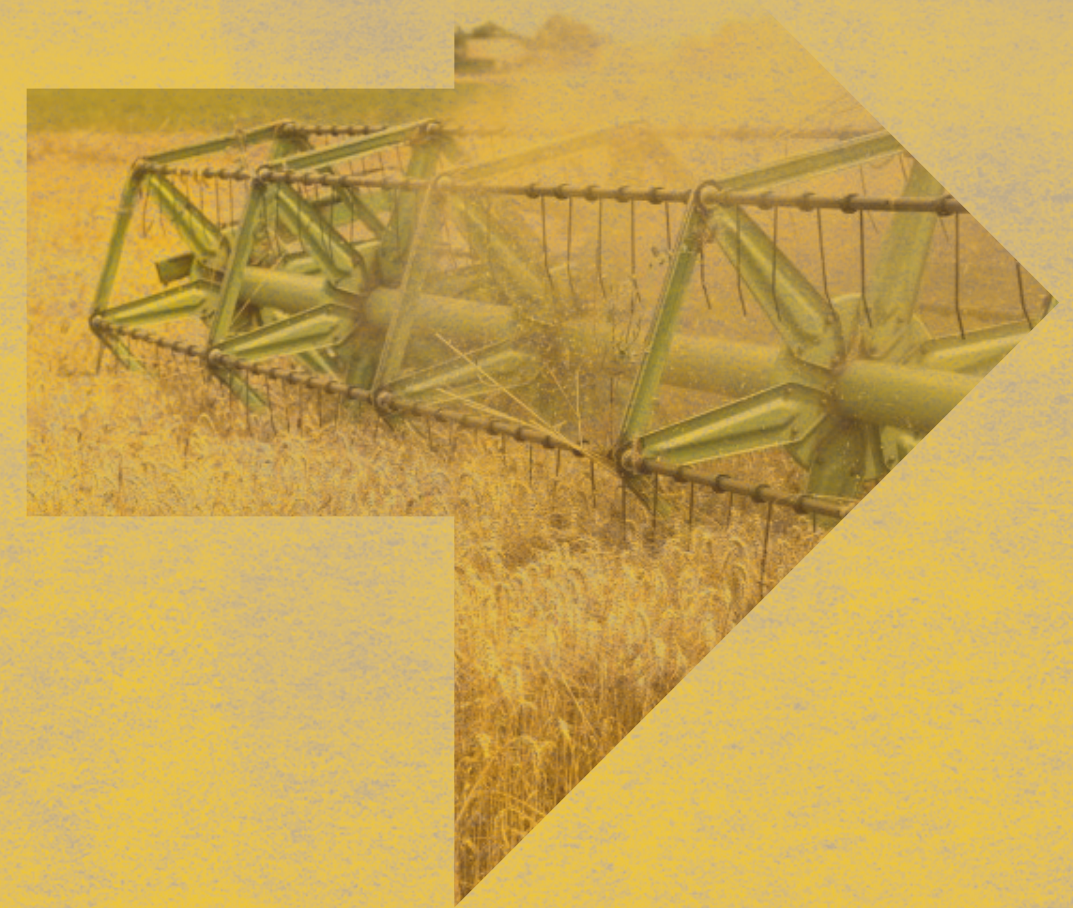


MAKING LASTING POSITIVE CHANGE



STATE
CLIMATE CHANGE

ANNUAL REPORT 2022

Shake Climate Change has successfully moved through its fourth year of operation, and we are delivering lasting positive change. A glimpse of milestones we have reached in 2022.

36

highly skilled jobs created

4

leading academic/
research
institutions

AWARDED
Deep Tech Investment
of the Year

91%

of Shake funds
invested directly/
indirectly into
start ups

723

workshop days
delivered

50+

Specialist Advisors

1.83m

tons annual CO₂
savings potential in
the medium term

Equivalent to:

226K

homes energy usage
for 1 year

489

wind turbines running
for 1 year

11

portfolio companies

£1.46m

investments made

£5.78m

additional funding raised

Business support to

64

startups

As we look back at 2022, and indeed the four years of Shake Climate Change operation, it is exciting, rewarding and encouraging to see the ventures grow and deliver positive impact.

This year we have also gained a better understanding of the programme's ripple effect beyond the science, business support, and investment.

The current portfolio of ventures consists of 11 very different technologies, and several have earned awards for their ideas and positive climate change impact potential. In addition to the £1.46 million they received from Shake, our portfolio ventures have collectively raised more than £5.7 million.

It underscores the importance of the Shake programme. As a research-led seed investment programme dedicated to agri-tech ventures with potential for positive impact on climate change, it is truly unique in the UK.

The importance of our mission to "Make Agriculture Part of the Solution" to climate change has intensified in the past year. 2022 was the warmest yet recorded in UK history and international droughts, storms, flooding, and hurricanes affected food and energy production, water availability and caused excessive crop losses worldwide. These are all signs that we must act now to make a difference, and Agriculture arguably remains one of the sectors with the largest opportunity to impact on Climate Change in the UK and globally.

It has always been Shake's vision to create an evergreen fund to sustain the future of the programme. Returns released from all our investments are to be re-invested into Shake to support future cohorts of entrepreneurs. However, it takes time for ventures to significantly grow their value, and Shake's evergreen fund model cannot rely on venture returns in the short term.

During 2022, we have therefore been working hard to attract further funding to bridge the program in the next few years. We are excited and grateful that the Societe Generale UK Foundation are continuing their support by joining an anchor group of funders for the next phase of Shake's evolution. Their support will allow us to keep the momentum and brand presence of Shake alive, build on the lessons learned and take advantage of the tried and tested consortium approach, team, processes, and infrastructure already in place.

We look forward to announcing a fifth cohort run in due course.

Angela Karp



Shake Climate Change is combining the best in science expertise with excellent entrepreneur support and investment to deliver a clear positive impact on climate change through:

A focus on big challenges in climate change arising from, or impacting on, agriculture

Unsurpassed sector connectivity, with access to entrepreneurs, academics and businesses

Charitable status and **a track record of innovations** that benefit society

A mentoring and services support programme, provided by leading research institutions, that combines technical know-how, deep market intelligence and sensitive business modelling for social impact

Unrivalled on-site facilities for initial proof-of-concept and field testing as well as extensive links to user communities for scale-up

Shake Climate Change is consortium-led, combining expertise from Rothamsted Research, Cranfield University, University College London and the University of Hertfordshire. It was established in 2018 with a £3.5 million fund provided by the Societe Generale UK Foundation and a vision to champion innovation across the agri-food industry and have a clear positive impact on climate change.

What's so special about

SHAKE?

Sector connectivity

with access to a high quality pool of experts and customers

Excellence

in leading-edge science and technology, market intelligence and business

Ambition

to solve big sustainability challenges of climate change arising from food production

Long term mentorship

tailored to meet the needs of each entrepreneur

Unrivalled facilities

for testing and validation

Investment access

to a seed fund and investor pool

We're not a typical fund.

Imagine us more like a family – nurturing collective potential to create something truly amazing. Shake successfully attracts applicants from across the sector, from farmers, to university spinouts and family-led businesses, and from the young to the more senior.

Focus

on improving the success of every venture



Between the Shake network and the portfolio of ventures, we have a shared passion and a collective ambition to tackle climate change.

Shake measures its success by that of its ventures in:

A

Creating climate change reductions as calculated by extensive Life Cycle Analysis for each venture

Our potential climate change impact in the medium-term equivalent² to:



226k
homes energy usage
/yearly



88k

lorries of waste recycled instead of landfilled

B

Socio-economic impact through job creation

36

highly skilled jobs created



In addition to Shake's portfolio,

53

start ups have received valuable business training and science support to help them upskill and sharpen their business potential

Plans to hire in 2023

15+

C

Additional funds raised in support of their work

We have the drive, determination, and courage to push the boundaries of the food and farming industry. We are not afraid to go first, and by investing in brilliant ideas, we hope to attract others to do the same.

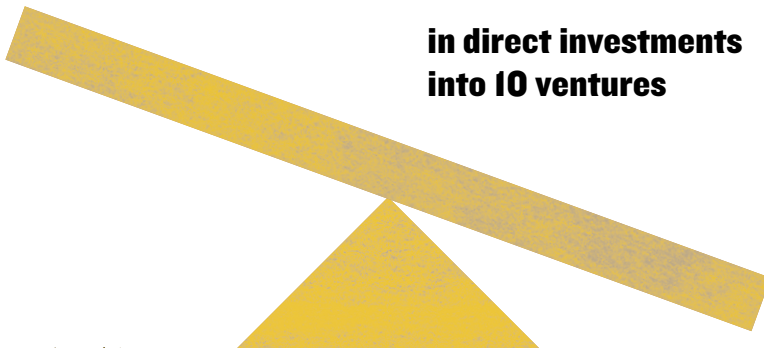
Shake's portfolio ventures have secured additional **grants and private investment equivalent to 3.9 times the amount of capital provided by Shake.**

£5.7m

leveraged in grant and equity funding

£1.4m

in direct investments into 10 ventures



² According to the EPA GHG equivalencies converter

PROUD

The ventures in our portfolio are at very different stages of their evolution.

From developing their first prototype to already generating revenues, we have been delighted to see the portfolio members being recognized and receiving accolades in the past year. Some examples of what others think of the Shake portfolio ventures:



Awarded the **UKBAA “Deep Tech Investment of the Year”**

— GLAIA



Ranked in The Best Startup **London’s selection of the top 100 agriculture start-ups** in London

— CLIMATE EDGE



Finalist for this year’s **Royal Society of Chemistry Competition** in the environment category

— PHEROSYN



Top 10 finalist in **Tesco’s AgriTjam** to present innovative ideas to improve their supply chain and help achieve net-zero

— PHEROSYN



Highly commended in category **Anaerobic Digestion Pacesetter: Micro Anaerobic Digestion** at AD & Biogas Industry Awards 2022

— ECONOMAD SOLUTIONS



Won **10x10 Barclays Eagle Labs** competition

— ENTIO



One of the top 50 **“UK most innovative Green Technology Creators”** for 2022

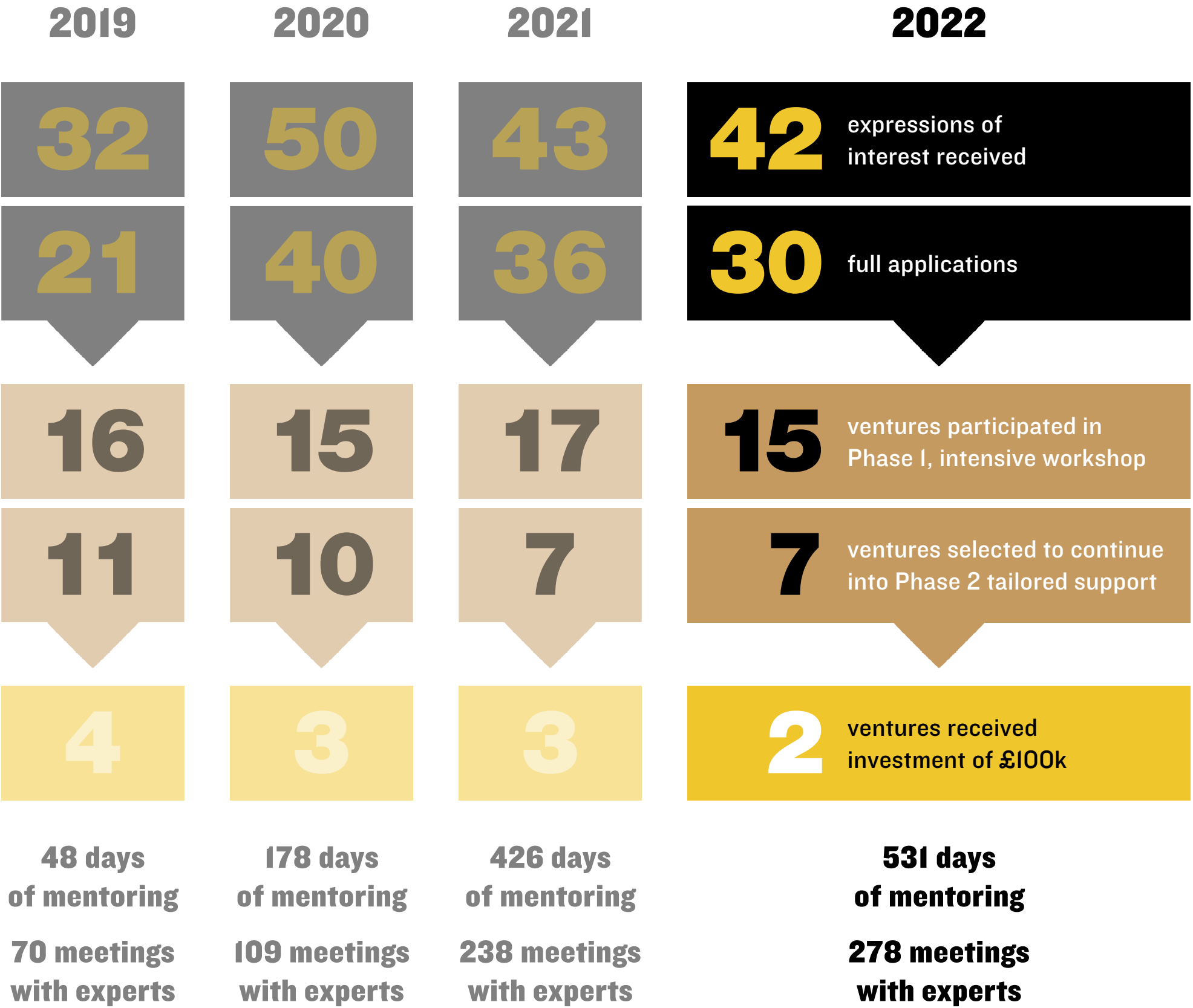
— CLIMATE EDGE



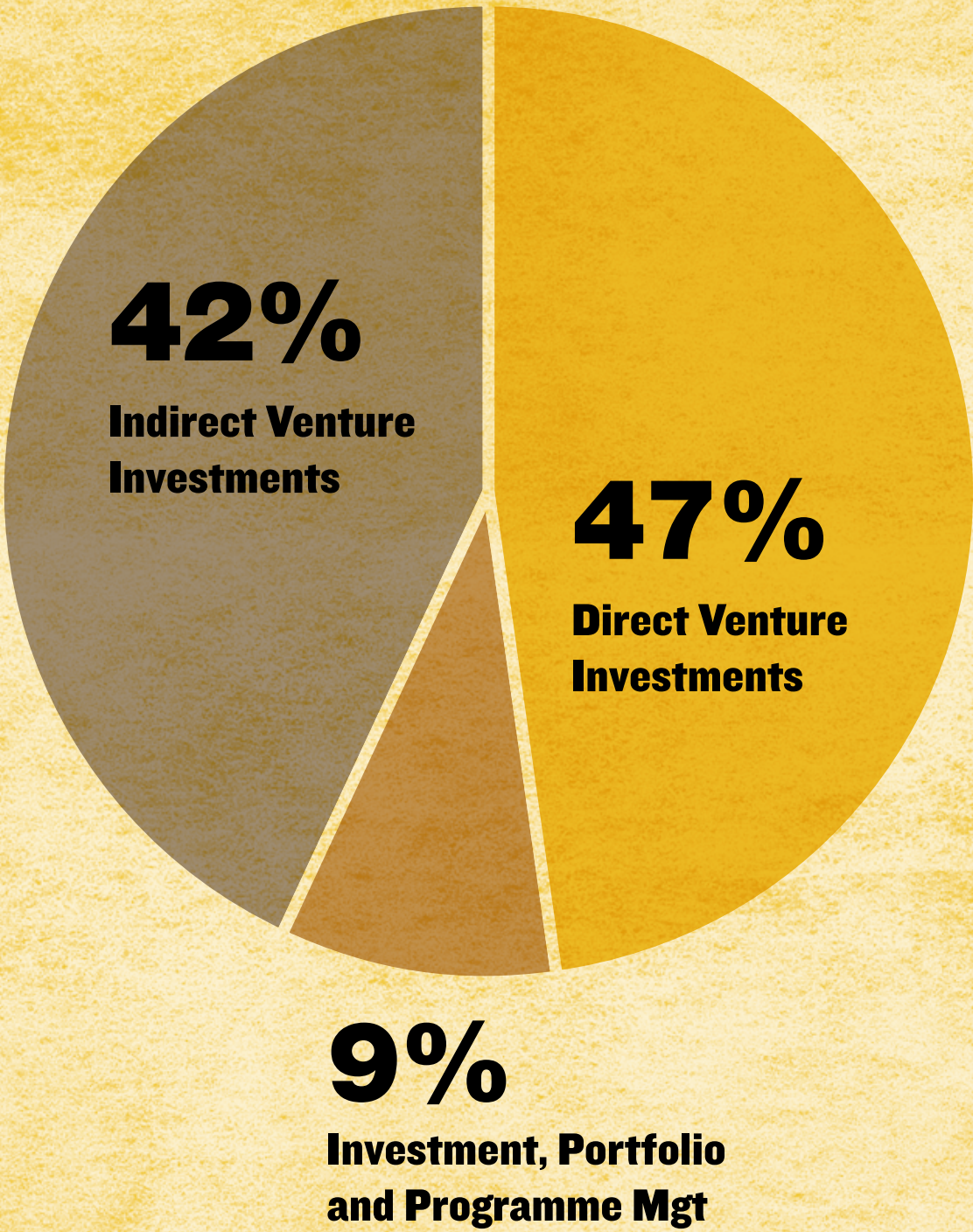
Nominated one of the top **“101 Most Innovative United Kingdom Based Farming Companies & Startups”**

— CLIMATE EDGE





Shake has performed well in terms of overall budget management with a strong emphasis on direct- and indirect investments into the ventures and keeping programme management and administration to a minimum.



**Get to know our newest portfolio ventures from Cohort 4;
Adamo Food and Resurrect Bio.**



MEET OUR NEW MEMBERS

ADAMO FOODS

Fungi derived product looks to mimic the whole experience of eating beef steak.

Whilst plant-based meat alternatives have come a long way in the last decade, most still fall short when it comes to that convincing meaty, juicy, chewy texture you get from tucking into a beef steak.

Adamo Foods think they've cracked it though, with what they describe as 'Europe's first convincing alternative'.

Rather than shape and chemically coax a plant protein to have something approaching the same texture as an actual cut of meat, the team have instead turned to the already fibrous, protein-rich and root-like structures produced by fungi, which when cultivated in the right way, are just like muscles fibres.

Once aligned, these tightly packed mycelia are cut into steak shaped slabs and seasoned with a few natural

flavourings and plant oils to produce the long sought-after taste, and juicy and chewy mouthfeel of a steak.

Whilst others have produced whole cut meat alternatives, Adamo say theirs is the first to truly mimic the experience of eating a grilled steak.

The market for such whole cuts currently stands at about \$850 billion worldwide, so the potential is certainly there.

And as is well documented, animal farming is a leading contributor to climate change and environmental degradation, with steak one of the main culprits – using 15,000 litres of water to produce just 1 kg.

The company plans to launch this year, with an initial roll out into restaurants and the wider food service industry.



Website www.adamofoods.com

Founder Pierre Dupuis



RESURRECT BIO

Resurrected resistance – giving crops a fighting chance.

In the never ending, running-to-stand still, arms race of pest versus plant, we've put our crops at something of a disadvantage.

Years of selective crop breeding has helped bump up yields and enhanced other traits such as drought tolerance – but, with an armoury of chemical pesticides to fall back on, we've mostly neglected the resistance genes that give plants that vital protection from diseases.

In the wild, having to fend off pests or diseases means those plants with natural immunity would survive to set the most seed, thereby giving subsequent generations a fighting chance. But on the farm, the seeds planted the next year won't have gone through any such selection process.

Our crops are, figuratively at least, fighting with one stem tied behind their backs.

With diseases and pests shifting their ranges under climate change, and a widespread desire to reduce our use of farm chemicals (which in themselves contribute to carbon emissions), London based start-up Resurrect Bio is looking to put the R back into resistance.

Using the latest precision breeding techniques, the team plans to resurrect some long-defeated resistance, or 'R', genes, in soy and other crops.

Doing so would give the crop a fighting chance against the cyst nematode, of which there is currently no defence and leads to \$1.5 billion dollars of soy yield lost every year in the US alone.

Bringing a unique understanding of the way pathogens causes disease and the how an immune response is mounted, Resurrect Bio say their approach is both precise and robust.

In addition, by tailoring their gene editing approach to each crop-disease system, it actually adds to overall genetic diversity without adding any foreign DNA.



Website www.resurrect.bio

Founder Dr Cian Duggan, Dr Tolga Bozkurt



Let's see what existing portfolio ventures have achieved.



EXISTING MEMBERS



CLIMATE EDGE

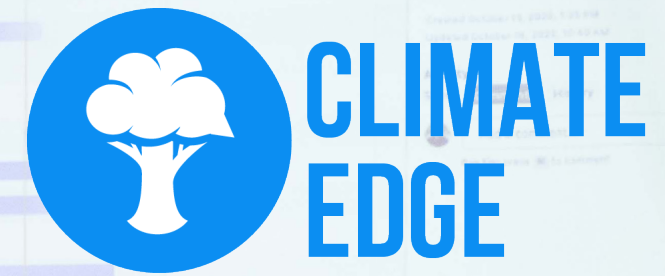
Bridging the Knowledge Gap.

Climate Edge is building a B2B SaaS CRM product which enables agricultural businesses to achieve greater profitability in emerging markets, a sector worth \$5bn and growing rapidly. The Climate Edge software helps agricultural organisations build farmer relationships and streamline processes so they can increase sales, improve customer service, and increase profitability.

In other words, they solve last mile delivery to the 500m smallholder farmers who own 94% of farms globally. These farmers form up to 70% of revenue for multinationals operating in these markets, and by solving the disconnect between businesses and their customers, open this hugely underserved market and create unparalleled opportunities for impact.

Website www.climate-edge.com

Founder Paul Baranowski and James Alden



Key milestones celebrated on their journey in 2022:

- Built an ecosystem that enables business to gather insights on smallholder farmers without a need for costly ground teams
- Developed a cheaper way of serving these farmers (around 500x cheaper!), with a \$5bn market opportunity
- Onboarded both major enterprise customers, such as Unilever and CropNuts (East Africa's largest soil testing lab) and over 1800 small agribusinesses
- Reached over 500,000 smallholder farmers through businesses using our product
- Proven a viable SaaS business model that can be driven by low cost digital marketing

ECONOMAD

Big Challenge With a Small Solution.

EcoNomad's waste to energy technology the BioNomad™ brings an affordable and easy to use solutions for small size farms to increase their ability to operate sustainably and off-grid.

At present, the EU produces about 1.4 billion tonnes of manure per year from livestock farming operations, while this sector accounts for 10% of anthropogenic greenhouse gas emissions globally. Agricultural technology has made great strides in converting farm waste into renewable fuel and natural fertiliser, but the economy of scale has always limited the financial opportunities to be had from farm waste to just the big players.

Economad is on a mission to change this and reduce the environmental impact of livestock smallholdings through animal waste-to-energy conversion at a local scale.

Website www.economad.co.uk

Founder **Dr. Ilan Adler and Alexander Demenko**



Key milestones celebrated on their journey in 2022:

- Included in Business Insider's list of 10 most promising agritech startups in December 2022
- Installed 5 BioNomad waste to energy platforms
- Commenced field trials of passive solar pump
- PSPP patent was granted for UK, with subsequent patents for the EU, US and China in review
- Highly commended in category Anaerobic Digestion Pacesetter: Micro Anaerobic Digestion at AD & Biogas Industry Awards 2022
- Successfully closed a fundraising round, worth £600k

ENTIO

In the war on waste, it's time to send in the tiny troops.

ENTIO optimises the bioconversion of natural waste into protein and organic fertiliser using Black Soldier Flies.

According to the World Bank, 64% of global waste is natural waste, and if we don't do anything, by 2050 our natural waste will generate 2.4 billion tonnes of CO2 equivalent emissions per year. ENTIO sees natural waste and residual biomass from agricultural practices as a resource to create new products and offer local communities new income opportunities for development. ENTIO aims to become the global lead in scalable and intelligent insect-based bioreactors.

Website www.ent-io.com

Founder **Dr. Rafael Cepeda-Lopez and Mr. Camilo Wilisch**



Key milestones celebrated on their journey in 2022:

- Entio completed its pilot phase and further developed innovation in: Dynamic digital platform for tracking performance of multiple plants; natural waste sanitation and preservation; feed preparation and formula for polygastric animals; enhanced fertiliser from fermentation process; and new feed additives for Black Soldier Fly larvae.
- First commercial deployments in place with waste management company and municipality
- In discussions with potential customers for bioreactors
- Commercialized organic fertiliser and larvae for animal consumption



Increasing crop yields with less carbon.

Glaia is on a mission to enhance agricultural productivity and reduce pressure on natural resources by optimising the performance of plants.

According to the UN, the global demand for food will double in the next three decades to meet the demand of the growing world population - expected to reach 9.8 billion people by 2050. This is putting resource and our climate under enormous pressure. Glaia set out to address this problem by asking the question of “What if we could improve current productivity without increasing the carbon footprint?”

Glaia’s biostimulant technology allows plants to harvest light more efficiently resulting in enhanced photosynthesis and increased crop yields. With this technology, Glaia aims to improve food security as well as reduce the carbon footprint of agricultural food production.

2022 was the year for Glaia to demonstrate the commercial potential of the photosynthetic enhancement technology and preparing for market entry, engaging in projects with growers as well as commercial partners for distribution in 2025.

Website www.glaia.co.uk

Founder **Dr. David Benito-Alifonso and Dr. Imke Sittel**



Key milestones celebrated on their journey in 2022:

- Completed the first stage of the development of the protocol for the industrial production of sugar-dots
- Trials with growers in strawberries and lettuces
- Scale-up developed to 65 litre reactor
- Validation trials produced very positive results
- Expanded the team to help enable market entry; Business Development, Commercial Strategy, Research Chemist and Photosynthesis expert

THE GOOD PULSE Co.

Focusing on consumer experience could shake plant protein business to its roots.

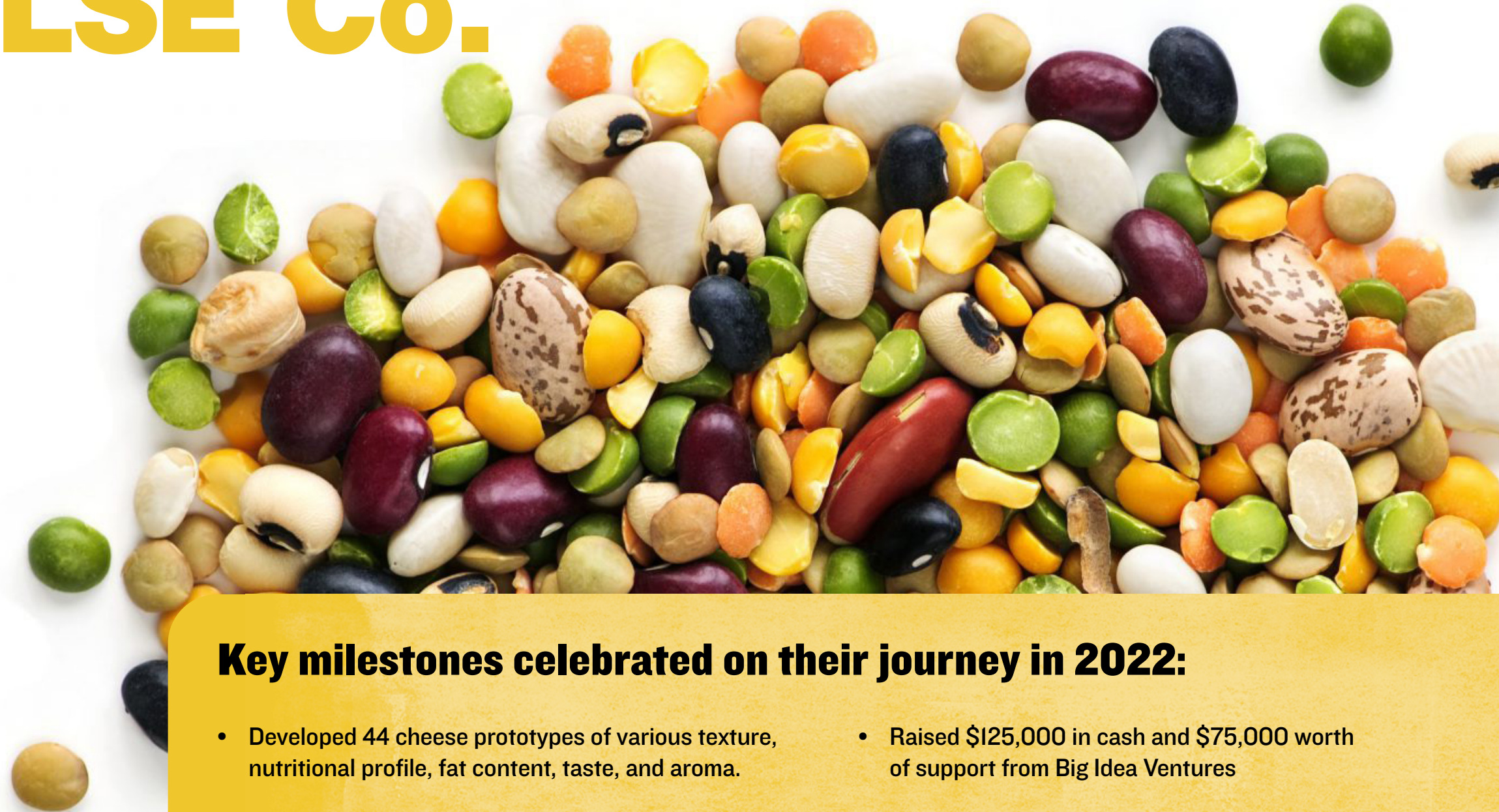
The Good Pulse Co. develops natural, functional proteins and ingredients from pulses for use in plant-based foods and supplements.

The impact of the meat and dairy industry on the climate is a staggering 14 % of global Greenhouse gas emissions. Fortunately, for a variety of reasons, including ethics and wellness, demand for alternative proteins is a fast-growing market, with consumers increasingly willing to shift their consumption to alternative proteins when they can find alternatives that live up to their tastes and expectations.

The Good Pulse Co's mission is to power the transition to plant-based foods by providing sustainable and minimally processed ingredients that make it easier and cheaper for food companies to create more nutritious dairy and meat alternatives. Their unique processes focus on maximizing functionality, nutrition, and re-valorisation of all components extracted from pulse seeds – all of which increase sustainability and reduce waste.

Website www.goodpulse.co

Founder Cesar Torres and Dr. Vincenzo di Bari



Key milestones celebrated on their journey in 2022:

- Developed 44 cheese prototypes of various texture, nutritional profile, fat content, taste, and aroma.
- Developed numerous prototypes of baked goods such as high-protein biscuits from their enhanced functional pea flour and demonstrated significant reduction in the total number of ingredients, which opens a new market for high-protein, gluten-free baked goods.
- Identified first potential customers (food companies) to co-develop high-protein, low-fat cheese from pulses and in early conversations with the largest dairy cheese companies in Germany and France.
- Raised \$125,000 in cash and \$75,000 worth of support from Big Idea Ventures
- Secured facilities for micro-pilot and full-scale pilot trials.
- Currently securing support from major ingredients producer for improving the use of their ingredients in cheese applications.

**THE GOOD
PULSE Co.**

HE FEEDS

Healthy hens are no hill of beans.

HE Feeds is developing a new type of animal feed with improved nutritional characteristics and sustainability, displacing the need for soy and reducing the impact on climate and tropical forest of soya farming.

Soybeans are one of the most important crops in the world, doubling up as a highly nutritious protein source for both humans and for livestock feed. But the demand has led to vast amounts of deforestation and habitat conversion in some of the world's most precious places. The main driver underlying the increase in soy production is the growing global demand for animal protein – especially for chicken, pork, eggs, dairy, beef and lamb.

As a Nuffield scholar, Gordon studied animal welfare across the world and saw the potential to develop a different system of feeding hens to reduce the reliance on soya.

Website www.lowermilloftynet.co.uk

Founder **Gordon Whiteford**



Key milestones celebrated on their journey in 2022:

- Prototype installed and commissioned
- Testing trials for feed productivity, benefits and bird welfare conducted
- Continued development of attractiveness of the feed

PHEROSYN

Providing sustainable pheromone-based solutions to secure the future of our global food supply.

PheroSyn has set out to challenge the current ways of insect pest management by providing species-specific pheromones that target the most prolific and damaging pests.

Effective pest management is essential in agriculture to avoid significant crop losses and damage. With growing demands for food production, effective strategies for pest management, that do not add to the burden on our climate and environment are crucial. Crop spraying with insecticides may be effective, but the lack of basic information on the location and timed appearance of pests results in the excessive application of chemicals, creating an unnecessary environmental pressures and poor cost control.

PheroSyn enables effective pest management through pheromone-based integrated strategies, reducing the use of pesticides and helping mitigate climate change.

Website www.pherosyn.com

Founder **Dr. Mike Birkett, Dr. John Caulfield, Dr. David Withall and Mr. Daniel Bahia**



Key milestones celebrated on their journey in 2022:

- Raised further non-dilutive funding from Innovate UK SMART Grants and BBSRC (£244k).
- Hired an experienced CEO with a track record in successful start-ups and over 20 years' experience.
- Completed their first GEP validated field trials ready for the launch of their lead product in 2023.
- Developed a pipeline of candidates for field validation studies with commercial growers and customers, with over 25 field trials for 5 lead candidates either on-going or completed.
- Expanded their advisory board bringing on international experts in the field.
- Applied for and secured further protection of an expanding intellectual property portfolio.

SUGAROX

Boosting crop yields to feed the world sustainably.

SugaROx is on a mission to help meet the challenges of food security with their single-molecule biostimulant formulations that increase the productivity and resilience of crop systems whilst improving farmers' profitability and reducing the carbon impact of food production.

Academic research on the technology licensed by SugaROx showed potential to prevent yield-loss in wheat by up to 40% when applied after a drought event and can boost yields by up to 20% under typical growing conditions.

SugaROx is leveraging this game-changing technology to develop products that slot seamlessly into existing agricultural practices, offering ease-of-use for farmers. Their first product, a biostimulant for wheat, will be applied together with a fungicide application already adopted by farmers.

Opportunities to join their Seed Round are still available for investors looking for ventures with a focus on food security and climate change.

Website www.sugarox.co.uk

Founder **Dr Cara Griffiths and Dr Matthew Paul (Rothamsted Research) and Prof Ben Davis (Oxford University)**



Key milestones celebrated on their journey in 2022:

- Field trials in winter wheat conducted in the UK demonstrated a yield increase of about 20% from a single application of 2 litre/ha around grain filling;
- Glasshouse tests on four new crops showed the potential of the technology in other market segments;
- Initial in silico and in vitro tests allowed refinement of the strategy to register the product in large international markets;
- Additional patents were granted, extending IPR protection for the use of the SugaROx molecule in key markets for crop inputs;
- Circa £250k in non-diluting funding and £1.4M in equity capital was raised to allow an expansion in product and business development activities in 2023.

TUMBLEBUGS

Unlocking the regenerative value of organic waste.

In the UK there are 140 million tonnes of readily available untreated, untapped organic waste.

Tumblebug machines dries, sanitises, and reduces waste by 90% and creates input for biochar manufacture – thus enabling farmers and food services to recover the economic and environmental value in manure: put carbon back in the soil; claim carbon credits; minimise emissions from agriculture; reduce reliance on artificial fertilisers; and take farms with heat and power demands, such as poultry units, off grid.

Tumblebug's patented, scalable solution takes a low value waste resource, presently land-spread on farm, and creates a new high-value resource and revenue potential.

Website www.tumblebug.co.uk

Founder **Sylvie Verinder**

Key milestones celebrated on their journey in 2022:

- Delivered a product proof of concept and demonstrated the establishment of market.
- A joint venture with the manufacturers of biochar used for the successful growing medium trials
- Peat-free medium growth trials were completed in the summer and delivered 3 formulae which competed favourably with the two-market leading peat free products.
- Patent application



At the core of Shake are the people.

We are fortunate to have some of the very best in our teams and are truly grateful for everything they do. From the Programme Steering Group and the Investment Panel to the Mentors and the incredible network of more than 50 Specialist Scientific Advisers, everyone is pulling in one direction to make an impact by fostering entrepreneurship and helping the ventures grow and prosper on their journey to achieve a more sustainable agriculture sector.

In 2022, we said goodbye to valuable team members who have been with us from the beginning, but also welcomed new members to the Shake family.



GOODBYES

We would like to extend our gratitude to former IVP Chair, Jackie Hunter, IVP Members Martin Carr and Leon Terry, PSG member and Mentor Paul Ross, Mentor Yuri Andersson, and Programme Manager Tinne Midtgaard for their contributions since the founding of SHAKE and for helping make SHAKE a successful programme. We have greatly benefitted from having them share their experiences with us and the ventures, and we wish them the best of luck going forward.

Tinne Midtgaard,
Programme Manager



Professor Jackie Hunter,
Chair of the Investment Panel



Yuri Andersson,
Mentor



Leon Terry,
Investment Panel
Member



Martin Carr,
Investment Panel
member



Paul Rous,
PSG Member and Mentor



WELCOMES

The Investment Panel (IVP) holds the vital role of deciding which Entrepreneurs should be invested in as well as monitoring the portfolio progress. We have had the pleasure of introducing a new Independent Chair of the IVP alongside 4 Independent Expert Members, who together brings deep sector knowledge, specialist expertise and vast experience with all things entrepreneurship, sustainability, and investments.

The entrepreneurs in the Shake program benefit from working closely with a group of experienced Mentors, who, amongst other things, help the ventures to develop and implement their business ideas, test the market application for the solution they seek to commercialize and advance their business and entrepreneurial skills and increase their confidence.

In 2022, we were successful in securing two new Mentors, who's experiences in working with innovators and entrepreneurs has been major contribution to the ventures in Cohort 4.

Visit our [Team page](#) to get to know everyone better.

Dr Mary Ellis,
Mentor



Nicole Sadd,
Mentor



Subhash Jogia,
Investment Panel member



Krista Friis,
Programme
Manager



**Joanna
Southernwood,**
Investment
Panel member



Wilfred Otten,
Investment Panel
member



Eli Kershavarz-Moore,
Investment
Panel member



Dr Belinda Clarke,
Chair of the
Investment Panel



Shake Climate Change

Making agriculture part of the solution
through partnerships:



ROTHAMSTED
RESEARCH



University of
Hertfordshire **UH**

With the generous funding from:



UK FOUNDATION

Curious to learn more or just connect:

