**Future Feast: Mapping the Cultivated Meat Sector**

Dr. Cyntia Vilasboas Calixto Casnici, University of Leeds, UK, [c.casnici@leeds.ac.uk](mailto:c.casnici@leeds.ac.uk) \* (corresponding author)

Dr. David Schulzmann, University of Leeds, UK; Aalborg University, Denmark, [d.schulzmann@leeds.ac.uk](mailto:d.schulzmann@leeds.ac.uk)

**Abstract**

The importance of cultivated meat industry has been continuously growing with the potential to substitute animal-based production systems and contributing to mitigation of the effects caused by climate change. Despite the current uncertainty and regarding scalability, reaching price parity with conventional meat and increasing consumer acceptance, we are witnessing an increasing number of cultivated meat companies joining the race and expanding and diversifying their product portfolio. Their rapid growth in size and technological advancement are supported by the developing competitive ecosystems.   
This chapter analyses 18 globally leading cultivated meat companies, highlights differences and provides an outlook on the industry. Cultivated meat company horizontal diversification within conventional meats, rare or even extinct animals, and vertical expansion along the value chain supplying growth media and equipment. Cultivated meat companies have successfully demonstrated to attract large funds that can further push the novel industry even further. The increasing number of applications for regulatory approval provides a positive outlook to an upcoming race for more innovation and efficiency in the cultivated meat industry.

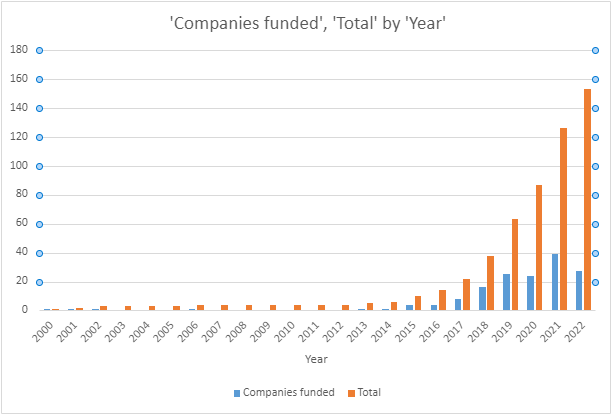
Keywords: Cultivated meat, climate change, regulatory approval, case studies, investment grant

**Introduction**

Animal-based production systems are one of the largest contributors to greenhouse gas emissions, responsible for about 14.5% of global emissions (Gerber et al, 2013). Cultivated meat production has the potential to dramatically reduce these emissions. A study from the University of Oxford suggested that cultivated meat could reduce greenhouse gas emissions by up to 96% compared to conventional meat production. Animal-based production systems are resource-intensive, requiring vast amounts of land and water. Cultivated meat production is significantly more efficient in this regard (Tuomisto & Matos, 2011). While the energy requirements for cultivated meat production are still a subject of research, initial studies suggest that it could be more energy-efficient than conventional animal-based production systems, especially when renewable energy sources are utilized (Mattick et al, 2015).

The last few years have seen an exponential rise in the number of companies entering the cultivated meat space. In 2015, there were only a handful of such firms, but the landscape has changed dramatically, with dozens of start-ups now in operation globally (GFI, 2021) - See figure one for development of this industry. In these 156 companies, span a range of products, from red meat to poultry and even seafood. The cultivated meat industry is at a pivotal moment, seeing rapid technological advancements, regulatory milestones, and increasing consumer interest. By growing animal cells in a controlled environment, cultivated meat aims to provide a more ethical and sustainable alternative to conventional meat (GFI, 2022).

Figure 1: Companies funded per year



Source: adapted from GFI database, 2023.

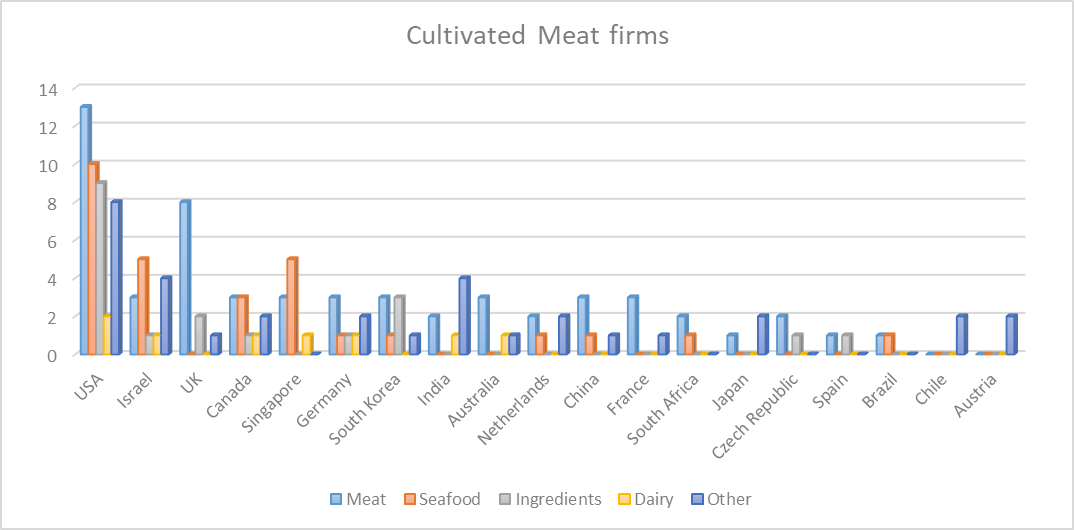
Building upon the burgeoning momentum within this innovative industry, the primary aspiration of our investigative endeavour is to present a global outlook of cultivated meat across varying geographical landscapes. Therefore, we examined different cases to illustrate the industry developments until October 2023, when this book chapter was written.

**The Global Atlas of Cultivated Meat**

As the industry matures, companies are increasingly specializing within the areas along the value chain of cultivated meat. The cultivated meat value chain is complex and entails different stakeholders, processes and resources. Companies may focus on broader areas that include specific meats and fish such as poultry, beef or pork, and seafood. They may focus on a specific element such as fat or cell biosynthesis (E.g., Cellva). Other companies focus on value chain activities that include the supply of animal free growth media (E.g., Clear Meat and Joes Future Food), certain types of meat as poultry and bacon (E.g., Good Meat, and Uncommon) or seafood (E.g., BlueNalu).

The ecosystem has several companies and in various stages of product development, pilot production, and commercial launch. This diversification allows for more targeted research and development, and commercialization efforts. To expedite growth and product development, many companies are entering strategic partnerships. For instance, Mosa Meat has collaborated with Nutreco, a global leader in animal nutrition and aqua feed, to develop growth media for cell cultivation[[1]](#footnote-1). Memphis Meats has received investments from big names in the animal-based food industry like Cargill and Tyson Foods, signaling an industry-wide interest in this new form of meat production[[2]](#footnote-2). It is important to note that the number of investors in cultivated meat and seafood grew by 19% to 679 investors total in 2022 (GFI, 2022).

Figure 2: Cultivated meat firms around the world



Source: adapted from GFI database, 2023.

As we can see in Figure 2, the United States, Israel, and the United Kingdom are the leading countries on the number of start-ups founded in the last years five years. However, in none of these countries, commercialization of products was approved. The cultivated meat sector is at the intersection of food safety, biotechnology, and environmental policy, making its regulatory landscape incredibly complex. Each country has its own set of challenges and opportunities when it comes to commercialization approval. Singapore became the first country in the world to approve the commercial sale of cultivated meat in December 2020[[3]](#footnote-3). As being the first in this space, Singapore had no existing frameworks to rely upon, but ensuring the safety of the new products was a prime concern.

Israel has been supportive but is still formalizing regulations. It is working on the coordination between different governmental bodies like health and agriculture departments. One example of the Israel’s engagement in this area is the most extensive state-supported consortium for cultivated meat thus far, which includes leading food manufacturers and academic research facilities (GFI, 2022). In the case of European Union, even though there are several start-ups interested in this segment, only The Cultivated B has applied to get access to the European Market. Many start-ups refer to stricter regulations and transparency requirements by the European Food Safety Authority (EFSA).

As in many other regions, cultivated meat falls under the "Novel Foods" category, requiring extensive safety assessments[[4]](#footnote-4). Finally, In June 2023, Upside Foods and Good Meat received final approval from the U.S. Department of Agriculture to sell lab-grown meat, marking the advent of the USA's first-ever sales of such products[[5]](#footnote-5).

The growth of the cultivated meat industry has attracted cultivated meat companies from developed and emerging economies to adventure into a new agricultural industry. Based on our selection of the cultivated meat companies, we see a representation of both economies in our chapter.We selected 18 cases of cultivated meat companies that currently have pilot-scale (or larger) facilities to illustrate the development of the industry in different countries. In addition, we tried to present the most prominent cases in the media on cultivated meat, as well as outstanding regional start-ups. Thus, it will be possible to see an overview of the industry with a diverse pool of companies, different levels of maturity, product portfolio, and financial and regulatory conditions.

Table 1 summarises the case companies based on their product portfolio, uncommon characteristics, regulatory status and funding type. The selected case studies demonstrate that cultivated meat companies focus on diversities of meats and fish, while only a few companies offer growth media as a specific product. Further is it interesting to observe that Wildbio and Vow offer unusual and even mixed meat from extinct animals while Stakeholder Foods and The Cultivated B have extended their offerings vertically in the value chain to supply cultivated meat equipment.

Table 1: Overview of cultivated meat company product offering, regulatory and funding award from developed and emerging country

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Home Country** | **Company** | **Product Portfolio** | **Uncommon characteristics** | **Regulatory Status** | | | **Latest Funding Type** |
| **Not applied** | **Applied** | **Success** |
| Australia | Vow | A black and white image of an elephant  Description automatically generated | Mixed: elephant and mammoth | X |  |  | Series A (2022), Seed (2020), Pre-seed (2019) |
| Germany | The Cultivated B | chicken iconA black background with a black square  Description automatically generated with medium confidenceA black background with white spots  Description automatically generated | Bioreactors, growth media and full service |  | X |  |  |
| Israel | Aleph Farms | A black background with a black square  Description automatically generated with medium confidence |  |  | X |  | Funding Round (2023), Series Unknown (2022), Series Unknown (2022), Series B (2021), Series A (2019) |
| Israel | Super Meat | chicken icon |  |  | X |  | Grant (2022), Series A (2021), Seed (2018) |
| Israel | Stakeholder Foods | A black background with a black square  Description automatically generated with medium confidence A fish silhouette on a black background  Description automatically generated | 3D bioprinters | X |  |  | post-IPO Equity (2023), post-IPO Equity (2022) |
| Netherlands | Mosa Meat | A black background with a black square  Description automatically generated with medium confidence A fish silhouette on a black background  Description automatically generated |  |  | X |  | Angel (2021), Series B (2021), Series B (2020), Series A (2020) |
| Singapore | Shiok Meats | A fish silhouette on a black background  Description automatically generated |  |  | X |  | Seed (2021), Series A (2020) |
| South Korea | Cell Meat | A fish silhouette on a black background  Description automatically generated | Growth media | X |  |  | Series A (2023), Series A (2022), Seed (2021), Seed (2020) |
| UK | IvyFarm | A black background with a black square  Description automatically generated with medium confidence A black background with white spots  Description automatically generated | Pork fat |  | X |  | Series A (2022), Seed (2019) |
| UK | Uncommon | A black background with white spots  Description automatically generated |  | X |  |  | Series A (2023), Seed (2021) |
| USA | BlueNalu | A fish silhouette on a black background  Description automatically generated |  | X |  |  | Series unknown (2023), Series B (2020) |
| USA | GOOD Meat | chicken icon | Eggs |  | X | X | Grant (2023), Series Unknown (2021) |
| USA | Upside Foods | chicken iconA black background with a black square  Description automatically generated with medium confidenceA fish silhouette on a black background  Description automatically generated |  |  | X | X | Grant (2023), Series C (2022), Series B (2020), Series A (2018) |
| Brazil | Cellva | A black background with white spots  Description automatically generated | Pork fat | X |  |  | Seed (2023) |
| China | Joes Future Food | A black background with white spots  Description automatically generated | Growth Media | X |  |  | Series A (2023), Series A (2021), Angel (2020) |
| India | Clear Meat | chicken icon | NASDAQ: STKH  Growth Media | X |  |  | Seed (2021) |
| Russia | OKPI | A black background with a black square  Description automatically generated with medium confidence |  | X |  |  | n/a |
| South Africa | WildBio | chicken iconA black background with a black square  Description automatically generated with medium confidenceA black background with white spots  Description automatically generated |  | X |  |  | Pre-seed (2022) |

Source: Authors.

**Developed economies**

Developed economies tend to have a strong institutional support with focus on Sustainable Development Goals (SDGs), especially SDG 2 - Zero Hunger, addresses points with the aim to increase food security, improve nutrition, and promote a more sustainable agriculture.

Businesses operating in developed economies have the support from educated and a large proportion of wealthy population supporting sustainable business models. The acceptance towards more sustainability-driven agriculture has nurtured a university and business research environment, aided building cross-disciplinary and international networks. The intertwined networks have been a major support in the early stages for startups and facilitated better circulation of business, research and institutional collaboration. The formed ecosystem for cultivated meat has resulted in a larger number of diverse successful startups especially in Israel and the United States, further progress on regulatory approval stages and more successful funding rounds.

These developments indicate a growing recognition and support for alternative proteins in developed countries, with significant investments and policy advocacy efforts aimed at promoting research, innovation, and sustainable practices in the food system.

**Australia**

**Vow**

Established in 2019, the startup is focused not on mirroring inexpensive, common meats such as beef, pork, and chicken, but rather on leveraging cultured meat technology to devise new and enhanced proteins that industrial animal farming cannot produce. In 2022, Vow opened its first factory and is already planning a quick expansion to another one by 2024 (Holland, 2022). Seeking to stretch the limits of culinary creativity, Forged/Vow embarked on crafting a meatball in 2023, blending woolly mammoth DNA with snippets of African elephant DNA, its nearest living kin, to achieve this endeavor (Vow website, 2023). The firm already submitted the dossier to Singapore and is looking forward to obtaining regulatory approval.

Learn more at - <https://www.vowfood.com/>

**Germany**

**The Cultivated B**

The company has been founded in 2009 and is developing technologies related to cellular agriculture and precision fermentation with its research and development being located in Heidelberg, Germany and its manufacturing facilities in the US and Canada (The Cultivated B, 2023). It is a subsidiary emerging from the German multinational InFamily Foods with additional subsidiaries focusing on meat sausages and plant-based meat alternatives (InFamiliy Foods, 2023). Unlike many other companies, Cultivated B is not specialising in one area or in specific meat, but it is positioning itself as a complete value chain player cell lines and growth media development, production bioreactors and further scale and end-to-end solutions while working with leading research institutions and private multinationals (The Cultivated B, 2023). The Cultivated B is the first company to enter the pre-submission process towards EFSA approval for its cultivated sausages (Vegconomist, 2023).

Learn more at - https://www.thecultivatedb.com/

**Israel**

**Aleph Farms**

Founded in 2016 with experiments at Technion, Aleph Farms was able to produce the first cultivated steak in 2018. One year later, it received investment from big food companies - Migros and Cargill. Aleph Farms invested in promoting its beef into a space station and got recognition from the World Economic Forum and UNESCO for its technology. In 2021, it signed an MOU with Mitsubishi Corporation to sell cultivated meat in the future in Japan. Same year, another agreement with BRF to sell the meat in Brazil, with Thai Union to cover Thai market and Cheil Jedang for South Korea (Aleph Farms website, 2023).

In 2023, Aleph Farms affirmed its cultivated stake is kosher, approved by a Chief Rabbi. The company is working towards securing regulatory approval for the commercial sale of its products, although it has not yet received such approvals.

Learn more at - <https://aleph-farms.com/>

**SuperMeat**

SuperMeat, headquartered in Tel Aviv, was founded in 2015 and is endeavoring to provide the global market with premium poutry meat cultivated straight from chicken cells (SuperMeat website, 2023). In 2022, SuperMeat revealed two very important Memorandum of Understanding (MOU). The first one with PHW Group, one of Europe’s largest poultry producers and the second with Migros, Switzerland's leading retail supermarket chain and eminent meat manufacturer in Europe. Those MOU are set to accelerate the production and commercial-scale distribution of cultivated meat.

SuperMeat stands as the initial B2B cultivated meat enterprise tackling the whole poultry meat category, offering a comprehensive solution for the production of cultivated meat. The arrangements outlined in the MOUs are furnishing the firms with chances to launch cultivated meat in the market under their respective brands.

Learn more at -[**https://supermeat.com/**](https://supermeat.com/)

**Stakeholder Foods**

Founded in 2019 and focused on 3D bioprinting technology for beef, Stakeholder Foods, formerly MeaTech 3D Ltd. was the first cultivated meat company listed on the Nasdaq. In 2021, the firm has granted its first patent for systems and methods that enhance muscle fiber formation (Stakeholder Foods website, 2023). It has facilities in Israel, Belgium (through the acquisition of Piece of Meat) and is currently expanding to the USA.

In 2023, the Stakeholder Foods enlarged the portfolio of products to include 3D cultivated fish. Also, Steakholder Foods has signed a Memorandum of Agreement for Strategic Cooperation (MOA) with a recognized governmental entity from the Gulf Cooperation Council (GCC) as their strategic ally. This partnership aims to enhance food security by utilizing Stakeholder Foods' innovative 3D printing technology. The MOA ultimately seeks to establish a pioneering large-scale production facility in the Persian Gulf region.

Learn more at - <https://steakholderfoods.com/cultured-meat-company-meatech-3d-becomes-steakholder-foods/>

**The Netherlands**

**Mosa Meat**

In 2006, researcher Mark Post and food expert Peter Verstrate first crossed paths via a government-sponsored initiative focused on the potential of lab-grown meat. This partnership was fruitful and years later they were able to produce the first lab-grown beef burger in 2013. In order to launch the concept and show the characteristics of this product, it was covered in a press conference in London (Mosa Meat, 2023). This was a significant milestone in the field of cultivated meat.

In 2020, Mosa Meet opened its production facility in Maastricht and is still waiting for regulatory approval to sell its burgers (Greenqueen, 2023). However, a first step in this direction happened in July 2023 with a Dutch Government Agreement to Conduct Pre-Approval Tastings of Cultivated Meat in The Netherlands (Mosa Meat, 2023)

Learn more at - <https://mosameat.com/>

**Singapore**

**Shiok Meats**

Shiok Meats was founded in 2018 focused on developing products like shrimp, crab, and lobster, aiming to recreate the taste and texture of these items through lab-grown methods. The company aims to initially target the Asian market, where there is high demand for seafood, but has ambitions for global distribution. While Shiok Meats had not received regulatory approval for commercial sales, it was actively working on fulfilling the requirements needed for such approvals, particularly in the Singapore market (Shiok Meats, 2023).

Learn more at - <https://shiokmeats.com/>

**South Korea**

**Cell Meat**

Founded in 2019, the firm produces Fetal Bovine Serum (FBS). This ingredient is crucial for growth media development. Cell meat has developed the mass cell culture technology for the economic viability of their currently main products: shrimp and caviar.

Learn more at - https://www.thecellmeat.com/index\_en.php

**United Kingdom**

**IvyFarm**

Founded in 2019 in the University of Oxford, IvyFarm aims to sell muscle and fat as raw ingredients to other food producers. 'Ivy' is an abbreviation for 'in vitro,' referring to a process occurring outside a living organism, also known as in vitro meat. The company already applied for patents in 12 countries (IvyFarm, 2023; FoodManufacture, 2023).

In 2023, Ivy Farm inaugurated the largest operational cultivated meat pilot production facility in Europe, located in Oxford. However, as sales haven't yet been approved in the UK, the subsequent facility will be established overseas. This expansion will be undertaken in collaboration with Dennis Group, a US-based company specializing in the design and construction of food processing facilities due to easier approval compared to their home base in the UK (FoodNavigator, 2023.

Learn more at - <https://www.ivy.farm/news/>

**Uncommon**

Founded in 2017 as Higher Stakes, it started producing alterative foie gras in 2018 and moved to pork belly and bacon in 2020. A year later, raised £1M from Innovate UK and in 2023 opened its pilot plant and rebranded as Uncommon (Uncommon website, 2023).

Learn more at - <https://uncommonbio.co/>

**The United States**

**BlueNalu**

The company was founded in 2017, focused on developing cell-based seafood products. The company is working on various seafood products, such as finfish, crustaceans, and mollusks. Their first product offerings were expected to include species like mahi-mahi and bluefin tuna.

The company has been known to collaborate with research institutions (Nomad Foods, Nutreco), governments, and other industry players such as Mitsubishi Corporation to advance its technology and mission (BlueNalu website, 2023).

Learn more at - <https://www.bluenalu.com/>

**GOOD Meat**

Originally named Beyond Eggs, the company was founded in 2011 and focused on planted-based eggs. Later, research and development included cultivated chicken nuggets and in 2017 it was rebranded as Eat Just. In 2019, Eat Just opened its first manufacturing plant in the USA and one year later a subsidiary in Singapore. The expansion occurred through a Joint-Venture with Proterra Investment Partners Asia[[6]](#footnote-6) (Shu, 2020).

In December 2020, Singapore's government gave the green light to lab-grown meat produced by Eat Just, under the brand name GOOD Meat. The first establishment to offer this cultured meat was a Singaporean restaurant named 1880. Following this, Eat Just received further permissions to market various poultry items like shredded and breast meat. Good Meat is available at Huber’s Butchery in Singapore. More recently in June 2023, the FDA had also approved the company's lab-grown meat for sale in the United States (Good meat website, 2023).

Learn more at - <https://www.goodmeat.co/>

**Upside Foods**

Founded in 2015 as Memphis Meat, Upsides Food created a diversified cultivate-meat portfolio, including beef meatballs, poultry, duck and seafood. The company attracted the attention of Bill Gates and Richard Branson and traditional meat companies such as Cargill and Tyson Foods (Upside website, 2023).

In 2018, Upside foods also developed a partnership with the North America Meat Institute to advocate for federal regulations on cultivated meat. A year later, co-funded Alliance for Meat, Poultry and Sea Food Innovation – a cultivated meat coalition (Upside website, 2023).

After obtaining significant funding in 2020, Upside Food opened its first production facility in the USA. It reached the unicorn evaluation (over US$ 1B in 2022), same year that obtained the green light from FDA (Food and Drug Administration) for poultry products (Upside website, 2023). Upside Food is still waiting for regulatory clearance to market 'unstructured' or ground items like nuggets, which are produced through a more scalable method that blends plant-based proteins with cell biomass cultivated in much larger bioreactors.

Learn more at - <https://upsidefoods.com/company>

**Emerging Economies**

Emerging markets are earnestly attempting to align with Agenda 2030, particularly in terms of sustainable food systems, yet they confront a multifaceted set of challenges. Among these, the development of cultivated meat stands out as a significant opportunity to enhance their stature on the international stage. This innovative approach to protein production offers a pathway to meet sustainability goals, potentially reducing reliance on traditional, resource-intensive agriculture. However, firms in these markets are predominantly in the early stages of developing the cultivated meat industry. The path to regulatory approval remains uncharted for these firms, with most still engaged in the crucial phases of product validation and ongoing research and development. This lag in regulatory progress reflects not only the nascent state of the industry in these regions but also the broader developmental challenges facing emerging markets in the realm of high-tech, sustainable food production.

Moreover, the consumer dynamics in emerging markets present an additional hurdle. Unlike their counterparts in developed economies, customers in these regions exert comparatively less pressure on businesses for sustainable practices. There is a notable lack of a robust sustainability culture, and scepticism towards novel foods, like lab-grown meats, is more pronounced. This scepticism is compounded by a general lack of awareness and understanding of the benefits of such innovations. Consequently, firms in these markets face a dual challenge: not only do they need to advance in the technological and regulatory aspects of cultivated meat, but they also need to cultivate a market where consumers are more receptive to and supportive of sustainable, innovative food solutions. Bridging this gap is essential for these firms to not only contribute to global sustainability efforts but also to secure a competitive edge in the rapidly evolving global food industry.

**Brazil**

**Cellva**

Created in 2022 by very experienced founders in the food sector, Cellva aims to provide solutions for food industries meat through fat production. In 2023, Cellva was selected to be part of ProVeg incubator, this food tech start-up aims to improve its business model during the acceleration programme. The plan is to be able to produce 11 tons of pork fat by 2030. Therefore, the firm is looking to have the production facility ready by 2025.

Learn more at - <https://cellva.com/>

**China**

**Joes Future Food**

The company was founded in 2019 is the first cultivated meat startup in China with focus on cultivated pork and serum-free growth media (Vegconomist, 2022). It originated at Nanjing Agricultural University and is based in the national agricultural hi-tech industry demonstration area. A large success has been achieved through an awarded funding of $10.9 million in October 2021 to continue Research and development efforts and further production scaling (Greenqueen, 2022). In addition to its investment backing, it strongly embedded in university research networks in China and in the Netherlands (Joes Future Food, 2023). It has won several awards, among the recognition to be one of the "50 Smartest Companies" by MIT Technology Review (EqualOcean, 2023).

Learn more at - http://joesfuturefood.com/en/

**India**

**Clear Meat**

The company is India’s first cultivated meat technology start-up founded in 2018 that focuses on poultry and growth media (Green queen, 2021). It’s product portfolio includes chicken in minced and steak form as well as growth media (Clear Meat, 2023). Growth media usually requires extraction of necessary elements from fetal calf in pregnant cows that will be sent for slaughter [(van der Valk et al. 2018)](https://www.altex.org/index.php/altex/article/view/101). However, Clear Meat claims to base its growth media to be animal-free (The Vegan Indians, 2022) which would be an important step to increase independence from the meat industry. It has been one of the successful start-ups that have gone through the ProVeg Incubator programme in 2019 and claims to have reached price parity on its chicken mince with conventional meat (ProVeg,2020; Vegeconomist, 2020).

Learn more at - <https://clearmeat.com>

**Russia**

**Ochakov Food Ingredients Plant (OKPI)**

The company is focused on food additives and has produced its first 40mg cultivated meat beef sample in 2019 in Moskow. It has taken two years to produce the meat given a cost of 900,000 rubles (ca. $9.800). They expect to launch a commercially viable product within the next few years (Forbes, 2019).

Learn more at - https://ochakovo-food.ru/

**South Africa**

**Mogale Meat – Wild Bio**

Mogale Meat, rebranding to WildBio, was founded in 2020 and it aims to make nutritious cell-based meat accessible in Africa. It focuses on driving innovation in cell cultivated meat production in Petroria to provide affordable, healthy products, benefiting animals, people, and the planet (MogaleMeat website, 2023). Its portfolio of products includes wild antelope, poultry and free-roaming livestock.

Learn more at - https://mogalemeat.com/

Businesses operating in emerging economies are considered second-mover in the cultivated meat industry. With an increasing demand for meat in emerging economies compared….

**Conclusions and Future perspectives**

The cultivated meat industry is still in its nascent stage but has shown enormous promise and received significant investments. In addition, it is also showing great promise in mitigating the impact of conventional animal-based food production on climate change. However, it is crucial for the industry to continue to innovate and for regulatory frameworks to evolve to fully realize these benefits. All the companies analysed claimed that company’s main goals are to create a sustainable and ethical alternative to traditional meat production, which is often criticized for its environmental impact and ethical concerns related to animal welfare.

Cultivated meat companies have overall secured a large number of funding in the last few years. This continuous trend displays confidence, positive outlook and willingness for investments. It's important to note the increase in start-ups securing funds in Series A, which is used to optimize their product, conduct more aggressive market research, and structure the dossier for regulatory approval. In addition, we have observed expansion (even geographically) following substantial funding in selected cases.

Despite selected successes in regulatory approval in a handful of markets such as Singapore and the United States, the pipeline for approval is increasing which will likely increase the competition on the consumer market in foreseeable one or two years in countries with existing food safety approvals and further expansion of additional countries approving cultivated meat in the near future. Regulatory approval in more countries and technological advancements will be crucial for its success. However, the industry must overcome challenges related to production cost, consumer acceptance, and supply chain complexities to realize its full potential. Hybrid solutions have proliferated in the alternative protein sector, as food producers strive to integrate plant-based, fermentation, and cultivated meat technologies in an effort to develop products that achieve both taste and price parity with conventional meat (GFI, 2022).

Like most academic studies, our study has some limitations; first, it only covers selected firms, which might represent a limitation concerning its generalizability of the industry. In addition, it is important to emphasize that this book chapter was written using only secondary sources. As such, the space dedicated to each selected company was determined not by the author's preferences, but by the volume of information available online. We recognize the limitations of relying solely on desk research. However, the chapter's aim was to provide key and most recent information about cultivated meat from around the globe until the publication of this book, which we believe the information provided was accurate.

Future studies may develop in depth cases studies with the selected companies through interviews and surveys. Another direction could be addressing the role of regulation on the internationalization of start-ups and foreign direct investment attraction policies. Since regulation is moving in different pace around the world, we are seen the potential of global centres of excellence for cultivated meat.

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