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Food Tech: Alternative Protein Opportunities in Asia

Project for Private Equity: Venture, Growth & Buyout Investing

Chun Yue Tan

Melody Song

Kai Jun Hong

Jian Lin

Kristoffer Yap

Tomomi Natsume

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EXECUTIVE SUMMARY

The past decade has seen an increasing prevalence of alternative proteins. Concerns about the environmental costs of animal farming, the prevalence of healthier eating, and the urgency of simply producing enough food for growing populations have helped spur the growth of a new sector of interest to private investors.

Investors ranging from sovereign wealth funds and venture capitalists have ploughed increasing amount of funds into alternative protein companies. Funding in 2020 is on pace to outstrip previous years, with the amount of money raised in the first quarter of the year already dwarfing all of 2019. Companies deriving meat-substitutes from plants such as Impossible Foods and Beyond Meat come to mind to most consumers, with Beyond Meat the first alternative protein company to successfully list on public markets. However, the sector is more than just about plant-based proteins. Companies are also attempting to cultivate meats using cell technology or fermentation, with others also attempting to bring insect proteins and whey proteins into the mainstream.

Despite the publicity around alternative protein ventures, it remains to be seen who the winners might be, or when they might emerge. In order to achieve mass market acceptance, companies need to have products that can satisfactorily replicate the tastes and texture of actual meat, and be able to manufacture these at scale with a sustainable cost structure. Companies and investors would also need to navigate potential regulatory hurdles and public wariness about the safety and health attributes of their products.

While the United States remains the core market for alternative proteins products, most of the world's population ultimately resides in Asia, and early movers such as Impossible Foods have begun entering markets in the region. With the team having resided in various countries in Asia, we have seen first-hand the growing presence of alternative proteins in restaurants and stores. We have hence elected to dive deeper into the trends, players and opportunities in Asia's alternative proteins space. Specifically, the report zeros in on the 5 broad sectors in alternative proteins – Cultivated Meat, Fermentation, Insect Protein, Whey Protein and Plant-Based Protein.

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1. INTRODUCTION

The promise of alternative proteins to replicate the taste and texture of meat without the environmental and ethical issues of animal farming has excited both investors and the general public. With the global meat market estimated to be worth US\$2 trillion a year, alternative proteins could be a means to “save the world” while turning a profit. This report of meat focuses on the alternative proteins landscape in Asia with the intent to highlight opportunities for private equity.

1.1 Defining Alternative Proteins

Alternative proteins refer to food or beverage products that derive proteins from sources besides live animals. These sources span a spectrum ranging from familiar sources such as plants and mushrooms to exotic ingredients such as insects and cell cultures (Credit Suisse, 2020).

The sector can be broken into 5 broad categories **(1) Plant based meat**, which is created by extracting and reassembling protein isolates from plants such as soy and pea, **(2) Cultured meat**, which is real muscle tissue grown from tissue-culture technology, **(3) Fermentation based proteins** that cultivates microbial organisms to yield protein and other ingredients such as enzymes and flavourings, **(4) Insect protein** such as crickets and mealworms, and **(5) Whey protein** which is a protein by-product of milk and yogurt production.

1.2 What Drives the Alternative Protein Industry?

The alternative proteins industry is estimated to be worth approximately \$2.2billion today (McKinsey, 2019), and it is expected to grow at a CAGR of 9.5% from 2019 to reach \$17.9 billion by 2025 (Meticlulous, 2020). Conventional meat’s share of consumption is also expected to fall from 90% of the market to 40% in the same time period. This shift is driven by several factors:

- **Food Scarcity:** According to the United Nations, the world’s population is expected to reach 9.7 billion in 2050. In order to sustain the protein needs of the future demographic, current agricultural land would need to improve productivity by 70%. Alternative proteins could be a novel way to address the growing demand for food.
- **Concern around farming’s environmental impact:** The significant barrier to the expansion of existing agricultural practices is its impact on the environment. In addition to the land and water costs, producing 1,000 calories of beef generates 10kg of greenhouse-gas emissions. Alternative

proteins have a significantly lower carbon footprint with plant-based meats producing 11% of emissions generated by beef (Jefferies, 2020).

- Growing consumer acceptance: Younger generations are willing to embrace new forms of protein. Plant-based milk already represents 13% of milk sold in the United States and 79% of millennials regularly consume meat substitutes (Jefferies, 2020).

2019 saw the first public listing of an alternative proteins company with Beyond Meat raising US\$241 million on the Nasdaq. Beyond start-ups, incumbent food companies such as Nestle and General Mills are launching their own line of plant-based products and investing in alternative protein ventures. (Good Food Institute, 2020).

1.3 Alternative Proteins in Asia

Though Western companies such as Beyond Meat and Impossible Foods currently dominate headlines, ventures from Asia have the potential to become major players as well. With Asia simultaneously home to majority of the world's population and the region with the highest meat consumption in the world (OECD-FAO, 2019), the challenges of food scarcity are particularly pronounced in the continent. This challenge is exacerbated by epidemics with animal origins, with China's pork industry forced to cull half its pig population in 2019 due to African swine fever.

As such, governments in Asia have supported the alternative proteins sector in an effort to diversify and strengthen food supplies. China has indicated its intent to streamline regulations to support innovation in alternative proteins and has also established an accelerator to jump start investment in Chinese alternative protein start-ups. Singapore has set aside S\$144 million for investments in strategic sectors such as urban farming and alternative proteins and has established the Singapore Institute of Food and Biotechnology Innovation (SIFBI) to strengthen and consolidate public sector research capabilities in alternative proteins.

Start-ups such as Shiok Meats (Singapore), Turtletree Labs (Singapore) and Avant Meats (Hong Kong) have emerged in recent years and made headlines with successful fundraisings. Investors have ranged from sovereign wealth funds such as Temasek (Shiok Meats) and VCs specialized in the foodtech space such as Big Idea Ventures (Singapore) and Lever China (China). This report further explores the landscape of alternative protein ventures in Asia and the trends behind their rise.

2. SUB-SECTOR 1: CULTURED MEAT

2.1 The Science behind Cultured Meat

Cultured meat or cell-based meat define meat grown in bioreactors. Stem cells are extracted from a living animal and then fed with a medium containing amino acids, salts, sugars and signalling molecules for proliferation. Cells subsequently differentiate into muscle, fat and connective tissue that are structured using 3D scaffolding materials and lastly, combined into meat (Khan, 2020).

2.2 Market characteristics: Size, growth, attractiveness and concerns

The global cell-based meat market is expected to be worth \$15.5M by 2021 and grow at 4% annually to reach \$20M by 2027 (Markets and Markets, 2019). AT Kearney estimates that the market will accelerate further at 16% annually from \$140B in 2030 to reach \$630B by 2040, marking the time at which 35% of global meat supply is estimated to be cultured (AT Kearney, 2019). In addition to cultured meat for human consumption, there are companies working on cultured seafood and companies targeting the pet food market. Lever VC has invested in Bond Pet Foods that is growing animal protein using muscle genes and yeast fermentation (Subramaniam, 2020).

Cultured meat has the highest similarity to meat in terms of sensory profile and mix of nutrient and vitamins (Powell, Chiang, & Lurie, 2020). While this bodes well for commercialization, there is a myriad of challenges that explains why rapid growth would likely come only after 2030 (Kateman, 2020). Cultured meat is far from being mainstream as current cost of production is extremely high, limiting both variety of product and market accessibility. In addition, consumer acceptance of artificially modified foods such as genetically modified ingredients have been traditionally low. There are health concerns yet to be unvalidated such as the unstable control of nutritional composition, carcinogenic potential that require more time. Legislation is progressing slowly, if at all. Even environmental benefit claims relating to the reduction of carbon footprint have been proven to be inconclusive given how nascent technology is today and what commercialization would look like is not yet well-understood.

2.3 Key players and recent PE deals in Asia

Globally as of Oct 2019, 26 cultured meat firms have received more than US\$500M in investments from 133 investors in 65 deals (PitchBook, 2019). Cell-based meat companies' seed-round deals range between \$2.2M and \$5M (The Good Food Institute, 2019). The largest investments as of 2019 were made into Memphis Meats (US), CUBIQ Foods (Spain) and Mosa Meat (Netherlands) (The Good

Food Institute, 2019). According to Good Food Institute, as of end 2019, there are 55 cell-based meat and seafood start-ups globally, with 8 based in APAC (The Good Food Institute, 2019).

Company	Country	Products	Founding Year	Total Funding (Round, USD)
Avant Meats	Hong Kong	Seafood	2018	Seed
ClearMeat	India	Chicken	2018	Seed
Heuro	Australia	Meat	2017	Seed
IntegriCulture	Japan	Chicken, foie gras, cell culture media, bioreactors	2015	Series A; \$12.42M
LIKE Foods	China	Meat	NA	Pre-Seed
Nanjing Zhouzi Future Food Technology	China	Pork	2019	NA
SiCell BioTechnologies	China	Cell culture media	2019	Seed; \$0.14M
Shiok Meats	Singapore	Seafood	2018	Series A; \$20.2M
VOW Food	Australia	Kangaroo meat	2019	Seed
<i>Reproduced from: Good Food Institute's 2019 Cultured Meat Industry Report Updated using Preqin 6th October 2020</i>				

Asia companies are also partnering with more established firms globally. For example, Toriyama in Japan is partnering with JUST, a US based plant-based food and cultured meat company, to grow, distribute and sell cell-based wagyu worldwide (Kateman, 2020).

2.4 PE opportunities: What should investors care about?

For investors to be interested in Asia, the path to commercialization needs to be proven. Firstly, start-ups need to demonstrate ability to scale production to a commercially viable size that is cost efficient (Best, 2019). Reuters previously reported that Shiok Meats' cultured minced shrimp meat costs US\$5,000/kg, which translated into an exorbitant US\$300 for a single siu mai (pork and shrimp) (Reuters, 2020). Secondly, the distribution from lab to shelf must be smooth across inventory management, transportation, to storage. (Kateman, 2020). Finally, regulatory support is also critical, and that would come with ensuring that long term unknown health effects of consuming cell-based meat can be mitigated (Neo & Lim, 2020).

Recommended investment angles and targets to look out for:

- Broad-based application for risk diversification: IntegriCulture’s vision is to develop a general-purpose large-scale cell culture system that can be licensed out, and is not just applicable to cultured meat but also other areas such as healthcare (Albrecht, 2018). For example, IntegriCulture is affiliated to Shojinmeat Project that has open-sourced its cellular agriculture technology. We believe that the growth potential beyond cultured meat provides risk diversification in the event cultured meat takes much longer to return on investment.
- B2B focus on cell media and bioreactors: Rather than focusing on the entire production and supply chain, focusing on a single step in cultured meat production could drive efficiency and scale while reducing risk and complexity for investors. It also allows for a B2B business model that could be more sustainable in the long run versus a B2C model. IntegriCulture and SiCell BioTechnologies are both in the production of cell culture media, an ingredient of large cost due to slow cell growth and hence critical for scaling production (The Good Food Institute, 2019). IntegriCulture also manufactures bioreactors that are a key component of the infrastructure needed for scale (IntegriCulture Inc., 2019). However, there exist competition outside of Asia: Future Fields from Canada claimed that they developed a media that is 1000X cheaper (Y Combinator, 2020) and allows cells to rapidly grow and form meat at 100% of the current market costs (Subramaniam, 2020).
- Strong commercialization potential and regulatory support: Shiok Meats have declared that they estimate cost to reduce 100-fold by 2022, and Singapore seems likely to be first to formulate regulations, given government-linked investment from Seed Capital (Enterprise Singapore) and Big Idea Ventures (Temasek-backed) (The Straits Times, 2020). However, in Series A funding in September 2020, they raised an additional \$12.6M, bringing their total funding to \$20.2M. Investment horizon for an interested investor may end in 2022 when they hit their cost milestone.

3. SUB-SECTOR 2: FERMENTATION BASED PROTEIN

3.1 The Science behind Fermentation-based Protein

Fermentation is a metabolic process in which microorganisms (yeasts, molds, and bacteria) and their biological processes are used to create desirable changes in food. There are three types of fermentation. (1) Traditional fermentation uses live microorganisms to convert ingredients (usually plant-derived) into different food products. Examples include fermenting beans to create tempeh and making cheese. (2) Biomass fermentation employs the fermentation process to grow and harvest biomass for edible food and animal feed. Examples of this might be growing fungi or

microalgae into large quantities of edible matter. (3) Precision fermentation utilizes recombinant DNA technology to harness microorganisms as cellular factories to create desired products.

3.2 Market characteristics: Size, growth, attractiveness and concerns/challenges

In 2019 the fermentation-based protein market size exceeded USD 3.5 Billion and is estimated to register over 8% CAGR between 2020 and 2026. Fungal protein industry growth is attributed to rising product incorporation in food and beverage, pharmaceuticals and animal feed manufacturing. Fermentation-based protein industry from witnessed highest growth potential and the sector is further anticipated to grow due to increasing demand for meat alternative and fat substitute dairy products. APAC region is expected to have a CAGR of 6% in the next few years. (Global Market Insights, 2020)

- (+) Efficient production: By industrial fermentation, animal protein can be grown to maturity in a month. This is faster than the two months needed to grow chickens to maturity, or the 20 months needed to grow cows to maturity.
- (+) Low input cost: Fermentation generally utilizes low-cost inputs (dextrose/sugar, carbon monoxide, carbon dioxide, etc.) As such, while the cost of creating a tailor-made microorganism through recombinant DNA engineering requires involves expensive research and development, the cost of food production through fermentation is relatively cheap.
- (-) The requirement for a larger R&D investment: Companies have developed promising fermentation technology but are nascent, under resourced, and few in number. Scaling up bioprocesses from pilot to demonstration to full commercial, as well as developing additional use cases and optimizing this technology, will take billions of dollars in financing and R&D funding.
- (-) Regulatory considerations: In the US, FDA approval is needed for product roll-out that usually takes place over one year. The same regulations are estimated for roll-out in Asia over the next years. A factor that could negatively affect branding and consumer base growth is the recent legal settlement requiring labeling to include the term “mold,” as customers are relatively unfamiliar with mycoprotein than other alternative proteins

3.3 Key players and recent PE deals in Asia

Company	Country	Products	Founding Year	Total Funding (Round, USD)
Sophie's BioNutrients	Singapore	Microalgae R&D to create proteins for plant-based meat and dairy	2013	SGD \$1 million (seed)
More Foods	Israel	Yeast-based meats	2019	N/A
Foods Myco Mizoram	India	Mycelium-derived meat	2019	N/A
Utilization of Carbon Dioxide Institute Co., Ltd.	Japan	Conversion of CO2 and hydrogen to edible protein and other applications	2015	\$1 million / \$1.5 million (seed)

3.4 Key players and recent PE deals globally

Company	City, Country	Largest round (date)	Total amount raised (round)
MycoTechnology	Aurora, CO, USA	\$39 million (Jun. 2020)	\$120.67 million (Series D)
Motif FoodWorks	Boston, MA, USA	\$90 million (Feb. 2019)	\$117.50 million (Series A)
Nature's Fynd	Chicago, IL, USA	\$80 million (Mar. 2020)	\$113 million (Series B)
Clara Foods	San Francisco, CA, USA	\$40 million (Apr. 2019)	\$56.80 million (Series B)
Wild Earth	Berkeley, CA, USA	\$11 million (May 2019)	\$15.55 million (Series A)
3F Bio	Glasgow, Scotland, UK	\$8.63 million (Apr. 2018)	\$9.22 million (Series A)
Meati	Boulder, CO, USA	\$3.2 million (Jun. 2020)	\$8.00 million (seed)
Atlast Food Co.	Green Island, NY, USA	\$7 million (May 2020)	\$7 million (seed)

Sophie's BioNutrients and Utilization of Carbon Dioxide Institute have raised around \$1M for their seed round, and the global investment in fermentation innovation reached new heights in 2019; 15 companies raised investments in 21 separate deals, ranging from seed to Series C. This means that about 68% of all industry VC/PE investment through the end of 2019 occurred in the prior 12 months. Even amid the Covid-19 pandemic, VC/PE funding in the first half of 2020 surpassed all other years combined. From January 1, 2020, to July 15, 2020, fermentation companies brought in \$435.38 million in venture funding across 14 deals and nine companies.

3.4 PE opportunities: What should investors care about?

Fermentation-based protein market size exceeded USD 3.5 Billion in 2019 and is estimated to register over 8% CAGR between 2020 and 2026, but the sustainability of the growth relies on the consumer trend in Asia. Fermentation-based protein industry growth is also attributed to demand from the corporate side, including rising product incorporation in food and beverage, pharmaceuticals and animal feed manufacturing. Fermentation-based protein has the unique advantage of (1) low input cost, (2) high-speed replication, (3) variety of products and tastes, and (4) proven technology, compared with other types of alt protein.

Within the limited target companies in Asia, we identified two specific areas to examine:

(1) B2B fermentation applications: The majority of B2B companies using fermentation position themselves as ingredient suppliers that empower B2C companies to improve their branded products. Companies such as MycoTechnology produce natural microbe-derived flavoring solutions. Their first product, ClearTaste™, is derived from an extract of fungal mycelium cultivation and serves as a flavor modulator, its primary use is as a bitter blocker for undesirable off-flavors in some plant proteins. This product is an illuminating example of fermentation's potential to cater to consumer-led interest in so-called clean label products. (2) Precision fermentation: Precision fermentation uses genetic modification as a means of creating animal proteins at a low cost and high speed. Currently there is an underestimation of the opportunity to create totally new foods with cell-based fermentation – and to create product expansion. These are novel products and extensions of what we can do now using scientific advances. Cellular agriculture and precision fermentation can make food opportunities available that were totally unavailable before, creating new demand for the customers.

There is a concern of frothy valuation in the fermentation protein market. Investors have reported aggressive uplifts in valuations particularly for early-stage companies. Growth in valuations of 3-5x were cited anecdotally, often for companies that possessed no real IP and were at prototype stages.

4. SUB-SECTOR 3: INSECTS

4.1 The Science behind Insects

While the idea of eating insects can be an abnormal experience, it is being consumed by approximate 2 billion people all over the world. In comparison to traditional farming, insect farming requires a smaller foot print: when comparing weight to weight, edible insect can only require up to

500x less water, 12x less feed, and 10x less land than beef, while also producing 613 times less greenhouse gases (Izabelanair, 2018). However, most insect farms are still operate at small scale with manual labour. In time and with industry growth, automation in feeding and harvesting will reduce costs further. Once harvested, insects are commonly ground into powders to combat the negative perception of the ingredient. (Melgar-Lalanne, 2019)

4.2 Market characteristics: Size, growth, attractiveness and concerns

The current market size of insect proteins is at USD 152mil in 2019. With a CAGR of 38%, insect protein is set to be USD 1.4 billion industry by 2026. In 2018 crickets held majority share as ingredient. Cricket contains the highest protein percentage as compared with other insects and widely used in powder form in sports nutrition industry. The mealworm segment is expected to witness the fastest-growing segment with a CAGR of 24.00% during the forecast period; they are considered healthy due to their high protein and fat content. The dried mealworm is reflected to have around 53% protein, while live worms have approximately 20%. (Reports and Data, 2019)

Insect protein is high-quality protein-rich product. Crickets contain about 69% protein, while beef is supposed to have only 29% (Reports and Data, 2020) . In addition, crickets contain nine crucial amino acids, alongside with B12, iron, zinc, magnesium, sodium, potassium and calcium.

The major obstacle that the industry face is the perception of insects. Many view insects as distasteful. However, this perception is only apparent predominantly in North America and Europe. Entry into over 100 countries around South America, Africa and Asia that regularly consume insects would be an easier task. If a firm could produce a snack base and/or market the product as a sustainable and healthier alternative, the growth can be exponential.

4.3 Key players and recent PE deals in Asia

Company	Country	Products	Founding Year	Total Funding (Round, USD)
Insectta	Singapore	Black Soldier Fly	2018	Seed; 16 mil
Thailand Unique	Thailand	Insect powder, snacks	2003	-
AIFS	Singapore	Crickets	2017	Seed
Cricket Lab	Thailand	Crickets	2014	2.1 mil
Protenga	Malaysia	Black Solider Fly	2016	1.6 mil
Insect Feed Technologies	Singapore	Black Soldier Fly	2020	Pre-Seed

Deals for insect farming startups are currently based in Europe more than anywhere else. Protix, a Netherlands-based company, raised €45 million (\$50.5 million) in equity and debt funding in June, marking the largest investment in the industry to-date. Protix recently acquired Fair Insects, a consortium of breeders growing mealworm, crickets, and locusts.

Another large raise for an insect product company went to cricket bar Exo Protein. In early 2016 led by AccelFoods, the startup raised a \$4 million Series A round. The Series A round followed a \$1.6 million seed round in October 2014. (Burwood-Taylor, Protix Raises \$50m in Largest Insect Farming Investment on Record, 2017)

4.4 PE opportunities: What should investors care about?

There have been a handful of sizeable deals in the last few years, but larger deals are few and far between. There is no shortage of farms, but deals have not been materializing as fast as other industries (Cosgrove, 2017). As public perception and acceptance of insect as a source of protein is currently low, the sector has not yet reached its full potential. With funding and strong R&D in robotics technology, the yield for insects will rise and consequently reduce the cost. Investors who strongly believe in the prospects of this space could consider investing in yield improvement technology-based companies.

5. SUB-SECTOR 4: WHEY PROTEIN

5.1 Science behind Whey Protein

Whey is divided into two categories: sweet and sour. Sweet whey is the by-product of hard cheese making. When milk has been curdled by adding coagulant, the curd and whey are separated. On the other hand, sour whey is produced when dairy products with acid properties are made such as cottage cheese or yogurts. This by-product is widely used in whey protein that is consumed by athletes in powder form with a mix of flavours. Whey protein is a high and easily absorbed source of protein. (Patel, 2020)

There are three main types of whey protein currently in the market:

- Whey protein concentrate (WPC): This is a concentrated protein that keeps most of the nutrients. Most non-isolate proteins are comprised of WPC.
- Whey protein isolate (WPI): Similar to WPC but most of the carbohydrates, fat, and fat-soluble vitamins have been removed allowing for a higher percentage of protein. WPI is

digested more quickly. For that reason, most trainers and registered dieticians recommend opting for WPI, despite its higher price point.

- Whey protein hydrolysate (WPH): WPH is considered pre-digested since it breaks down the amino acids — the building blocks of proteins — to help with quicker absorption.

5.2 Market characteristics: Size, growth, attractiveness and concerns/challenges

The global whey protein market size was valued at USD 7.4 billion in 2018 and is expected to register a CAGR of 8.1% from 2019 to 2025 (Grand View Research, 2019). The Asia-Pacific whey protein market is forecasted to reach USD 1.57 billion by 2025, witnessing a CAGR of 9.2% during the forecast period (Patel, 2020). The rapid expansion of the food industry owing to the growing population, increasing purchasing power, and health awareness in countries such as India, China, and Indonesia are expected to fuel the market growth over the forecast period.

5.3 Key players and recent PE deals in Asia

Company	Country	Products	Founding Year
Lion Labs Nutrition	Singapore	Whey Protein	2018
Myprotein	England	Whey Protein	2005
Ora Organic	USA	Vegan whey protein	2014
Glanbia	USA	Whey protein, protein bars	2003
Alpavit	Germany	Whey protein, dairy	1993

5.4 PE opportunities: What should investors care about?

Since whey was discovered as early as 17th century in Switzerland, it has been regarded as health tonic. Only in recent years when technology has improved, whey was able transform into its less perishable form of powder. While in its liquid form, the shelf life is just around 10 hours. When transformed into powder, it can last for longer periods (Muscle Insider, 2015).

While the tech itself is relatively straightforward and the industry dominated by large food players, some new players are appearing and aiming to achieve a lower cost with wider flavour variation (Market Data Forecast, 2020). As it is a mature and saturated market, PE firms may be more attracted to the segment than VC firms are.

An attractive target for PE firms is to invest in companies that have low presence in Asia today. With the rising spending in health products, PE firms can contribute know how and region knowledge to

these Whey protein firms. Another opportunity for PE firms is targeting vegan whey proteins which has less suppliers.

6. SUB-SECTOR 5: PLANT BASED PROTEIN

6.1 The Science behind Plant-Based Meat

Plant-based meats are plant-based imitations of animal products. The plant-based meat industry dates to the 19th Century in the US and much further back in many Asian countries as cultural and religiously motivated staple products. (Mackenzie DionSally, 2020) The 2016 launch of Beyond Burger and Impossible Burger evidenced technological leaps that brought the product closer to real meat. Beyond Meat's successful distribution to fast food chains such as Burger King demonstrated the sector's potential appeal to a wider, mainstream customer base. (JefferiesUniversity, 2020). Contributing innovations include extrusion, 3D printing, isolation of plant proteins and recombination, and exploration of novel plant ingredients with higher nutrition content and product suitability.

6.2 Market characteristics: Size, growth, attractiveness and concerns

AT Kearney predicts that by 2040, 60% of meat will be alternative proteins, of which 25% will be from plant-based meats. (AT Kearney, 2019). The bulk of the sector's largest players are based in the US: existing veterans in the industry such as LightLife and Morningstar Farms or traditional meat-based tycoons such as Tyson. Spotlighted Asia-based players are start-ups focused on niche foods such as plant-based eggs and seafood, novel ingredients such as jackfruit or have a distribution arm such as Green Monday with urban retail stores, and Gooddot with a fast-food franchise in India.

The attractiveness of plant-based meats in Asia lies in its market readiness. Due to historic presence, the sector faces little resistance in legislation, distribution, and market reception. However, the lack of technological sophistication results in a highly competitive and brand-centered landscape. Another concern for investors is the projected market size for plant-based meats. The product is, at its best, imitation of meat. While the sustainability factor may encourage first world and first tier cities to be receptive markets despite compromise, the remaining developing market may prefer real meat due to taste, price, and health reasons.

6.3 Key players and recent PE deals in Asia

The 2020 GFI Report estimates that \$2.4 billion in venture capital has been invested in the sector, with over 99% of these dollars closing in the past 10 years. Just in 2019, Beyond Meat’s IPO accounted for over \$290 million and Impossible Foods attracting \$300 million in their Series E round. (JefferiesUniversity, 2020) The majority of these funds occur in the US and Europe, with the Asian companies attracting more conservative VC investment or relying on government investment.

Recent funding highlights:

Company	Country	Products	Founding Year	Total Funding (Round, USD)
Goodmylk	India	Dairy	2018	Seed: \$400,000
GoodDot	India	Chicken	2018	Seed: \$200,000
Phuturefoods	Malaysia	Pork	2019	Seed: \$750,000
Right Treat	Hong Kong	Pork	2018	-
Zhenmeat	Beijing	Pork	2018	Seed: \$700,000
Karana	Singapore	Jackfruit meat	2018	Seed: \$1.5M
Shin-Etsu	Japan	Binding agent	2020	-

Source: (HoSally, 2019) (JefferiesUniversity, 2020)

6.4 PE opportunities: What should investors care about?

Due to the competitive and largely B2C landscape of plant-based meats, investors are directing interest into B2B companies that can sell into a plethora of B2C brands. One example is Japan’s Shin-Etsu Metolose chemical is a binding agent to preserve the shape of plant-based meats when cooked. (The Good Food Institute, 2019) Investors are also seeking companies with technological sophistication, as the IP moat can provide resilience against more marketing-driven companies. A prime example is Impossible’s precision fermentation to create plant hemoglobins. Investors are also watching for companies that offer a unique angle such as healthier “clean label” products – a key challenge to plant-based meats – and companies targeting less-explored product types such as seafood.

7. SUMMARY

7.1 Summary of the subsectors

	Cultured Meat	Fermentation	Insect	Whey	Plant-based
Market size	20M by 2027 630B by 2040	\$3.5B in 2019	1.4B by 2026	7.4B in 2018 11.8B in 2025	12.1B in 2019
Projected growth	4% (2021-27) 16% (2030-40)	8% (2020-2026)	38% (2019 – 2026)	8.1% (2019-2025)	15% (2019-2025)
Investor type	Venture Capital	Growth Equity	Venture Capital	PE	Venture Capital
Average deal size in Asia	\$2.2-5M seed	\$1-1.5M seed	\$2M		700K
Reasons to invest	Closest to meat in taste, clean, slaughter-free	Proven technology, clean meat	Low footprint, healthier content	Growing Industry in Asia	Market familiarity and ease of entry
Things to pressure test	Time to commercial scale and cost, Social acceptance, Regulatory environment	Regulatory environment, technology advancement	Public perception of insect foods	Cost reduction, public taste	Tech behind the product, health of product, resilience against new entrants
Recommended geographies and targets	Singapore, Hong Kong	Singapore, India, Japan	Singapore, Thailand, Malaysia	China, India, Indonesia	Japan, Singapore, Hong Kong, China
Barriers to entry	Highest	Medium	Low	Low	Low
Production Cost	Highest	Low	Medium	Low	Medium-Low
Taste relative to real meat	Very close to meat	High	NA	NA	Medium
Availability (distribution)	Low and expected to take the longest	Medium	Medium	High	Medium-High
Consumer perception	Medium: Ethical but unnatural	High: Clean and natural	Very Low	High	High

We believe that the most attractive sub-sector to get into is cell-based meat. Consumer acceptance is arguably the most important evaluation criteria. While low today, consumer acceptance is expected to grow rapidly once there is greater access to cell-based meat. This is mainly due to its taste and texture and potentially nutrients composition being the closest to real meat. Other forms

of alternative proteins would find it difficult to match cell-based meat on this dimension. It is also slaughter-free, faring better than insect protein.

However, the path to commercialization, availability and regulatory support are all key barriers to cell-based meat truly becoming the future of meat. As such, investors are encouraged to be prudent when choosing targets to invest in. We recommend targets/areas with 1) cell culture technology that has broader applications than cultured meat to diversify risk and shorten time to returns, 2) B2B potential in cell culture media and bioreactors for greater scalability, and 3) operations that have faster commercialization potential and regulatory support.

7.2 Private Capital Value-Add

Funds add value by bringing a network of food partners to provide portfolio companies with expertise in strategy, R&D, supply chain, distribution/retail channels and navigating the legislative environment. Strategic FMCG partners/investors could lend credibility for the start-up and pave the way for a future exit. That said, this could also narrow the list of potential acquirers. Competitors of FMCG investors would be unlikely to acquire the company if proprietary technology is deemed to have been shared. Government partners also tend to be investors, and the fund can play an instrumental role in accelerating legislation for alternative proteins. Additionally, diversified investors can also help uncover synergies between portfolio companies.

For example, Lever VC (US/Hong Kong) is extremely active in the Alternative Protein space, having set up a China-dedicated fund to invest US\$28M over the next 4 years (Wang, 2020). Its partners include F&B giants COFCO and Yili Group, national industry trade group China Plant-Based Foods Alliance, and top global alternative protein ingredient and services companies Givaudan and Cremer (Gonzalez, 2020). To date, it has invested in >15 plant-based and cell-based companies covering a comprehensive menu of alternative meat, dairy and seafood products (Wang, 2020).

7.3 Exit opportunities

As of October 2020, we have not seen any public exits in Asia for alternative proteins company. Looking beyond Asia, a couple of exit options are available:

1. IPO: Beyond Meat successfully IPO-ed in 2019
2. Strategic sale to major FMCG companies: Players along the food production and distribution value chain are all potential exit options, from meat processors (e.g. Tyson Foods), to consumer brands (e.g. Nestle), to supermarket chains (e.g. Walmart), to restaurant chains (e.g. Starbucks) etc. For example, Brynwood Partners (US PE firm) sold Lightlife Foods to

Maple Leaf Foods, and a group of Dutch venture capital firms sold Ojah to Korys, the investment arm of the owners of a Belgian supermarket chain (Burwood-Taylor, 2 Plant-Based Alternative Meat M&A Deals Provide Exits for VC & PE Investors, 2017).

3. Sale to other investors: It is also possible to sell stakes to other investors should the investment horizon become too long for the investor. For example, Tyson Foods sold its stake in Beyond Meat to an unknown buyer right before Beyond's IPO (El-Bawab, 2019).

7.4 Conclusion: Concerns and advice for alternative protein sector

Investors seemed to be convinced that alternative proteins are here to stay and is transforming the future of food. With the increasing interests and expectations for alternative proteins to be a viable solution for growing demand of food supply, while it reduces environmental impacts from food production, the alternative protein industry has attracted increasing amount of funds to the industry in the last few years. Concern on food security raised by Covid 19 pandemic might accelerate the transformation even further.

Mattan Lurie from Hanaco Ventures compares the sector to the 1990s Dot com bubble where frothy valuations can lead to a major shakeout in the industry. Alexander Pestalozzi from Mueller Ventures echoes the concern of overvaluation and the consequent harm to LPs who may shy away from the sector, and consequently weaken it in the long run. (JefferiesUniversity, 2020) To prevent this from happening, investors should ground valuations in meaningful metrics such as repurchasing rate and carefully identify data sources. Investors should be cautious of bullish timelines: legislation for cellular based proteins cannot be predicted regardless of start-up promises and customer uptake of alternative proteins may be slower than predicted. Investors should also be careful to discern real technological innovation from marketing spin especially in the plant-based protein sector.

In reaching scalability and price competitiveness, alternative protein companies can gain significantly from shared infrastructure and government funding. Investors can assist in arranging partnerships between firms such as combining manufacturing facilities for optimized product formulation and distribution. Investors can partner with government accelerators in the structuring of shared infrastructure.

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