, insect pests are responsible for an annual crop loss worth

£320 billion globally. Current methods of manual investigation and identification are not only time-consuming, but often inefficient in their ability to accurately assess insect populations and the length and extent of damage to crops. Once an impact is seen, it's often already too late to treat and recover the crops and, ultimately, the food produced. This lack

of clarity often leads to an over-use of insecticides to avoid any issues, which has its own negative impacts on the environment and resistance to crop protection products.

Spotta's technology provides valuable support and strategic insight for its users to help find a better way to tackle this continuing issue.

Driving innovation

Spotta received funding in 2021 through the TFP Challenge, via the Investor Partnership competition. This provided non-dilutive TFP Challenge grant funding alongside private equity investment from specialist investors – with a further £2.2m secured with Yield Lab.

The project centred around the use of Internet of Things (IoT) technology to monitor on-farm insect activity in key crop locations, alongside essential data, insights and alerts to users around insect populations, crop damage and necessary treatments. This allows farmers and growers to create a far more effective treatment strategy to manage crop pests and pathogens.

With the funding, the project aimed to focus on enhancing agricultural productivity through the early detection and real-time monitoring of insect populations. Robert Fryers, Co-Founder and CEO of Spotta, commented: “This innovative approach has the potential to significantly mitigate the harm caused by insect pests to food production, leading to a substantial reduction in the need for insecticides. As a result, we anticipate substantial increases in productivity alongside a reduction in the negative environmental impact and cost associated with insecticide use.”



©Spotta

Accelerating the journey to net zero

With the Investor Partnership funding secured, Spotta have been able to further hone the benefits of the sensing technologies and expand the demonstration to commercial customers, helping to grow the business. “Since the funding, our staffing headcount has doubled, and the business has gone from strength to strength,” adds Roberts. “We now have 2,000 products deployed across nine different countries, expanding our reach while continuing our UK-based R&D work. We’ve also secured further investment to support our ongoing business growth scale-up plans since receiving the TFP Challenge Investor Partnership funding.”

Robert added: “We have been able to demonstrate a 50% reduction in insecticide use in some of our

application areas and are looking to repeat this success globally, which could have a CO₂ reduction effect equivalent to removing 100 million petrol and diesel cars from our roads. We are developing a solution that enables growers to use the right intervention at the right time – targeting the exact place where the treatment is needed.”

**“We now have
2,000 products
deployed across
nine different
countries”**



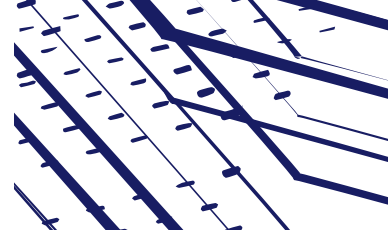
Future horizons

Since the TFP Challenge Investor Partnership funding, Spotta have seen the benefits of being connected with other experts through the project. Robert commented: “Being connected to a knowledgeable investor through the TFP Challenge was a fantastic opportunity. We had always focused on getting access to smart money not just any money, where expertise from a well-matched investor would give us longer-term impetus.

“The private capital has been really important to us and has helped us grow and scale the business in a way which is challenging to do through grant funding alone, while the TFP Challenge grant has meant we can simultaneously complete some essential technical due diligence and make plans for further market research.”

Spotta are continuing to grow as a business, and their export story of UK research-based expertise through innovative technology continues to gain traction in new overseas markets. This is leading to the development and implementation of a range of different commercial methods to suit the needs of different international customers.

Pilot plant for cultivated pork for sustainable food systems



Meet the innovator

Uncommon are a cutting-edge scientific food producer, having developed an innovative method for creating cultivated pork products from animal cells. By taking a small number of animal cells and cultivating them with animal-free growth media, the processes developed by Uncommon guide the cells as they develop and mature to become muscle, fat, and other types of tissue to create fully formed meat products.

There is increasing consumer demand for alternatives to traditional meat and dairy proteins, and innovations that can enable new protein sources, such as cultivated meats, to be produced at a commercially viable scale are required to meet this market opportunity in the UK and globally.

Driving innovation

Uncommon were heading towards an impasse, where the concept was proven at laboratory scale, but pilot plant infrastructure was needed to move to the next stage of testing, data gathering and product refinement to demonstrate that the process was technically and economically viable at commercial scale.

In 2021, Uncommon successfully applied for funding through the TFP Challenge Series A Investor Partnership competition, achieving Innovate UK grant funding, alongside private investment through a syndicate led by the recognised Investor Partner, Dismatrix.

With the funding, Uncommon wanted to secure backing to build and fit out a pilot-plant facility, capable of completing the necessary engineering and testing to move towards regulatory approval and scaling of the business. Start-up firms can face difficulties getting funding from traditional venture capital investors to cover their R&D costs. With the support of the TFP Challenge grant funding to cover the R&D expenses needed for the pilot-scale facilities, this barrier was unlocked and allowed Uncommon to secure private investment.



Accelerating the journey to net zero

Benjamina Bollag, Founder and CEO of Uncommon, had this to say: “The TFP Challenge Investor Partnership competition gave us the opportunity to align on private investment and R&D requirements. The grant funding support itself from the TFP Challenge was crucial for completing our technology transfer and product testing, bringing us more proof-of-concept data and target hitting that made us more attractive to continued investment from elsewhere.”

With the combined funding, Uncommon have been able to expand their team of experts, supporting the growth in both size and maturity of the business. This has included attracting international talent and further insights to help tackle the ultimate hurdle – regulatory approval.

“Unlocking the regulatory side is fundamental for being able to bring our meat products to market,” Benjamina continues. “With complex ‘novel food’ applications required to access our key UK, European and far eastern markets, being ready to make a comprehensive case for bringing Uncommon’s products to consumers is essential to succeed in overcoming regulatory scrutiny.

“The support from the TFP Challenge team in helping us understand how to approach our messaging, investment planning and submissions, has been invaluable. We want to get everything right so customers can trust meat-alternative products as they are introduced to the market and become more mainstream.”





**“It has been a
gamechanger
for our business”**

Future horizons

Uncommon have gone on to raise a further \$30m in a Series A funding round following the TFP Challenge Investor Partnership funding and are now realigning their business as they move from the pre-revenue stage towards commercialising their cultivated pork meat as a consumer product.

They continue their operational decision making and development too, with a product lab and kitchen at their UK plant providing initial access to the meat products themselves. The continued scaling and ongoing research and development work, as well as further data and results gathering, will also be a key part of the business – all being delivered from their UK-based production and research hub in Cambridge.

Benamina concluded: “The TFP Challenge Investor Partnership competition was pivotal to us securing this further investment round, ensuring we were well positioned to attract further external support with our business model, expertise and potential to meet this innovation opportunity in the novel food space. It has been a gamechanger for our business.”

Exploring the future of agri-tech: What's next?

Defra's £270m Farming Innovation Programme (FIP), delivered by Innovate UK, funds projects that benefit farmers, growers and foresters in England.

The programme's aims are to:

- Help farmers, growers and foresters increase productivity, sustainability and resilience
- Reduce the environmental impact of agriculture and horticulture
- Apply agricultural research to provide real benefits for farmers, growers and foresters

- Use science to develop solutions for the practical challenges in agriculture and horticulture

Since its opening in October 2021, FIP has funded 17 competitions up to September 2023, delivered by the TFP Challenge team at Innovate UK. This has already led to the creation of innovative approaches aimed at enhancing the sustainability and productivity of farms. These initiatives range from novel methods to reduce or completely eliminate pesticide usage to projects focused on reducing emissions originating from livestock.



Competitions include:

- **Research Starter** – assisting farmers at the initial stage of the innovation process, who have bold, ambitious, early-stage ideas that aim to solve significant problems affecting their farming operations
- **Feasibility Studies** – supporting businesses and researchers through the testing phase of an idea that will improve the productivity, sustainability and resilience of farming
- **Farming Futures R&D** – supporting strategic projects aimed at tackling climate change by reducing the environmental impact of farming
- **Small and Large R&D Partnerships** – helping businesses develop new farming products and services and take them to commercialisation on the open market
- **Investor Partnership** – combining government grant funding with private investment to help smaller agri-tech businesses to grow and scale

For further information about FIP and forthcoming funding opportunities, visit:
farminginnovation.ukri.org





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