13th August 2024

BSF Enterprise Plc

Company undergoes a 5-faceted growth-ready restructuring.

Much has happened for BSF Enterprise Plc (BSF) since our initiation note back in May 2023. The company has undergone several restructuring steps to enhance its focus on its individual markets, unique IP and make BSF's offering more friendly to prospective clients and investors, which may alter how we value BSF at Plc level in the coming months. Over the past year, over 30 prospective customers – including those within cultivated meat, biotech, and academia – have been carrying out product evaluation, and we are starting to see what could be a plethora of partnerships and sales activity.

- **Corporate Activity & Restructuring.** Since October 2023, BSF has implemented an umbrella strategy in which R&D and commercial activities around each market and IP vertical are housed in separate subsidiaries. Key benefits of this include: minimisation of dilution at Plc level; the catering to strategic investors with different sector preferences; allowing each product line to be valued individually; and an individual management team assigned to each – allowing for a laser focus on growth within their respective markets. The strategy began with Kerato Limited (Kerato), an entity responsible for clinical trials and licensing of its corneal products, where Sarah Greenhalgh, former biotech and medtech operator with 18 years' experience in academic and clinical research, has been appointed as MD. Cultivated Meat Technologies Ltd followed in December 2023 and is a 50%-owned joint venture with CellularRevolution ('CellRev'), another company founded by Prof. Che Connon that is focused on bioreactors used in cell culture. Lab-Grown Leather Ltd is another subsidiary that BSF has incorporated and from which we have already seen the first of hopefully many deals. Meanwhile, 3D Bio Tissues Ltd, will continue as a standalone entity, aimed at commercialising BSF's physical standalone products – City-Mix and Etsyl – and will continue to act as a transferable technology to support all other subsidiaries through the lens of its tissue templating technology. Finally, in July 2023 BSF founded BSF Enterprise (Hong Kong) Ltd (BSF HK), an entity targeting the Greater China market, a region whose 2022 five-year plan included cultivated meat and houses one of the fastest growing biopharma and stem cell markets in the world.
- **Sales and Partnerships.**
  - In July 2023, BSF partnered with Biozol, a world leader in science distribution, to act as a distributor of City-Mix across Germany. Biozol engages with over 14,000 companies worldwide and has a product portfolio of more than 6 million SKUs.
  - In September 2023, 3DBT received a €612,000 grant from EIT Food and is in the process of exploring the expansion of its production capacity for City-Mix by a further 5x, to 12,500L pa.
  - BSF has also engaged with one of the leading global Fortune 500 pharmaceutical suppliers. This company has thus far purchased several vials of City-Mix for evaluation.
  - In November 2023, BSF entered into a proof-of-concept agreement with one of the world's largest cosmetic companies to test the suitability of 3DBT's proprietary lipopeptide product, Etsyl, for use in its skin cream solutions.
  - In February 2024, BSF signed an MoU with Paris-based Amelie Pichard, a fashion company that designs and makes products using environmentally friendly materials. Both companies will work together to develop and sell fashion that incorporates lab-grown leather.
  - In March 2024, Ivy Farm Technologies Limited (Ivy Farm), one of UK's leading cultivated meat production companies, partnered with BSF HK to help fundraise and boost its cultivated meat activity in China. We expect this to be beginning of a much wider business relationship.
  - Kerato is already working with one of America's largest consumer goods companies who has successfully evaluated lab-grown corneas as an alternative testing apparatus of chemical and pharma products. In light of this, Kerato is now developing a new Ocular Toxicity Testing Platform (Keratox™), as well as a trademark Implantable Medical Device.
  - In June 2024, in partnership with the University of Northampton, Lab-Grown Leather Ltd unveiled two bioengineered samples of 100% lab-grown leather produced at the Future Fabrics Expo in London, showcasing a sample that is biologically identical product to real leather. The event caught attention from the likes of Insider Media and Fashion United.

BSF's increased focus and progress on its individual markets instils further confidence in our bull case for the company, not least because it appears to be on the cusp of significant commercial deals. With this in mind, we also remain confident that the current market cap stands at an extremely undervalued level, including relative to recent private valuations of peer companies.

Sector: Technology

A biotech company focused on cell-based tissue engineering to generate sales in cultured meat, lab-grown leather, as well as human corneas, collagen growth and skin substitutes.

Market data

Ticker	BSFA/BSFAF
Price (p/sh)	4.25
12m High (p/sh)	13.75
12m Low (p/sh)	3.9
Target	63p
Shares (m)	103.34
Shares FD (m)	126.93
Mkt Cap (£)	4.4
Market	LSE Main Market

Source: Alpha

Description

BSF Enterprise Plc develops advanced biotechnological solutions for sustainable materials and products across various sectors. Its core technology in industrial tissue engineering enables scalable production of lab-grown alternatives for consumer and medical markets, including lab-grown leather and cultivated meat. in 2021 acquired the clinical and cellular agriculture company, 3D Bio Tissues, and now operates through 5 industry-led subsidiaries.

www.bsfenterprise.com

Board & key management

Non Exec-Chairman	Min Yang
CEO & Director	Dr. Che Connon
Executive Director	Geoff Baker
NED	Dennis Ow
CFO	Graham Duncan

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Subsidiary updates & outlook

Introduction

Since October 2023, BSF has implemented an umbrella strategy in which R&D and commercial activities around each market and IP vertical are housed in separate subsidiaries. *Key benefits of this include minimisation of dilution at Plc level; catering to strategic investors with different sector preferences; allowing each product line to be valued individually; and an individual management team assigned to each entity – allowing for a laser focus on growth within their respective markets.* We believe this reorganisation significantly improves the focus of the company and makes it more robust and appealing to different markets. Once this reorg has been fully executed, the corporate structure of the BSF Enterprise will appear as follows:

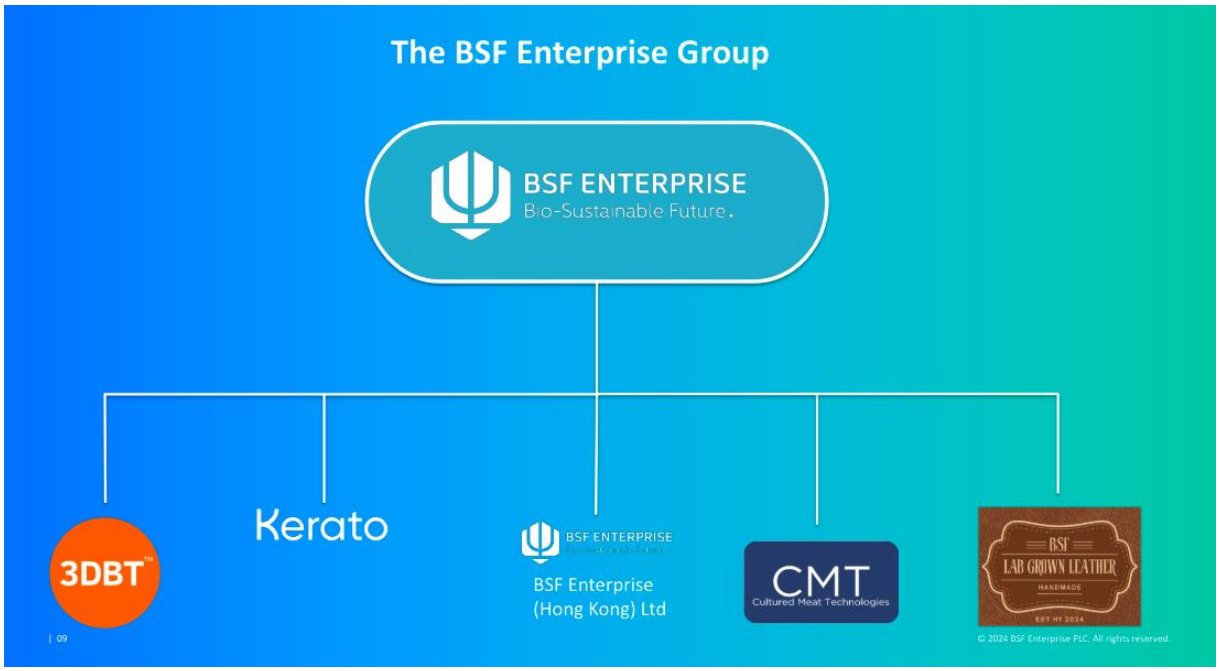

Figure 1: The new corporate structure for BSF Enterprise Plc (BSF Enterprise website).

5 subsidiaries in total have been incorporated: 3DBT, which existed prior to the reorganisation and is being used as a support entity for all other subsidiaries due to its technology being ubiquitous among BSF as a whole; Kerato Limited, an entity which is devoted to the development and sales of its patent-protected cornea technology; BSF Enterprise (Hong Kong) (BSF HK), focused on the Greater China market for BSF as a whole; Cultivated Meat Technologies (CMT) Limited, BSF's 50%-owned cultured meat segment, born out of a JV between BSF and CellularRevolution ('CellRev'), another company founded by Prof. Che Connon that is focused on bioreactors used in cell culture; and Lab Grown Leather Limited, which was incorporated in early 2024 and is focused on the company's technology for producing sustainable lab-grown leather.

Along with this restructuring, the Appointment of Marcelo Bravo as Chief Business Officer has been another strategically important move for the company in forming partnerships and bolstering overall business operations – he will focus on the commercial development of City-Mix, Etsyl, and lab-grown leather, with scope for responsibility in other areas of the business. Marcelo is a seasoned entrepreneur and C-level executive with expertise in life sciences, consumer healthcare, advanced materials, and FMCG. He has extensive experience in launching and expanding businesses and leveraging partnerships with major corporates worldwide. He has founded four start-ups, raising approximately £50 million in total, leading to two successful exits on the AIM market including Oxford Advanced Surfaces Group plc, listed via an RTO in 2008 at a valuation of £100m, just 14 months after its founding, and Oxford Pharmascience Ltd, another £100m exit and where Marcelo headed up licensing agreements with Bayer and Ache Laboratorios (Brazil's largest pharma company). He is also currently Executive Chairman of FoodMarble Digestive Health Ltd and Chairman of Oxford Pharmascience Ltd. Marcelo holds degrees in Chemistry (B.A.), Chemical Engineering (B.Sc.), Management (M.Sc.), and Experimental Therapeutics (M.Sc.).

Marcelo comes as former CCO at CellRev and has full background and knowledge of what BSF are trying to do in cell culture. His joining is testament to overall confidence in the company and its strategic direction.

In each of the following sections below we will outline the nature and activity of each subsidiary in terms of its team, resources and technology. We will also discuss market potential as well as an opportunities pipeline.

3DBT

Among all subsidiaries sits the tissue templating technology of 3DBT and its trademark Serum-Free growth supplement City-Mix. Both apparatuses are used to engineer BSF's entire product line across the 4 other business segments. In essence, 3DBT has two purposes: selling its City-Mix and supporting the other 4 subsidiaries with its globally patented tissue templating technology and City-Mix itself. As described in our initiation note in May 2023, City-Mix is a newly innovated animal-free growth media supplement designed for companies using cell media that replace Foetal Bovine Serum (FBS), an expensive and ethically questionable component due to its collection from foetal calf blood. Growth media is a critical part of cell culture, and is essential for muscle, fibroblast, and fat cell growth. Using City-Mix, companies can also reduce the amounts of expensive growth factors they normally use without seeing a drop in productivity and the product has received extremely positive feedback from the market.

Both Geoff Baker and Prof. Che Connon – Executive Director and CEO of BSF, respectively – will remain as directors and board members of the company and will continue to drive sales and marketing efforts. There has also been hiring of 2 sales and support staff to drive sales activity of City-Mix. This has been further enhanced by the hiring of the new Chief Business Officer with a wealth of experience in biotech manufacturing and licensing, as mentioned above.

We expect 3DBT's technology and expertise within the team will continue to bolster the successes of BSF's products within their respective subsidiaries. With a strengthened sales arm, we expect the company to drive sales and business activity of both City-Mix itself and the subsidiaries. Already, numerous companies have successfully tested City-Mix, with several cultivated meat producers progressing to larger scale testing for various applications. Further, at a recent event devoted to cellular agriculture and cultivated meat, Cultivate UK, our analyst met with William Gordon-Petrovskii – a PHD student at UCL working in the alternative protein space, former scientist at Hoxton Farms and current Program Associate at Cellular Agriculture UK – to obtain feedback on his experience with 3DBT's products. The feedback was overwhelmingly positive, and Will explained that there is nothing quite like the City-Mix products on the market with respect to its ability to produce a superior cell count.

Additionally, following multiple exhibitions of City-Mix at prominent bio-pharma events – including the London biotech show in May 2024 – the company has had numerous enquiries and are working to determine the potential application of City-Mix to a variety of disciplines outside of cellular agriculture.

The company has also now completed the hiring of an experienced molecular biologist and media development specialist for the purposes of media formulation for 3DBT, Dr Chris Knowles. His role will focus on enhancing the City-Mix product even further by exploring its use further in Biopharma and development of a complete media.

Kerato

Incorporated in October 2023, this entity now represents the transition of 3DBT's advanced knowhow and understanding of corneal tissue engineering into clinical trials and is completely devoted to going to market with two major applications: Implantable Medical Devices & and an Ocular Toxicity Testing Platform named Keratox ™. This means that BSF now not only have a route to solving the deficit of implantable corneas required to address the worldwide 12m+ waiting list of people needing corneal treatment, but also allows the company to develop testing material that is biochemically equivalent to real human corneas so that large pharma and biotech companies can perform product testing without the use of animals or human donors. This product can be incorporated into existing R&D pathways, providing an early indication of a formulation's ocular toxicity profile with reference to the United Nations Globally Harmonized System of Classification and Labelling of Chemicals. This product could enable companies to "fail fast", thereby supporting innovation. In light of this strategic change, the Company has also recently announced a collaboration with Newcastle University to work on the development of an ethical, and sustainable model for ocular toxicity testing. This initiative has the ultimate goal of developing replica testing materials for new-to-market active ingredients and consumer goods products.

Globally, the in vitro (studies conducted outside of a living organism) toxicology testing market is worth around $31bn with a CAGR of 11 per cent, compared with just over $5bn for outsourced services for in vivo (animal) testing. This is testament to the movement towards more ethical forms of biochemical trials and tells us that by operating in the field of *both* lab-grown corneas and toxicity testing, Kerato will now not only have access to a $400m+ cornea transplant market, but also an $11.2bn Global In Vitro Toxicology Testing Market projected to reach $28.19 bn by 2031.

Kerato is currently working on a timeline to launch the Medical Device in 2028. This gives sufficient time for optimising the standard operating procedures and implementing GMP manufacturing over the next 18 months before commencing Clinical Trials in 2026. There are also a number of grant funding streams that Kerato has identified to help finance the clinical trials. This coincides with their work with America's leading consumer goods company to develop lab-grown corneas for improved testing of chemical and pharma products, an ongoing project that is expected to lead to a potential licensing deal.

On the people front, Kerato will now be primarily managed by Sarah Greenhalgh, former biotech and medtech operator with 18 years' experience in academic and clinical research. She has been appointed as MD and will be overseeing the development of product offerings and implementation of the sales strategy. We believe Sarah is capable of fully realising the potential of this business segment and market and are pleased to have her on board. The rest of the board largely mirrors that of BSF, with Prof. Che Connon and Geoff Baker acting as executive directors, along with Graham Duncan, BSF's CFO, as the company Secretary.

BSF Enterprise (Hong Kong) Ltd

In July 2023, BSF founded BSF Enterprise (Hong Kong) Ltd (BSF HK), an entity targeting the Greater China market, a region which houses one of the fastest growing biopharma and stem cell markets in the world and whose government produced a 5-year plan in 2022 which included cultivated meat as part of its food security and sustainability strategies. The country's Ministry of Agriculture and Rural Affairs has included cultured meat in its latest five-year agricultural plan, highlighting the government's commitment to investing in this innovative technology. This move aligns with China's goals to enhance food security, reduce greenhouse gas emissions, and address the environmental impact of traditional livestock farming.

Consumer interest in cultured meat in China is also on the rise. Surveys indicate that a significant portion of the Chinese population is open to trying cultured meat, with younger consumers showing the highest levels of interest. This growing acceptance is partly driven by concerns over food safety and environmental sustainability, which are becoming more prominent among Chinese consumers.

As mentioned in our initiation note for BSF in May 2023, China is home to one of the largest meat markets in the world dominated by pork in which China accounts for nearly half of the world's production (c.115 million tonnes). What's more, with the total size of the meat market in China being $260bn, there is a clear market to be disrupted here, and in fact we are already seeing significant activity in this part of the world. Joes Future Food, a relatively newer player in the market, has quickly become a significant name in the Chinese lab-grown meat industry. Founded in 2020, Joes Future Food has already attracted approximately $11 million in investment to develop its lab-grown meat technology. The company focuses on creating sustainable meat alternatives that can meet the high demand in China while addressing food security and environmental concerns. WH Group, through its subsidiary Smithfield Foods has invested in alternative protein sources and is exploring how these innovations could complement their existing product lines. This strategic foresight positions WH Group to potentially integrate lab-grown meat into their offerings in the future. In August 2023, CellX, a Shanghai-based cell-grown meat start-up, launched China's first cultivated meat pilot plant in its home city, equipped with a 2,000-litre bioreactor capable of producing several tonnes of meat annually. CellX focuses on creating whole cut cultivated pork using advanced 3D printing technologies. The company aims to make lab-grown meat affordable and is working on reducing production costs to below $100 per pound.

In March 2024, BSF HK agreed to partner with Ivy Farm Technologies Limited (Ivy Farm), one of the UK's leading cultivated meat production companies, having raised $40m to date, to boost both entities' cultivated meat activity in China. Ivy Farm is an Oxford University spinout that has made significant strides in the market for cultivated meat, including the opening of the largest cultivated meat pilot production facility in Europe – this 18,000 square foot facility near Oxford University includes a 600L bioreactor capable of producing over 2.8 tonnes of cultivated meat annually. They are also working closely with the FSA – the Food and Standards regulator here in the UK – and are seeking regulatory approval in the US and Singapore. We expect this partnership to be the beginning of a much wider business relationship, with Ivy Farm acting as a significant downstream partner for BSF, including in the use of the latter's trademark City Mix and tissue templating technology. Currently, BSF HK is currently collaborating with Ivy Farm to test its City Mix™ media additive, aiming to reduce cultivated meat production costs in Asia.

The JV also enables BSF to share the risk and resources required to effectively break into this market and represents an improved access to funding and significantly lower financial cost to the Group. Already both entities have achieved significant milestones in the journey towards commercialising cultivated meat, including the world's first cultivated meat scotch egg produced for sale in Fortnum & Mason by Ivy Farm in February 2024. All of these factors have been reflected in our valuation for the later on in this report.

3DBT is developing a distribution network in this region for other markets too, engaging with biotech companies working in gene therapy, regenerative medicine, and Life Sciences. The Chinese Bio-Pharmaceutical industry has increased from US$3 billion in 2016 to US$380 billion in 2021.

We are confident that both the creation of a new subsidiary and its subsequent partnership with Ivy Farm is a sound strategic move for the company and one which we expect to be beginning of a much wider business relationship and footprint in the region.

Cultivated Meat Technologies (CMT)

In December 2023, BSF entered a Joint Venture with CellulaRevolution Ltd ('CellRev') to form Cultivated Meat Technologies Limited (CMT). Similar to that of the partnership between BSF HK and Ivy Farm, the strategy is to combine abilities on both sides but towards manufacturing cultivated meat at scale. CellRev is another company founded by Prof. Che Connon that is focused on cell culture. They have a solid management team with Martina Miotto – CSO and co-founder with a PhD in tissue engineering – and Chris Green, the CEO with several years' experience in the food industry. CellRev also comes with a seasoned roster of 3 R&D scientists, 3 bioprocessing engineers and a lab technician and manager. The team are working to establish a leading end-to-end platform for cost-effective cultivated meat production. This JV is important from both a commercial and financial standpoint, where BSF are able to leverage the efforts of another experienced team in the market without putting significant strain on the balance sheet.

The primary goal of CMT is to develop and scale the technology needed to produce cultivated meat in a cost-competitive and sustainable manner outside of China (BSF HK's primary market). This involves creating processes and technologies to showcase meat fillets produced at scale and forming key partnerships to support the production and distribution of cultivated meat feedstock across Europe, the US, and Asia.

CMT will combine CellRev's bioprocessing expertise with 3DBT's tissue engineering know how and CityMix™ animal-free cell culture supplement. Together they will develop a class-leading end to end process for the production of structured cultivated meat.

The JV also enables BSF to share the risk and resources required to effectively break into the market for B2B technologies in cultured meat outside of China, with the aim of this JV to reach licencing agreements with established meat-producers and local distributors and retailers. CellRev had just over £850k in cash as of its December 2023 accounts and is well resourced to fully take advantage of this opportunity alongside BSF.

Together, the company aims to develop a new cultivated meat manufacturing platform, by integrating specific and purposeful bioprocessing concepts and technologies. When scaled, this platform will allow anyone to produce high-quality cultivated meat affordably and sustainably. CMT plans to achieve its first two strategic R&D objectives within 1.5 years (18 months) via a number of well-defined, fully costed work packages.

Industry Update – Survival of the fittest

Globally, the number of publicly announced cultivated meat companies (focused primarily on cultivated meat inputs or end products) rose to 174 in 2023, up from 166 in 2022.

However, the last 18 months have been extremely challenging for this sector. Funding is at a 5-year low, with many companies in the industry approaching critical cash positions over the next 18 months. This presents an opportunity for CMT to take advantage of the space left over by other competitors while continuing its journey of commercialising its patent-protected IP and technology. The supply of companies is outstripping the amount of investment available, with 111 unique investors in the market in 2023 compared to 204 in 2022. Thus far, the amount raised in Q1 2024 was $12m, according to the Good Food Institute, which is a nominal amount compared to funding in the preceding 4 years. It is clear that the sector is experiencing a winter with respect to funding, and we are also seeing the same effects in public markets where, due to recent macroeconomic uncertainty around interest rates and inflation, micro and small cap markets have suffered. Benchmarks including the FTSE Small Cap and Russell 2000 indexes are still in decline since 2021, but a slow recovery has followed in the last year.

Looking at Figure 2 below, there is a clear and sizable decrease in cultivated meat funding in 2023 (<$200m) from the $922.3 million raised in 2022, with the largest deal raised in 2023 being Meatable's $35 million Series B round. This mirrors the broader tepid private funding environment and in 2023 companies and investors alike faced elevated inflation, rising interest rates, and a mixed economic outlook. As a result, global venture funding fell 42% year-over-year (YOY) in 2023 to its lowest levels since 2017 and investments in food tech start-ups declined by 61% YOY. However, it is also worth noting that in 2022, nearly half of the year's total investment dollars were raised in UPSIDE Foods' $400-million Series C round. By removing this from 2022, the funding decrease is closer to around 50% - largely in line with the global venture funding decline in 2023.

A notable indicator of the difficulties this sector is facing lies in Aleph Farms (Aleph) – an Israeli company focused on 3D-printed steak – who in June 2024 announced that almost a third of its workforce (30 people) had been laid off. The company reportedly said that they "are adapting our organisation to align with this next growth phase and need to part ways with approximately 30% of our local employees". This comes just four months after Aleph revealed it had partnered with two companies to produce its meat, grown in a lab from cells, at a new facility in Thailand. The company is believed to have raised a total of $140m historically for its R&D and product, with the latest round having taken place in 2022 for a $118m Series B. Having attended the 2024 Cultivate UK conference in June 2024, the overarching theme at the conference was

that those with the largest supply of capital who can execute a GTM opportunity will survive. We believe that BSF, with their recently formed partnerships and investor support, will be one of those companies.

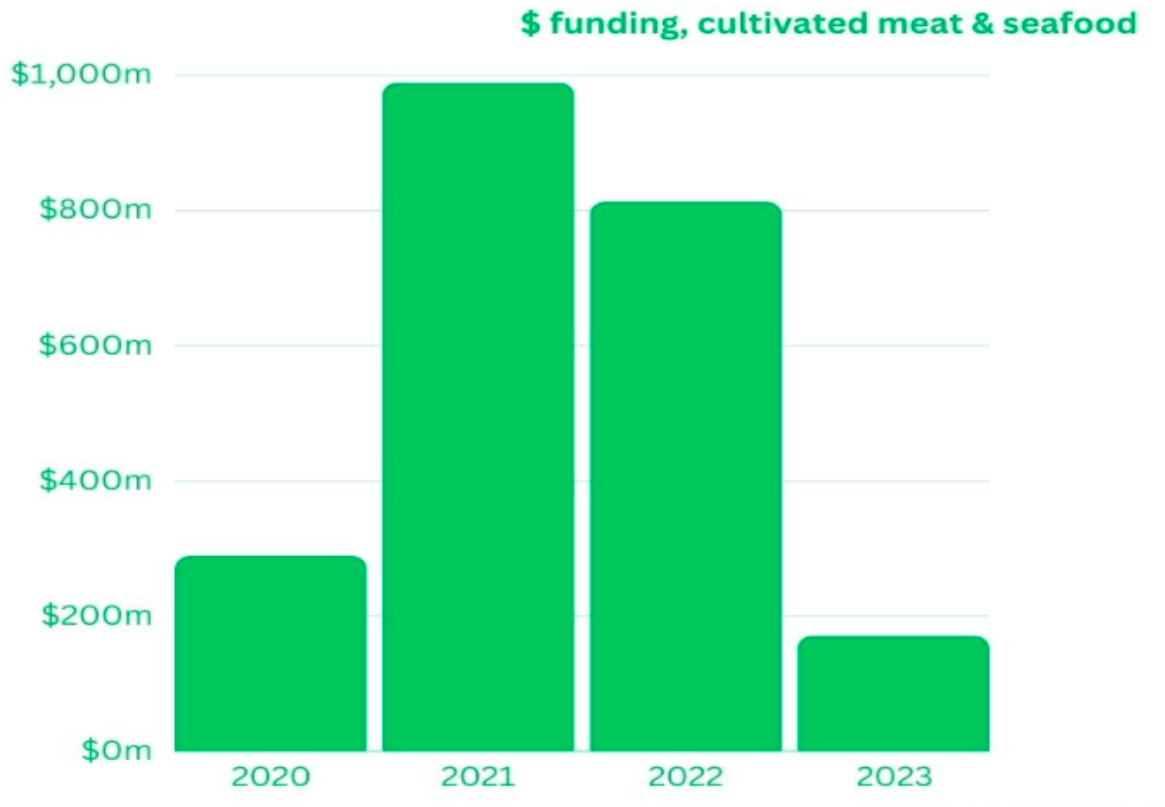

Figure 2: bar chart showing investment funding for cultivated meat from 2020-2023. Funding for cultivated meat startups peaked at just under $1 billion in 2021, dipped slightly to $807 million in 2022 (bolstered by a $400 million round into UPSIDE Foods) and then dropped off sharply in 2023 (-78%) to $177 million, against a backdrop of a -50% drop in agrifoodtech investing overall in 2023 (Good Food Institute).

As we approach H2 2024 we are beginning to observe green shoots, with alternative proteins and cultivated meat continuing to be among the most promising solutions for reducing the negative impacts of conventional meat production. Cult Food Science (CULT) – a publicly-listed Canadian investment company specialising in lab grown meat – is up just under 500% YTD and back at a CAD$ 25m (£14.5m) market capitalisation, up from a historical low in November 2022 of CAD$ 5m (£2.8m). This comes amid positive outcomes from a number of its subsidiaries, including Noochies (Further Foods), a company focused on producing freeze-dried dog and cat snacks produced from nutritional yeast rather than traditionally processed meat, who at the beginning of June 2024 announced the launch of its snacks in Canada and the USA; Unicorn Biotechnologies, who have launched five cell lines tailored for the cultivated meat industry, facilitating the development of sustainable meat alternatives; and GOOD Meat, the lab grown meat subsidiary of Eat Just, who in May 2024 through a partnership with Huber's butchery in Singapore began the world's first retail sales of cultivated chicken (see Figure 3).

The latter in particular is worth highlighting as this is the first time in history that lab-grown meat is being sold in a supermarket. However, though a significant milestone, there is still a long way to go: like many other cultured meat announcements in the past, these products are still only hybrid with plant-based substitutes making up for a significant proportion of the final result. Specifically, these cuts of chicken products from Huber's only contain 3% of real meat, with the rest of the product being the same kind of ingredients you'd find in plant-based meats that are already on supermarket shelves worldwide. The product is priced at $5.35 per 120 grams, roughly equivalent to $45 per kilogram – more than the cost of any raw chicken product in the western world. Furthermore, an article from WIRED which covered this story said 'startups that are pushing ahead with much higher cell ratios will say it's evidence that the real benefits of going cultivated kick in only when you're talking about products that are 60, 70, 80 percent animal' and that 'the costs of brewing animal cells are simply so high that the quickest way to get something to market that even approaches a reasonable price is to make up a substantial portion with plants.' This is testament to how difficult it still is to produce cultivated meat at scale in an affordable manner. This point is particularly important for CMT and BSF, as the latter showed in May 2023 that a 100% meat product can be produced. With 3DBT's Serum-Free Media product, the cost is driven down by the reduction in expensive growth factors and a much higher cell count with the same amount of media.

Figure 3: Lab-grown chicken being sold at a supermarket at Huber's Butchery in Singapore under a partnership involving GOOD Meat and Huber's, 2024 (GOOD Meat website).

We are also seeing reputable figures in the business space become pioneers in this sector. The Bezos Earth Fund, the charitable foundation of Jeff Bezos that is committing $10 billion of funding to various research projects and charitable endeavours, has awarded a $30 million grant to North Carolina State University to accelerate research around cultivated meat and alternative protein production. What's more, Brazil based food giant JBS is putting $62M into constructing a state-of-the-art centre for producing cell cultivated meat and cultured proteins. JBS previously made their first push into cellular agriculture when they acquired a majority stake in Spanish cultivated meat startup BioTech Foods, where their $100M deal to acquire majority ownership of BioTech Foods approximately $41M of JBS's investment went towards starting construction of a commercial scale plant in Spain which will produce BioTech Food's cultivated meat products.

Dutch cultivated meat start-up Meatable has also achieved a significant milestone for the industry, by successfully hosting the first ever legally approved lab grown meat tasting in Europe. Following approval from the independent Expert Committee sanctioned by the Dutch government on its dossier including extensive product safety data, Meatable welcomed a number of guests to its new headquarters in Leiden, the Netherlands, to enjoy its cultivated pork sausages. Among those who participated in the tasting was Ira van Eelen, whose father Willem van Eelen we covered in our initiation note and is known to many as the 'father of cultivated meat'.

Furthermore, we have seen Mosa Meat, the world-renowned Dutch player in the sector famous for its founder Mark Post producing the world's first cultivated hamburger in 2013, raising 40 million euros in April 2024. This is a sign that investors remain confident of the sector and its role in meat production in general. The oversubscribed round was led by Lowercarbon Capital LLC and M Ventures, part of Merck Group. New investors include government-backed partners including Invest-NL (the Dutch state-owned impact investor), InvestEU (the European Commission strategic development program), Limburg Institute for Development and Financing ("LIOF", the Limburg regional development fund), and the Limburg Energy Fund ("LEF", the regional fund supporting greenhouse gas emissions reduction).

Additional new partners with a background in the conventional meat sector also participated in the round, including the PHW Group, one of Europe's largest poultry producers, alongside XO Ventures.

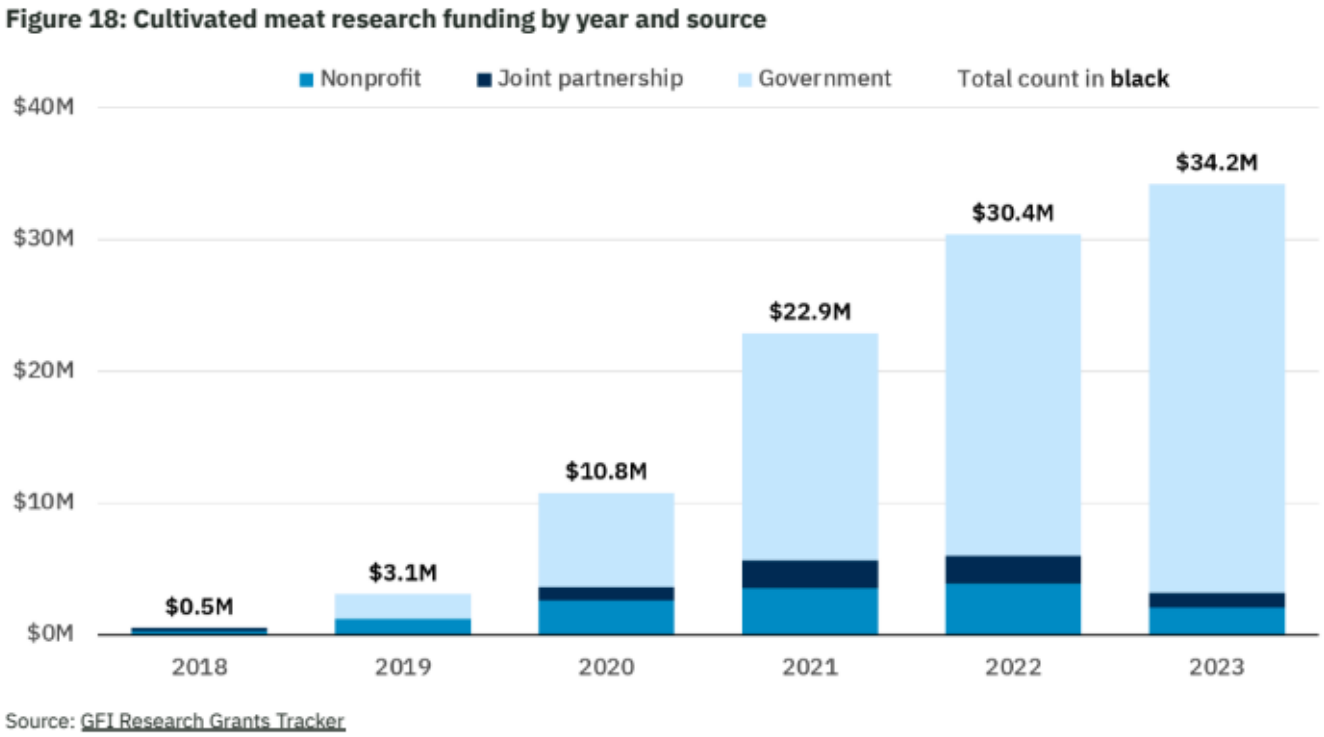

Figure 4: Cultivated meat research funding by year and source (GFI Research Grants Tracker).

Government support in the form of research and regulatory developments is also on the rise. The number of papers about cultivated meat continue to increase, and research funding has reached an all-time high (see Figure 4). Regulatory wise, set to be announced in June 2023, the Food Standards Agency (FSA) will introduce a "sliding scale of international engagement" to clear the highly congested docket of applications, which currently face a two-and-a-half-year waiting period. This would mean that the UK could approve cultivated meat and other novel foods based on their track records in other countries. What's more, having attended the Cultivate UK conference in Bath last year, we know that the FSA is approaching this with an open mind and that cultivated meat would largely follow the same review process as that of ultra-processed foods.

It is also worth noting that the UK approval of cultivated meat would be a watershed moment for the industry globally, due to its reputation as being thorough and rigorous in its assessments. Whilst the US approval to sell cultivated meat in mid-2023 was a significant moment for the industry, it was delivered via a 'no questions' letter – the US do not technically 'approve' things, rather they assume no issues and note if they have any questions. This process is notably different to the UK, where an approval process is applied and can take up to 2 years. In addition, a handful of countries and states are seeking to ban cultivated meat, including Italy and Florida which only reinforces the importance of the UK taking a stance on the topic.

Lab-Grown Leather Limited (LGL)

In February 2024, BSF Enterprise Plc incorporated Lab-Grown Leather Limited (LGL) as a dedicated subsidiary to spearhead its lab-grown leather business. The strategic goal of LGL is to establish 3DBT's tissue templating technology as the leading solution for sustainable leather materials, partnering with high-profile brands and key industry players to boost market penetration and credibility. LGL is actively forming partnerships with major multinational brands while collaborating with designers to showcase finished product applications, positioning its 3DBT Skin product as the premier sustainable leather material.

LGL is managed by a strong leadership team, including Prof. Che Connon and Geoff Baker as directors, with Dr. Emily Telford, Senior R&D Scientist at 3DBT, taking on the role of Project Manager. Dr. Telford's role includes liaising between luxury fashion houses and 3DBT's production teams, ensuring that development meets customer requirements and industry standards.

Following the successful completion of a 60-week proof-of-concept (PoC) study, where 3DBT fulfilled all technical and operational requirements for a major multinational luxury goods brand, the partnership has advanced into a more formal

strategic collaboration. During this period, 3DBT developed bio-engineered leather samples measuring up to 10 by 10 cm and 2 mm in thickness. To date, BSF has received over £50,000 from this partnership, which has been reflected in reported revenues.

In March 2024, BSF was awarded £45,000 in grant funding to support the development of its Lab-Grown Leather material. This funding has facilitated a collaboration with the University of Northampton, leveraging 3DBT's bio-equivalent dermal tissue alongside the university's leather tanning expertise to develop ethical and sustainable leather. The knowledge gained from this project is being transferred into LGL's operations.

Further enhancing its market position, LGL established a collaboration with Amélie Pichard, a Paris-based fashion company known for its commitment to environmentally friendly materials. This collaboration aims to demonstrate LGL's tissue-engineered leather in finished products, providing significant publicity and showcasing the material's superior qualities. The collaboration aligns with Amélie Pichard's sustainability-focused business model, which includes producing limited batches of products on demand to minimize waste and maximize product lifespan.

By June 2024, LGL had achieved a significant milestone by unveiling two bioengineered samples of 100% lab-grown leather at the Future Fabrics Expo in London. These samples, derived from immortalized cells taken from an adult female horse through a stringent and painless bioethics process, are structurally and genetically identical to traditional leather. The production, which took six weeks, utilized 3DBT's patented serum-free and animal-free cell culture media supplement, City-Mix, to minimize costs and enhance the quality of the final product. This breakthrough reduces the need for water- and chemical-intensive processes traditionally associated with leather tanning, offering a more sustainable and resource-efficient alternative.

LGL's scaffold-free technology, a key differentiator in the market, allows the production of leather without synthetic or plant-based scaffolds, which can negatively interact with tanning chemicals and affect the quality of the final product. This innovation is considered the "holy grail" in lab-grown leather and positions LGL as a leader in the sustainable leather industry. LGL is now in discussions with leading fashion groups to tailor its products to their specific needs, with further updates expected in the coming months.

This project has garnered substantial support from UK Research and Innovation (UKRI) through Innovate UK, along with co-funding from regional and national entities, underscoring the confidence in LGL's potential to bring this innovative product to market.

Figure 5: Lab-grown leather (left) produced via a partnership between BSF and the University of Northampton (Fashion United UK).

It is worth reiterating that there are fewer barriers to entry for this market than lab-grown meat, as it is expected to require far less regulatory steps and the level of consumer acceptance relative to the current market to be much higher, too. Furthermore, as leather products are more of a high-ticket category, this allows for a shorter go-to-market timeline which brings future earnings of the overall Group much closer. The global leather goods market was valued at $253 billion in 2023 and is forecast to grow to $405 billion by 2030. This is driven by an increasing number of High-Net-Worth Individuals (HNWIs) in Asia as living standards continue to improve, coupled with the growing trend of designer & branded clothes in major markets, such as the U.S. and France. Using LGL's method, leather goods manufacturers are able to start the process with only dermal tissue which removes the early stages of processing, that which are responsible for 75% of the oxygen demand, 79% of suspended solids, 100% of sulphide, 85% of nitrogen, 74% of chloride in effluent, and the use of sodium sulphide and sodium hydrosulphide and their considerable health and safety risks in leather production. Overall, LGL is helping to create a cleaner leather that still utilises the vast knowledge and skill of the leather manufacturing industry.

As lab-grown leather emerges as a better alternative to traditional leather, public attitudes towards animal-derived materials are shifting rapidly. Influential pop culture icons and fashion houses are increasingly endorsing cruelty-free and sustainable options, mirroring the growing demand for ethical products. Notably, the PETA (People for the Ethical Treatment of Animals) campaigns have highlighted the environmental devastation and animal suffering linked to conventional leather production, sparking widespread awareness and change. With statistics revealing that the fashion industry is responsible for 10% of global carbon emissions, the appeal of eco-friendly innovations like lab-grown leather is undeniable. This transformative shift, embraced by celebrities and designers alike, signifies a broader cultural movement towards more conscious consumption and environmental stewardship.

As for other companies in the world that are doing this, we currently know of only one that is publicly distributing its findings and results from trying to grow leather from real animal cells: Vitrolabs. Headquartered in Milpitas, California and backed by Leonardo DiCaprio, actor and environmental activist, this company are also in tissue production to obtain the look, feel and performance of and has made significant progress on product quality in the optimization of cell expansion processes and proprietary design of a novel, large-scale tissue cultivator. The company has historically raised around $46m in funding and is also backed by Agronomics, Khosla Ventures, and Kering, the parent company of luxury brands such as Gucci and

Saint Laurent. This level of interest and progress shows that there is a significant market to be had in which existing industry incumbents have a vested interest.

Valuation

Given the recent restructuring and the numerous business developments that have taken place since our last note in May 2023, Shard is mindful of the implications this has for the valuation of the company. As such, we have taken to deepening our industry analysis and looking at comparable companies in the respective industries of each subsidiary.

Valuation – 3DBT, CMT and BSF HK

Having looked at other companies in cellular agriculture – a market in which the company has been heavily involved thus far – we have been able to uncover some interesting insights.

In order to value these three companies, we have used comparables from other companies in the UK who operate in cellular agriculture. To do this, we have used the same method and data set from the initiation note and updated it with the latest figures as of July 2024 (see below). Note that the universe of companies is larger due to data being available for more companies this time round.

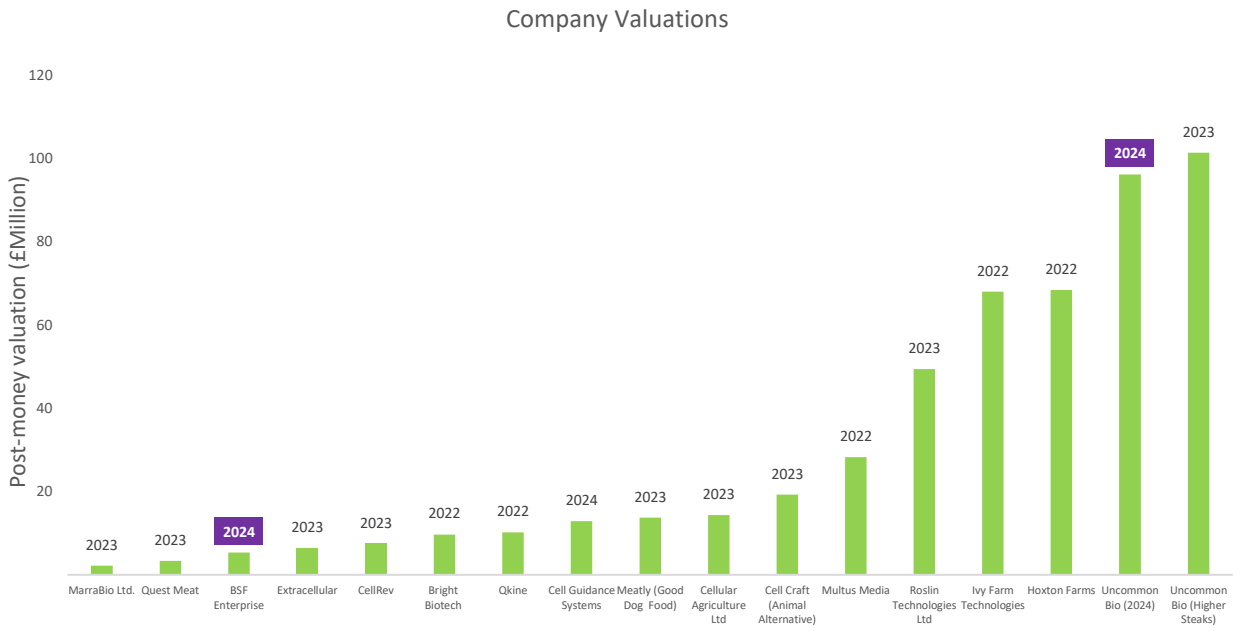

Figure 6: Post-money valuation estimates for the cellular agriculture market. Sources include companies house and relevant press releases. The figures on top of each bar represent which year the company last did a funding round, except for BSF Enterprise where, as a publicly traded company, its valuation is based on the latest market capitalisation (valuations are substantiated by share prices and share capital figures from Companies House as well as reputable news sources - see the Valuation section In the initiation note for further details of methodology).

As can be seen in the graph above, there are only two companies who have a relevant valuation in 2024 which reflects the tough conditions of the current market: BSF, which is of course listed and so has a market cap that is reset daily; and Uncommon Bio (formerly known as Higher Steaks), that carried out a Series A round in 2023 for $30m and followed this with another £10m Series A2 round in April 2024. The Series A featured blue-chip investors including Balderton Capital and Lowercarbon Capital, as well as Max and Sam Altman, the latter of which is a cofounder of OpenAI and was an investor in Uncommon Bio previously.

Of course, we must look at the valuation in today's world and recognise both the market downturn over the last 12 months as well as the cash burn these companies tend to exercise. We recognise that the activities of the subsidiaries of 3DBT, CMT and BSF HK all have some overlap, which also shows when looking at other players in the rest of the market. To build a bearing on where each subsidiary is at in terms of valuation, we have scored each company in the industry based on how similar they are to CMT with respect to their line of business, development and potential production capacity. We have deemed the following companies to be most like each of these 3 companies via a similarity matrix:

	BSF subsidiary		
Company	3DBT	CMT	BSF HK
MarraBio Ltd.	20%	10%	0%
Quest Meat	0%	0%	0%
Extracellular	20%	0%	0%
CellRev	0%	15%	0%
Bright Biotech	0%	0%	0%
Qkine	0%	0%	0%
Cell Guidance Systems	30%	0%	0%
Meatly (Good Dog Food)	0%	0%	0%
Cellular Agriculture Ltd	0%	20%	0%
Cell Craft (Animal Alternative)	0%	15%	0%
Multus Media	30%	0%	0%
Roslin Technologies Ltd	0%	0%	0%
Ivy Farm Technologies	0%	20%	70%
Hoxton Farms	0%	0%	0%
Uncommon Bio (Higher Steaks)	0%	20%	0%
Cellx (China)	0%	0%	30%
Total	100%	100%	100%

Figure 7: Similarity matrix representing 3DBT, CMT and BSF HK's 'closeness' to the rest of the UK and Chinese markets. 100% means virtually the same company, 0% means sharing no similarity whatsoever (Shard Capital).

This matrix has been built from our knowledge of the market and what we have found is that some companies overlap in terms of their focus.

For instance, Cell Guidance Systems is similar to 3DBT in that it produces peptides for supporting cell growth and differentiation, using synthetic peptide hydrogels to mimic the extracellular matrix (ECM). This technology enhances cell adhesion, proliferation, and tissue formation, aligning with 3DBT's approach to tissue engineering. Multus Media competes with 3DBT's City Mix by providing essential culture media components. We also saw parallels with MarraBio, which looks to pose itself as an early stage competitor of 3DBT and uses engineered Caf1 proteins, and Extracellular, which optimizes extracellular matrix components and growth factors for tissue formation.

MarraBio Ltd is similar to CMT due to their focus on engineered proteins that enhance cell growth, much like CMT's tissue engineering techniques using the City-Mix supplement. CellRev parallels CMT with their advanced cell cultivation methods and custom bioreactors, enhancing scalability and efficiency in tissue production. Cellular Agriculture Ltd shares similarities in their scalable production methods for lab-grown meat, optimizing cell culture media and bioreactor conditions akin to CMT. Cell Craft develops high-fidelity animal-free meat products using cellular agriculture techniques, aligning closely with CMT's goals. Ivy Farm focuses on producing cultivated meat with innovative bioreactor systems, similar to CMT's objectives for large-scale, affordable production. Uncommon Bio and CMT both work towards scalability and commercial readiness in cultivated meat production, with a focus on specific product development.

The next stage of our valuation process is to produce a weighted average of the valuations of all companies posing any level of similarity seen in Figure 7 and apply a 50% discount to the final figure to account for the market downturn in 2023/2024 and the fact that all but one of these companies does not have a funding round in 2024. We also account for the JV structure of CMT given that BSF only own 50% of this entity.

With all of this put together, we have derived the following valuations for 3DBT, CMT and BSF HK:

Company	**Valuation**
3DBT	£7,027,781
CMT	£10,232,047
BSF HK	£32,262,344

Figure 8: Shard valuations for 3DBT, CMT and BSF HK (Shard Capital).

Readers will notice that BSF HK gives a significantly larger valuation than 3DBT and CMT. This is because the similarity matrix has deemed BSF HK to be closest to Ivy Farm (which has partnered with BSF on its efforts in China, as mentioned previously) and CellX, a key player in the Chinese market that is believed to be the most well-funded (also backed by

Agronomics) and developed in terms of technology and production capacity. We have of course discounted for the fact that they are likely to be much more established in China and so only provided a similarity percentage of 30%. We also looked at two other major Chinese cultivated meat companies: Avant Meats, which focuses on cultivated fish animal-component free cell culture medium and peptides for skincare, presenting a potential similarity to 3DBT; and Joe Future Food, the first creator of cell-cultured meat in China, which poses some similarity to BSF HK. Neither of these, however, provided a valuation.

Valuation – LGL

To value this company, we have looked at others who have created lab-grown leather as well as the leather alternative market in general. Currently, LGL is the only company in the UK that we are aware of that has successfully produced a piece of 100% real cultivated leather. As mentioned previously, the current size of the global leather goods market is $USD 253 billion in 2023 and is forecast to grow to $405 billion by 2030, presenting an enormous opportunity for LGL even if it were to capture a tiny percentage of the market. According to market research, the bio-based leather market alone was valued at approximately $760.9 million in 2024 thus far and is projected to reach $1.553.9 million by 2034, with a compound annual growth rate (CAGR) of 8.2%. The synthetic leather market is comparatively larger, valued at $39.2 billion in 2023, and expected to grow to $54.7 billion by 2032, with a CAGR of 3.7% during the forecast period. Moreover, the mycelium leather market is expected to reach $424.7 million by 2034, growing at an impressive CAGR of 23%.

Below is a profile of the most notable sector peer that has produced lab-grown leather in the past:

- **VitroLabs Inc.**
  - **Location**: San Francisco, USA.
  - VitroLabs has demonstrated the production of lab-grown leather by successfully cultivating animal cells to create leather in a lab setting. They have developed a tissue engineering platform that simplifies the traditional leather production process and reduces environmental impact. Although the specifics of their commercial product releases are limited, their Series A funding round and ongoing development indicate active production efforts.
  - The company is advancing towards mass commercialization by utilizing their funds to build and scale the world's first pilot manufacturing facility for cultivated leather. Their 45,000 square foot facility is designed for pilot production and laboratory research. They aim to integrate their leather into the luxury market by collaborating with brands like Kering for product quality testing, tanning, and finishing. This strategic use of funds positions them for significant commercial scale-up
  - **Latest Valuation**: Raised $46 million in a Series A round in 2022, with an estimated valuation of $156—234 million, according to Dealroom.

Other companies in this space include **Faircraft (Boston, USA)** and **Qorium (Geleen, Netherlands)**, the latter of which was founded by Mark Post, the founder of Mosa Meats and scientist behind the world's first cultured hamburger in 2013 (see initiation note for further information). The company raised capital at the beginning of this year from Brightlands Venture Partners and Sofinnova Partners, and brought on Michael Newton as CEO, a former senior executive at Nike.

Though significant progress has been made on the funding front by these companies, the market appears to have gone quiet and we have not seen any update from the most salient pioneer Vitrolabs since 2022. It is also worth noting that LGL has been able to produce real leather with less than £1 million in funding and the company has received feedback that it is the best product out there. Therefore, given LGL's impact in the UK and its existing relationships with international fashion companies, as well as the valuation commanded by Vitrolabs in 2022, we believe LGL should command a valuation of at least £20m in the event of a liquidity event. If LGL continues to advance its technology and manages to scale production, while forming strategic partnerships and demonstrating commercial viability, it could achieve comparable valuations to that of VitroLabs.

Valuation – Kerato Ltd

As mentioned previously, through the subsidiary of Kerato Ltd, BSF is now in the market for the development of *both* lab-grown corneas and toxicity testing, meaning it will have access to both a $400m+ cornea transplant market and an $11.2bn Global In Vitro Toxicology Testing Market, projected to reach $28.19 bn by 2031. If Kerato is able to catch even just a small percentage of each to these markets, they are on to a significant market opportunity. Furthermore, given the waiting list of patients needing a cornea transplant is largely underserved (c.13 million people versus 185,000 transplants being carried out annually), we believe the market itself is poised for significant expansion.

Given there is limited data and development from other companies in the lab-grown cornea space – with most breakthroughs taking place in hospitals and research organisations – we are using the Boston Keratoprosthesis (KPro) as a reference point for commercial potential, the artificial cornea referenced in the Cornea section of our initiation note.

According to the NHS, the cost of a KPro is around £2,000. Focusing on the UK alone, in which around 3,500 corneal transplants are carried out annually, we see an annual market potential of £7.5m alone. Therefore, given Kerato is the only commercial entity in the UK devoted to replacing synthetic cornea alternatives, we believe a valuation of £10m is ultra conservative and provides plenty of legroom for the company to grow into a much larger entity.

We also looked at the ocular toxicity testing vertical for the company and compared this with one other company operating in this space in the UK: Kirkstall Limited, 86% owned by Braveheart, appointed Beijing Kilby Biotechnology (BKB) as exclusive distributor for Quasi Vivo products in China. Braveheart currently values the company at around £2m. Kirkstall Ltd. specializes in developing Quasi Vivo® organ-on-a-chip systems that replicate human organ functions for advanced in vitro cell culture. These systems mimic organs such as the liver, lung, kidney, gut, and skin, providing dynamic environments that closely resemble human physiology. This technology significantly enhances drug toxicity testing and disease modeling, offering a more ethical and accurate alternative to animal testing. The company mentions that the technology can also be applied to human corneas. Therefore, given the similarity between this and the vertical Kerato is involved with, and considering that Kerato is earlier in the commercialisation stage than its closest peer, we believe an appropriate valuation for this segment to be £1m as things currently stand.

Finally, looking further forward, MatTek Life Sciences is another company that specializes in producing lab-grown human tissue models for various applications, including toxicology testing. Based in the US, their business model revolves around creating advanced 3D tissue models that serve as reliable alternatives to animal testing in industries such as pharmaceuticals, cosmetics, and personal care. In March 2021, MatTek was acquired by CELLINK (now BICO) for approximately $68 million, combining their expertise with CELLINK's bioprinting technologies. Kerato Ltd., with successful commercialization and licensing, could potentially reach a similar level of market penetration and valuation as MatTek by focusing on innovative tissue models and securing strategic partnerships.

Valuation – Total

Summing all valuations of the subsidiaries, we end up with a total of c.£80.5m which, when divided by the fully diluted share capital of around 127m shares, gives us a target price of 63p. We believe this is strongly justified by the what the market has historically paid for sector peers as well as the solid combination of R&D breakthroughs, partnerships and a fundamental restructuring of the company, which not only reduces cash burn of each vertical but also allows the company to focus properly on each market.

It is also worth noting that once we start to see further traction from the subsidiaries, we will be able to look at more traditional measures of valuation such as earnings multiples and DCF.

In conclusion, Shard remains extremely bullish on both BSF and the industries in which it is disrupting. We have already started to see green shoots in the form of improved market outlook on other exchanges and through extremely positive progress made by the company, and we are confident that BSF, with the multiple verticals it is currently pushing to market, will be able to fully take advantage of a recovery and be one of the companies that prevails through its superior product mix.

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