



THE ASIA ALTERNATIVE PROTEIN INDUSTRY REPORT 2020

green queen media

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NEW DECADE, NEW PROTEIN

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REPORT METHODOLOGY

This report is authored by Mackenzie Dion, Sally Ho and Sonalie Figueiras and published by Green Queen Media, the Hong Kong-based independent impact media platform whose online magazine Green Queen offers original news reporting on a wide range of sustainability and global health topics across Asia including the alternative protein industry.

The analysis in the report draws on both primary and secondary data collected by the Green Queen Media team including lead researcher Mackenzie Dion, who conducted over 35 one-on-one interviews and extensive discussions with stakeholders industry experts, entrepreneurs, investors, connectors, accelerators and government officials. Almost every founder of Asian plant-based, cultivated and whole food meat alternatives startups was consulted or interviewed about their experience.

The authors also attended several alternative protein industry events throughout Asia. Further, this report draws from a range of sources such as prior reports on alternative proteins, research from organizations like the U.N. Food & Agriculture Organization (FAO), and additional original reporting from Green Queen Media.

AUTHOR'S NOTE

We understand that Alternative Protein in Asia is nascent and evolves every day. We have done our best to make the report as up to date as possible, but we underline that this report is reflective of the industry as of January 31, 2020.

Further, for the purposes of this report, our geographic focus is on Asia specifically, and does not include any Pacific nations such as Australia or New Zealand.

Lastly, regarding the alternative protein startups that make up the subject matter of this report: our focus is on '2.0 companies' that are highly innovative, are pioneering disruptive technology and whose model is highly scalable, commercially viable in the medium term and whose mission is to fundamentally change existing global food systems. This report does not cover insect protein as it is not a slaughter-free choice.

EXECUTIVE SUMMARY

Asia is home to over half of the world's population and as a result, faces the greatest threat in terms of food insecurity and its associated social, environmental and economic challenges. Given that resource consumption, population growth, climate change and the looming disease epidemics will only continue to escalate, the region is in urgent need of innovation to with regards to sustainable mass protein production as a means to combat these issues.

Despite the region's vulnerability, the alternative protein industry in Asia is still in its very early stages, from product development to startup funding and consumer awareness.

While the available data implies that a majority of the Asian population are open to the concept of alternative proteins, consumers remain limited in their knowledge of the newest products and brands, not to mention more nuanced discussion of ingredient types and technology classifications. As of publishing date, there are just 22 Asian alternative protein startups that fit our criteria in terms of product quality, food technology and innovation. Of those 22, only 4 are cultivated protein companies, using lab-grown technology to create cellular-based meat, seafood and dairy.

Furthermore, Asian consumer appetites, cuisine preferences and food safety priorities in terms of protein consumption is vastly different to their Western counterparts. This has a range of implications for startups in the Asian alternative protein space, where business strategies and product development must be adapted to cater to regional demands and local requirements.

It's also important to note that at present, no Asian government has deemed cultivated animal protein safe for human consumption. This is on par with the rest of the world: as of publishing time, no government anywhere has done so. Although we do recognise the fact that the industry is still in its preliminary stages, the report finds that Asia will likely be the first geography where cultivated meat will launch on a large-scale basis and that there is a strong possibility that the first regulatory approval will come from Asia.

With its long history of more traditional plant-based meat products and the emergence of food tech startups tailoring products to suit local flavours such as ZhenMeat, China also stands as a likely candidate to drive alternative protein growth in Asia. This trend is additionally supported by the continued introduction of products from existing US food technology players such as Impossible Foods, Beyond Meat and JUST, all of whom are aggressively pursuing the China market after already launching in major cities such as Hong Kong and Singapore.

In a region where governments are already concerned about food security – given the horizon of a 5 billion strong population by 2050 at risk from the imminent threats brought on by climate change – as well as the fact that food safety is already top of mind, Asia is poised to dominate the alternative protein market globally.



It is the view of this report's authors that homegrown Asian alternative protein companies will overtake US and European brands thanks to a variety of factors as highlighted below, and simply due to basic demand: the region is home to over 4 billion people, with over 2 billion in China and India alone. Rising middle-class consumers are looking to make healthier, planet-friendly choices and are ready to jump on new and more sustainable proteins.

As the alternative protein industry takes off in the region and taps into the mainstream consumer market, we predict that local companies will be far more price competitive than industry players in the West, with lower per unit products costs. This is already underway in India, where plant-based leader GoodDot has achieved local price parity with meat, and is likely to be an important goal amongst a host of emerging startups across the region.

Further, Asian players cater to local tastes and cuisines. The success of Omnipork, the minced pork plant alternative created by the Green Monday group, must be highlighted. The ground pork imitation product, which was specifically designed for Asian cuisine applications such as dumplings, is now available in over 7 countries across the region and served in both high end Michelin-star restaurants and fast food chains alike.

The group recently shared that since launching with Taiwan's largest QSR chain Bafang Yunji in January 2020, they are selling over a million Omnipork dumplings per week, which would mean over 52 million annually in one country alone. This effectively dwarfs the much-advertised success of US players such as Impossible Foods (13 million burger patties between 2016-2018 total) and Beyond Meat (25 million burger patties as of January 2019).

Lastly, the logistical costs of producing locally makes far more sense from a carbon footprint point of view, not to mention lower manufacturing costs thanks to cheaper labour and more favorable commodity prices. GoodDot is produced in India, Omnipork in Thailand, ZhenMeat in China and Unlimeat in South Korea (from upcycled otherwise wasted grains) and all of them are priced far more competitively than US & European equivalents.

Despite challenges such as access to funding and a consumer base that is still hungry for conventionally produced food, Asia-based entrepreneurs are doing their part to address the growing need for meat, seafood and dairy alternatives, both in the plant-based arena and on the cultivated or cell-based front, it's clear that this growing industry is already off to a promising start.



IMPORTANT DEFINITIONS

This report looks at three categories of four technology startups growing in the alternative protein space: Cultivated, Plant-Based, and Whole Food Alternatives.

CULTIVATED PROTEIN

Cultivated protein is produced from small samples of animal cells grown in nutrient-rich environments (e.g. cultivators or bio-reactors) that enable the same biological process as if the cells were inside an animal and results in the same meat/seafood tissue and dairy. Cultivated food is most likely to be a key part of our future global food system but currently the technology is in its infancy (the first lab-grown

PLANT CULTIVATION VS MEAT CULTIVATION

Start with a small cutting from a plant



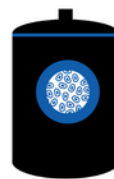
Start with a small sample of cells from an animal



Place cutting in a nutrient-rich environment that allows it to grow



Place sample in a nutrient-rich environment that allows it to grow



Enjoy your vegetable. Bon appétit!



Enjoy your meat. Bon appétit!



Source: The Good Food Institute





meat burger was trialed in 2013) and not ready for mass deployment due to high production costs and a lack of any regulatory framework/consumer testing. Nevertheless, costs are falling every day. Cultivated protein is undoubtedly a game-changing technology for obvious reasons: slaughter and cruelty-free animal meat products would be of great appeal to most consumers.

PLANT-BASED PROTEIN

Plant-based protein products are produced from various plant-based ingredients (most notably soybeans, peas and mushrooms) and processed in a way that replicates the taste and texture of meat. While plant-based protein alternatives have existed for a long time, especially in Asia where there is evidence of their use in culinary traditions as early as the 10th century, the new wave of plant-based alternative startups are utilising more modern technologies to create novel products that mimic the experience of eating meat with unprecedented accuracy and parity. This makes them different to plant-based protein replacements, such as tofu and seitan. The appeal of these products lies in their uncanny ability to replace animal meat and seafood without making use of any animal ingredients, thus offering both omnivores and vegans tasty realistic alternatives that have a much lower carbon footprint. These products are proving to be extremely popular with fast food operators and chains, who are able to offer customers plant-based diner-style menu items on a large-scale.

WHOLE FOOD PROTEIN ALTERNATIVES

Whole food protein alternatives are existing plant or fungi ingredients that can serve as a protein source or replacement for meat or seafood products from a textural and culinary point of view. Popular choices include jackfruit, lion's mane mushrooms and king oyster mushrooms. While these cannot be said to mimic animal ingredients entirely, their appeal lies in their health-forward qualities, including requiring little to no processing, and a short and mostly whole food plant-based ingredient list.

T

THE PROTEIN PROBLEM

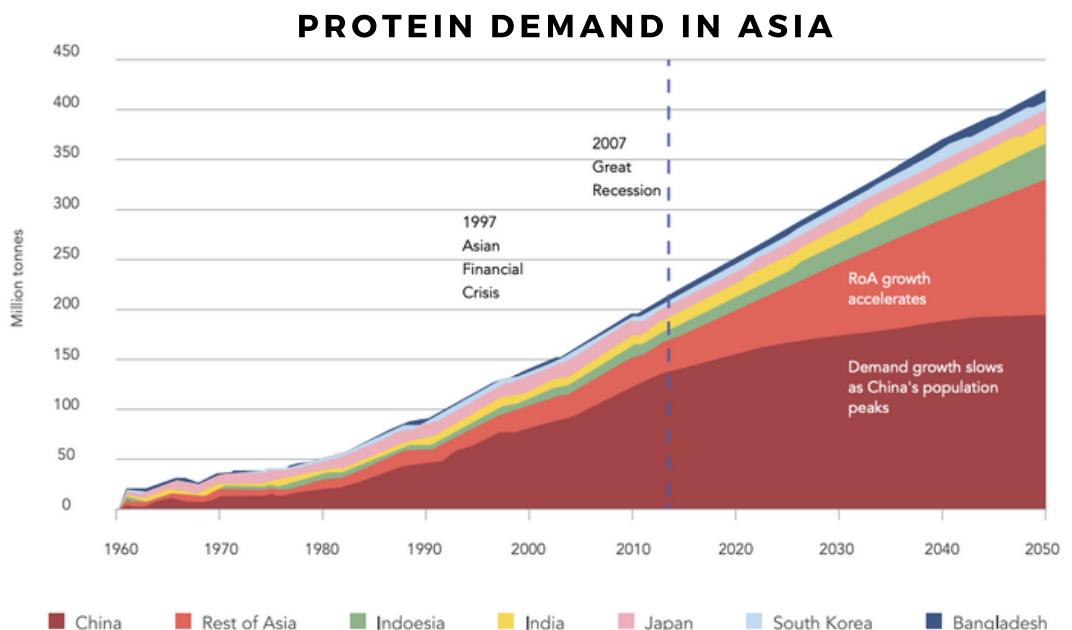


INTRODUCTION

This report seeks to provide a comprehensive overview of the alternative protein industry across the Asian region, highlighting important players including food technology startups, industry associations, key events, and funding organizations.

Entrepreneurs across the world and in Asia are developing products to sustainably feed a growing appetite and budget for meat, which at its current rate and structure, will lead to a range of system-wide social, environmental and economic problems.

With its sheer size and rapid population growth, Asia will usher in a huge increase in the demand for protein consumption. The future for Asia will be made up of 5 billion human beings, a large number inhabiting urban areas in the continent that will make up two-thirds of the world's share of megacities, driving over two-thirds of the global economic growth. But figures of its size aside, Asia is also the world's most ethically, linguistically and culturally diverse region of the planet – with many of these traditions standing in vast contrast to practices familiar to the Western world. With billion of humans to feed, rapid development and significant cultural differences, the region's current food system is simply not ready to take on the inevitable challenges that Asia will face.



Source: Asia Research & Engagement, FAO Statdata World Bank, OECD ARE estimates(2013 onwards)

ASIA'S GROWING APPETITE

Asia is the most populous continent in the world. By 2050, more than 5 billion people will live in the region – and as a result, animal protein consumption in Asia is expected to rise dramatically. This will have global ramifications on our already-strained global food system, posing clear risks and burdens for people, the economy and our planet. According to Asia Research & Engagement's report titled *Charting Asia's Protein Journey*, meat and seafood consumption in Asia will rise 78% by 2050.



In China and India, the two most populous countries within Asia, the intake of beef and mutton, the most environmentally-taxing meat products with the highest carbon footprints, will see a 110% and 138% rise respectively. Overall, the two countries are expected to consume 360 million tonnes of protein by 2025, a doubling of the figures in 2000. Looking at the landscape in Southeast Asia, research from the United Nations Food & Agriculture Organisation (FAO) indicates that the demand for poultry in the region will undergo a massive 725% growth from 2000 to 2030.

So what does this predicted landscape mean for the future of animal agriculture, the protein industry and our global food system? In addition to the ecological need for sustainable protein, Asian countries will need to battle the issue of hunger, with 67% of the world's hungry population calling the continent home. The reality is that Asia's ecosystems are struggling

ASIA IN NUMBERS



5 **67**
BILLION **%**

**ASIA'S POPULATION
BY 2050**

**OF THE WORLD'S HUNGRY
LIVE IN ASIA TODAY**

360 **78**
MILLION **%**

**TONNES OF PROTEIN
CONSUMED BY INDIA &
CHINA BY 2025**

**RISE IN ANIMAL
PROTEIN
CONSUMPTION BY 2050**

to sustain increasing animal protein production. Considering the damage traditional animal agriculture inflicts on the planet, from fuelling our climate crisis to driving the massive loss of biodiversity, relying on food imports is not a viable long term option.

THE INEFFICIENCY OF ANIMAL PROTEIN

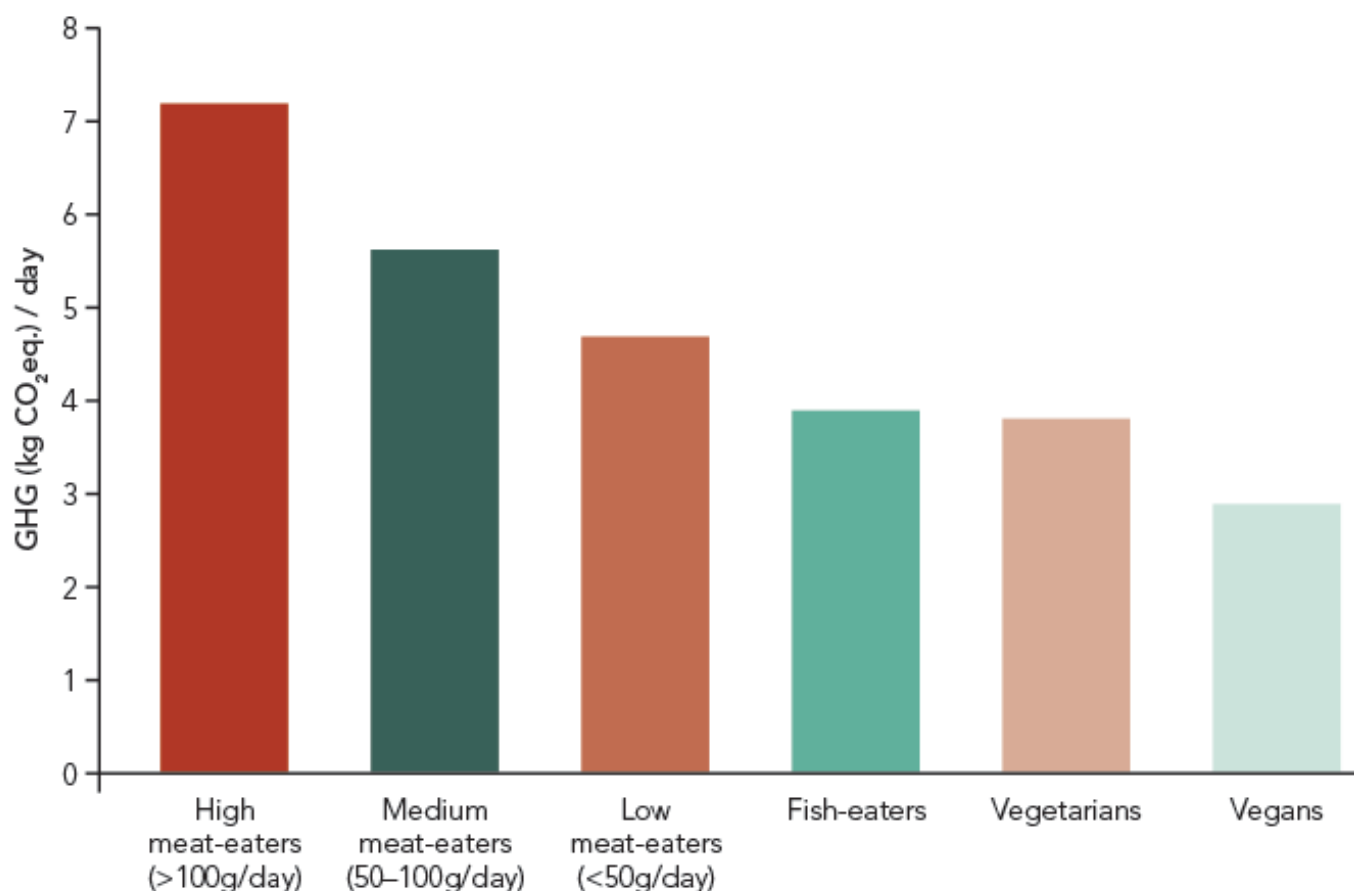
The multitude of burdens that the current system of protein production generates is phenomenal. Firstly, we can look at the inefficiency of animal protein. Animals are extremely inefficient in converting feed to protein. Poultry, which is already the most efficient out of the land animals commonly consumed, requires around 9 calories of feed to produce 1 calorie of meat for human consumption. Beef, on the other hand, requires anywhere from 25 to 40 calories to produce just 1 calorie of meat.

THE COST OF EATING MEAT

Throughout the process of animal production, vast amounts of land and water are required to meet the needs of a cycle of cattle ranching and feed cultivation. Around 98% of the livestock industry's water usage can be attributed to the water necessary to grow feed to raise animals. Globally, the growing appetite for beef is helping to drive the deforestation crisis in the Amazon rainforest. Farmers are continually setting fire to clear forests for the cycle of cattle ranching and soy feed cultivation. In turn, this practice destroys vast amounts of arable land, stripping it of its biodiversity and threatening species that originally inhabited the land to extinction. In fact, animal agriculture is the top driver of habitat loss.



GREENHOUSE GAS EMISSIONS (GHG) OF REAL LIFE DIETS IN KG OF CO₂



Source: FoodSource UK; Scarborough et. al. 2014

Researchers at the University of Oxford calculated the greenhouse gas emissions of varying diets. They found that even medium meat-eaters generate over twice the daily dietary carbon footprint compared to vegetarians.

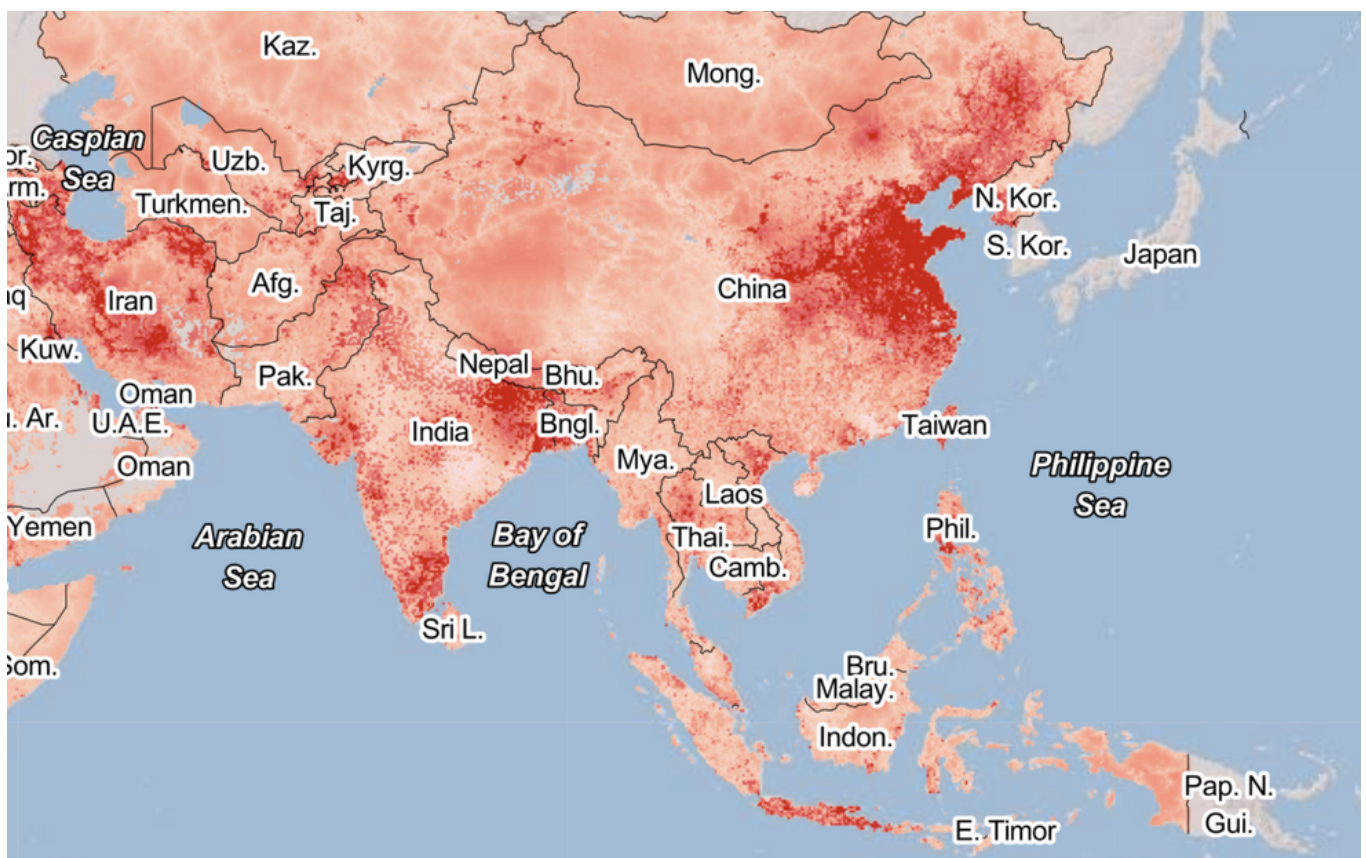
Animal agriculture is a top carbon emissions contributor, generating 18% of global greenhouse gases, which is more than the footprint of all transportation combined. The industry is therefore driving our planet's climate crisis and record-shattering temperatures. While many Asian populations have relatively low per capita meat consumption, particular areas and regions do exceed global averages, such as Hong Kong. Due to Hong Kong's increasing demand for meat and dairy, the city ranks as the 7th highest emitter per capita amongst 113 regions, according to a University of Hong Kong (HKU) Earth Science study.

ANTIBIOTICS & THE RISE OF THE SUPERBUG

The rise of antimicrobial resistance is yet another negative consequence of the animal protein industry. Currently, 75% of the global supply of antibiotics is fed to livestock. Coupled with rising demands for meat, the use of antibiotics in agriculture shows no sign of stopping. According to a study published in Proceedings of the National Academy of Sciences of the United States of America (PNAS), antimicrobial use will increase 67% by as soon as 2030. This threatens to render our modern antibiotics ineffective as antibiotic resistant bacteria becomes pervasive in animal agriculture.

The current model of tackling antibiotic resistance is to simply create new ones, but this has proven unsuccessful, with the World Bank estimating that such an approach could inflict over US\$100 trillion in losses from sources like livestock declines and increases in poverty.

MAP OF ANTIMICROBIAL RESISTANCE (AMR) IN ANIMALS HOTSPOTS IN CHINA & INDIA



Source: Resistance Bank

THE PUBLIC HEALTH COSTS OF HIGH MEAT CONSUMPTION

Meat consumption itself places key pressures on public health services due to its unhealthful impacts on the human body. According to the World Health Organisation (WHO), processed meat is a Group 1 carcinogen next to tobacco smoking and asbestos, and red meat is classified as “probably carcinogenic”. In addition to its relationship to different types of cancer, meat consumption has been associated with an increased risk of cardiovascular diseases, which is the leading cause of death in the world. Scientists across the board have emphasised the importance of a plant-centric diet and minimising animal protein sources to reduce the risk of cardiovascular diseases.



Reducing meat consumption has been repeatedly stated as a solution to ease the burden on global public health. *The Lancet Medical Journal* published the *Eat-Lancet Commission* on healthy diets from sustainable food systems, which outlines the ideal diet that would be instrumental in reaching the UN Sustainable Development Goals. The authors find that achieving a healthy diet by 2050 would require at least a 50% reduction of “unhealthy foods”, which includes red meat. They also recommend increasing healthy foods intake such as vegetables and legumes by 100%.

WATER SCARCITY THREATS

As the demand for meat-based protein rises, vital resources such as soil and freshwater are depleted, further exacerbating the impacts of climate change and threatening agricultural yields. India, for instance, is predicted to become one of the 17 countries that will soon run out of water, which will severely inundate the country's yields of key crops, such as bananas and rice. The UN estimates that over 5 billion people may experience water shortages by 2050. This will drive price volatility and affect the food security of many Asian megacities, such as Singapore, Jakarta and Hong Kong, which are currently heavily dependent on imports for their food supply.

GLOBAL EPIDEMICS

The FAO reports in World Livestock 2013: Changing Disease Landscapes that 70% of new human diseases in recent history have originated from animals, with animal agriculture being listed as one of the industries contributing to the increased threat.

Ren Wang, the FAO Assistant Director-General for Agriculture and Consumer Protection at the time of publication said that we are at a time when “livestock and wildlife are more in contact with each other, and we ourselves are more in contact with animals than ever before.”

While there are a number of cases of the recent novel coronavirus outbreak (COVID-19) that have shown no links to the seafood market in Wuhan where exotic animals are also known to be traded, a large number of people do appear to have contracted the disease at the city's wet



market, inviting questions surrounding the role of livestock meat and the wild animal meat trade in disease epidemics. All of this means that our current global food system must undergo a dramatic transformation if we are to avert multiple health, environmental and physical crises. A core part of this solution is to change the way we obtain our protein. If we are able to produce protein from new alternative sources, a vast amount of food and natural resources that would otherwise be devoted to feeding livestock to be killed for meat could be unlocked.



2

MARKET OVERVIEW

FEEDING ASIA

Asia is comprised of 38 countries, each possessing its own rich and diverse culture, cuisine, culinary traditions and consumption habits.

While this report covers key material trends across the region and seeks to offer a comprehensive overview of the Asia-wide alternative protein industry. It is beyond its remit to offer in-depth analysis of each country. The authors seek to underline that in order to adequately understand what is needed to tackle the gargantuan task of sustainably feeding Asia, it is important to recognise each countries' distinctions and specificities.



Beyond the role that food plays within the cultural fabric of each Asian nation, other factors such as average per capita income and economic development stages must also be taken into consideration. According to the most recent (2018) World Bank Data, GDP per capita US\$ 11,142.6 for East Asia & Pacific, and US\$ 1,902.9 for South Asia. Purchasing power, though growing, is still limited, especially as compared to Europe and the US where the alternative protein industry is far more developed. There are outliers: Singapore's GDP per capita stands at US\$ 64,581.9 and Hong Kong's at \$48,675.6.

Perhaps unsurprisingly, the majority of the startups covered in this report are located in one of two geography types: the economic and populations behemoths where governments and entrepreneurs are driven by significant food safety and food security issues to promote the alternative protein industry (China and India); and cities where there is significant access to resources including funding, accelerator programmes, as well as consumer markets that are ready for alternative protein (Hong Kong SAR and Singapore). There are also developments taking place in Japan, South Korea, Malaysia, and the Philippines.

While most of the 38 countries and regions across the continent do not have any homegrown alternative protein startups, some of these such as Thailand, Taiwan and Macau, already have access to global and Asian alternative brands such as OmniMeat, Beyond Meat and JUST thanks to the rapid expansion of ecosystem players such as Green Monday, whose distribution channels have already reached 8 territories. This will not only encourage Asian consumers to embrace alternative protein products, it will work to inspire local entrepreneurs to start alternative protein ventures. We can therefore expect to see the emergence of a wave of new food tech startups over the next few years.

ASIAN MARKET SIZE

The alternative meat market is growing rapidly and several analysts have made optimistic predictions for its future. Whilst Barclays estimates that the alternative meat market will grow from 1% of the global market share in 2019 to 10% in 2029 with US\$140 billion in market share, AT Kearney predicts that up to 60% of meat could be alternative proteins by 2040, with cultivated meat comprising 35% and plant-based meat 25%. Experts at Euromonitor International, on the other hand, suggest that the plant-based meat substitute market is set to hit US\$15.8 billion this year. Although estimates on the alternative meat market in Asia varies across the board, most analysis concludes that Asia's demand for plant-based and cultivated substitutes to conventional animal protein is the uptrend, and that growth will be major and rapid.



Despite the fact that the majority of noise surrounding rising consumption and new protein alternatives is focused on meat, Asia's market has an added dimension: the demand for seafood. Globally, seafood consumption is on the rise, and is projected to jump 21% by 2025 to 178 million tonnes – but of this growth, consumption in Asia will be responsible for 73% of this increase, taking over more than two-thirds of the available seafood supply in the world. This presents an additional opportunity sector for alternative protein industry growth in Asia, and entrepreneurs in the region are indeed already pioneering their own solutions. Just in Southeast Asia alone, new vegan and vegetarian product launches have increased by 440% since 2016, and of the sample of home-grown cultivated food tech startups, half of them are focusing on developing cell-based seafood.

3

FUNDING CHALLENGES



One of the key challenges that all the startup founders we interviewed highlighted was the difficulty they face fundraising in Asia.

Silicon Valley is alight with announcements of large ticket funding rounds – Impossible Foods recently announced a US\$ 300 million Series E – but here in Asia, we have yet to see even a single series A announcement for a local company.

The general sentiment is that investors in Asia tend to be more conservative than investors in other innovation hubs such as Silicon Valley. Given that the alternative protein industry is, relatively speaking, still in its infancy, especially on the cultivated meat and seafood front, Asian investors are playing a wait-and-see game. A few founders told us that their sense was that Asian investors prefer to see traction before signing terms sheets, and appear to be waiting for the nascent industry to prove itself first. In addition, there are still relatively few large VC firms that are currently dedicated to or providing major financing to alternative protein startups.

Many of the startups we spoke to are in their pre-seed or seed funding stage, with only a handful of them having publicly announced any major rounds and/or investors.

ASIA FUNDING HIGHLIGHTS

- **Goodmylk**, India's plant-based dairy alternative company, was lauded for the US\$400,000 seed investment made by Texas angel Stephen Sturdivant in early 2018 as founder Abhay Rangan was only 21 years old at the time.
- India-based **GoodDot** (who also operate GoodDO vegan food kiosks) raised a US\$200,000 angel round in April 2018 for their meat alternatives.
- Japan's **Integriculture** received US\$2.7 million in seed funding in May 2018 to build a commercial cellular ag plant. The round was led by Real Tech Fund, a Japanese government fund (demonstrating their interest in the cell-based sector) and Sony Computer Science Laboratories CEO Dr. Hiroaki Kitano.
- South Korea's plant-based mayonnaise maker **The PlantEat** raised US\$1.34 in seed investment in January 2019 led by Bridge Ventures, Lotte Accelerator and Future Play–KDB Capital.
- Singapore's **Shiok Meats** closed US\$4.6 million in seed funding in April 2019. This was notable for a variety of reasons: it was the first major funding news for Asia's cultivated protein industry (there are currently only 4 companies on record), it's the first women-founded team in the alternative protein space to receive such a sum and it's the largest round for any alternative protein company in Asia. Investors included Big Idea Ventures, Monde Nissin (owner of Quorn), LSE-listed Agronomics. Shiok is currently looking to raise a US\$15 million series A round.
- Hong Kong's **Avant Meats** announced a small pre-seed round in early 2019 featuring Lever VC, CPT Capital and Loyal VC and the cultivated seafood startup is currently looking to raise a US\$3 million seed round.
- Malaysia's **Phuture Foods** received US\$750,000 in March 2019 in a seed round that included food tech accelerator Brinc and Artesian Capital for their plant-based pork alternatives.
- Singapore's **TurtleTree Labs** completed a pre-seed funding round, backed by Lever VC, K2 Global and KBW Ventures in January 2020, though the exact amount was undisclosed.

VENTURE CAPITAL

It's worth noting that while Asia-based startups have difficulty finding investors, many large Asia-based investors are investing heavily in US-based alternative protein companies. Li Ka-shing's Horizons Ventures and Singapore government backed Temasek Holdings, both of whom have invested in Impossible Foods and plant-based egg maker JUST.

Asia is also home to Lever VC, Big Idea Ventures, Bits x Bites, Dao Foods and Green Monday Ventures, all of which focus specifically on alternative proteins. Other funds that are strongly eyeing the sector include ID Capital, VisVires New Protein, AgFunder, TPG, Omnivore Partners and Artesian Capital amongst others.

The remarkable success of Beyond Meat's 2019 IPO, which was the best-performing IPO of companies that have raised at least \$US200 million since 2000, has piqued the interest of Asian investors from across the spectrum of portfolios, with many investors across the region looking to start including alternative protein companies in their portfolios.

ACCELERATORS

For early stage startups, Asia offers a few notable food tech focused accelerator programs, which are listed in the annex. In general, the region lacks food-focused accelerators, whilst dedicated alternative protein programmes within ag-tech programmes are more prevalent. That being said, the few programmes that exist do offer alternative protein entrepreneurs strong networks, R&D resources, access to investors and partnerships with large-scale distribution conglomerates.



CASE STUDY

ACCELERATOR - BRINC

Since 2014, Brinc has run various accelerator programmes in several countries including Hong Kong, China, Spain, and the Middle East, most of which have focused on technology sectors such as hardware, drones and IoT. Launched in September 2018 and based in Hong Kong, the Brinc Food Tech Accelerator Programme was the region's first dedicated alternative protein programme. This programme is a signal to investors about the importance of the industry and the need for funding support for Asian food tech entrepreneurs. Brinc offers all the benefits of a traditional accelerator, but has in addition several unique initiatives such as its partnership with JUST, an alternative protein startup based in Silicon Valley best known for its plant-based egg substitute made from mung beans. It is also worth noting that CEO of JUST Josh Tetrick once told a reporter that he wishes he had built his first manufacturing plant in Asia, a signal of the bullish trend for Asia's burgeoning alternative protein industry.



Partnership with JUST

When US-based food tech startup JUST was in its initial research and development stages, the company developed a vast IP library of plant-based ingredients. JUST has since focused primarily on its plant-based egg. Startups participating in the accelerator can access JUST's resources and collaborate with its R&D team. The partnership promises to help startups avoid mistakes and even cut their R&D budget in half.



One of the reasons that a lot of the teams choose to join Brinc is because we have boots on the ground, not only in Hong Kong, but also in China across the Greater Bay Area.

- Manav Gupta, Brinc CEO & Co-Founder

Market testing in China

Brinc leverages its expertise and existing networks in China to help startups expand successfully into the historically challenging market. For example, Brinc helps startups test versions of their products in various markets partners with online retailers in China. Crowdfunding platforms are very popular in China where consumers can help fund a product by pre-ordering it, which then gets delivered to them directly. Brinc works with startups to test products and branding across several platforms to gauge interest,



“

I don't think consumers are going to walk in the doors of restaurants and say 'I want the alternative pork, or fake pork.' They are going to walk in a look for the brand in their purchasing decisions.

- Manav Gupta, Brinc CEO & Co-Founder

receive pre-orders, and iterate before their official retail launch. CEO of Brinc Manav Gupta emphasizes that Chinese consumers are brand driven. Beyond the product itself, Gupta is adamant that alternative protein startups have to create strong brand equity in order to win over Chinese consumers.



SPECIAL FEATURE

THE CHINA STORY

As the most populous country in the world and the nation with the highest total meat consumption globally, China's demand for protein will reverberate throughout the global economy and ecosystems.

Currently, China already possesses a large ecosystem of home-grown plant-based meat companies. However, the majority of these companies are not utilising high-tech methods of production, product innovation and recipes that characterise the most well-received plant-based meat startups. A few traditional plant-based meat companies are evolving over time to meet these new standards, such as Whole Perfect Food, also known as Qishan Foods, while other startups are emerging with product ranges catering specifically to Chinese palettes, such as Zhenmeat.

Chinese scientists have recently produced cultivated meat, but there are currently no cultivated protein companies based in mainland China. In 2017, the Chinese government signed a US\$300 million trade agreement with Israel to partner with Israeli cultivated meat companies, which reflects moves from the authorities to reduce its citizens' conventional meat consumption.

“

China has food safety, food security, water quality, water scarcity issues and a colossal antibiotic resistance threat, all while wanting to be the leader on climate change. And this is the solution to all of those issues.

- Bruce Friedrich, Good Food Institute Executive Director

CHINA IN NUMBERS



28%

China is responsible for 28% of the world's meat consumption (RaboResearch)

550M

China's middle-class population will reach 550 million by 2022, 1.5 times the size of the population in the United States (McKinsey, 2013)

#1

Chinese consumers listed food safety as their top consideration, above price concerns (Ecolab, 2015)

41KG

Chinese people consume on average 41 kilograms (90 lbs) of fish per capita annually, double the global average (FAO, 2018)

44%

The use of antimicrobials in meat & seafood production in China is expected to increase 44% by 2050, and will be responsible for over 91% of antimicrobial use in Asia's food system (ADMCF, 2018)

\$11.9B

China's plant-based meat market is already worth US\$9.7 billion and will grow to US\$11.9 billion by 2023 (Euromonitor, 2019)



The extent to which the Chinese government promotes the reduction of meat consumption has been misinterpreted in Western media. The majority of articles that focus on meat consumption or the launch of plant-based products in China frame the 2016 Chinese Dietary Guidelines as government-mandated outcomes. These guidelines provide dietary recommendations by food groups for Chinese citizens, and the most recent edition halves recommended meat consumption. In actuality, these recommendations are not bound to any policy and infrequently impact the life of average Chinese citizens. While the change in guidelines remain very positive for the new protein movement, it should not be overplayed, as the policies have not reflected a consumption-driven desire to significantly cut meat consumption.

Regarding the plant-based supply chain, China has the capacity to be a major supplier in a global shift toward more plant-based proteins. According to the Good Food Institute, 70% of global soy protein isolate is processed in the Shandong Province of China. Because soy protein isolate is often the main protein ingredient in plant-based meat products, China's production capacity for the crop makes it a major manufacturing player to supply the growing demand for plant-based meat ingredients.

CASE STUDY

SUCCESS STORY - STARBUCKS

The Chinese market is difficult to enter, and many successful companies have failed or encountered challenges throughout the process. However, American coffee brand Starbucks has bucked the trend – the brand has not only successfully launched in the country, but have plans to expand to 5,000 locations across the country by 2021. This comes despite the fact that coffee is atypical to the average Chinese diet, as tea drinking was, and still remains a deeply embedded part of Chinese history and traditional culture. Although alternative protein and coffee are different products, Starbucks' strategy can provide comparable insights into effectively introducing novel and foreign products that require behaviour and cultural adjustments for mass consumer adoption.



Helen H. Wang, author of *The Chinese Dream: The Rise of the World's Largest Middle Class and What It Means to You*, broke down Starbucks' China success in her article *Five Things Starbucks Did to Get China Right*. In summary, Starbucks created demand, used local flavours, didn't try to threaten pre-existing culture, crafted a premium experience, emphasized its Western origins, implemented global branding, and forged local partnerships. Starbucks also took a long-term approach, which involved investing in employees and being patient with the market.



If Impossible, Beyond, and similar companies are establishing themselves as cultural phenomena in the Western world quickly, then I think this can translate to success in Asia. It's a direct analogy to Starbucks.

- Michal Klar, Future Food Ventures CEO

Localizing Starbucks' products for Chinese palettes linked an iconic Western brand with familiar menu items. Starbucks focused on selling an aspirational story and experience to younger consumers – the demographic most interested in plant-based and cultivated protein.

All of these approaches can be adopted to plant-based protein strategies. The challenge for alternative protein companies, more specifically plant-based meat products, will be to balance aspiration and accessibility while decoupling vegetarianism from the concept of economic struggle.

INCREDIBLE INDIA

With the world's highest rate of vegetarianism, India is often overlooked in the global calls to transition into a plant-based food system. Yet, India's vegetarian demographic is in decline. As the soon to-be most populated country in the world, India is predicted to reach 1.5 billion people by 2027, making the need for sustainable protein crucial. In a poll, around 71% of Indians reported that they are not vegetarian, and this number is predicted to rise over the next 30 years, which will mark the biggest percentage jump in animal product consumption of any region in the world. Coupled with projected economic development, the country is set to have the largest GDP in the world, which means that even slight rises in meat consumption will pose major consequences for the environment and global food system.

There is only one cultivated meat startup in India, but there are a few plant-based meat companies facing challenges that are unique to Indian culture. For example, a product claiming to imitate meat and or using the word "meat" may be unappealing or confusing to lifelong vegetarians and India's population, of which 80% are Hindus who do not consume beef. Products that biomimic beef, such as the plant-based products made by Impossible Foods and Beyond Meat, may therefore be too "meaty" and are packaged and marketed in a culturally inappropriate way. Currently, the most common meat alternatives for vegetarians in India are paneer, a dish prepared in Indian cuisine that resembles tofu and soya chunks.

There are encouraging signs for the cultivated meat industry in India. In 2019, the Indian government granted US\$640,000 to two research centres for cultivated meat research. Aside from funding, there is an increasing appeal of alternative proteins to Indian consumers stemming from the negative impacts of environmental issues and climate change, which the country is

experiencing with rising intensity. For instance, roughly 600 million people in India already face acute water shortages.

The demand for alternative protein sources will also be driven by a combined interest in nutrition. Protein content is of particular interest to Indian consumers, which has driven up the popularity and doubled the number of products launched in India that are marketed with added high-protein claims. Beyond more affluent Indians purchasing new proteins, accessible and affordable new protein sources pose significant benefits to public health, especially in light of the figures that 73% of Indians are protein deficient and an estimated 50% of children in the country are underweight.

India is still very data dark, so many of the insights about Indians and the market for new protein are taken from interviews with experts, entrepreneurs, and everyday people.



CASE STUDY

STARTUP - GOODDOT

GoodDot is India's largest plant-based meat company, producing a range of plant-based meats and pre-made vegan meals crafted for Indian cuisine. GoodDot's strategy is different from other leading plant-based meat companies that often launch with high-end chefs and well-known restaurants. The company launched with RCM, a multilevel marketing grocery chain with locations all over India, whose target customer market is low to mid-income. It's worth noting that GoodDot products can be found at some of India's five star hotels as well. Currently sold exclusively in India, GoodDot's products, a selection of which are shown in the below photo, will be available in Canada in early 2020.



GOODDOT STRATEGY

TASTE: While GoodDot's products are affordable, the GoodDot team is clear that taste must be prioritised to make veganism mainstream in India and appeal to even lifelong meat eaters.

AFFORDABILITY: From its inception, affordability has been one of the top strategies employed by GoodDot, and they have achieved price parity with meat for several products.

SHELF STABILITY: All of GoodDot's products are shelf stable, meaning that they can be kept without refrigeration, a key consideration as only around 30 percent of Indians have refrigerators in their households (National Family Health Survey, 2015/6). In this context, combined with affordability, GoodDot's products offer an advantage over meat for Indians of all budgets.



India is primed to be one of the largest markets for plant-based meat in the world. With the critical elements of taste, price and convenience embedded in our products, team GoodDot is uniquely positioned to mainstream plant-based meat products.

- Abhishek Sinha, GoodDot CEO & Co-Founder

GoodDO is GoodDot's sister company, born out of the founders' realization that many Indians remain unfamiliar with preparing and cooking plant-based meat products. GoodDO is a vegan QSR chain featuring plant-based versions of fast food staples, such as fried

chicken, burgers and other popular Indian dishes. GoodDO outlets use GoodDot's plant-based meat products in their dishes, and they sell packaged GoodDot products that customers can prepare at home.

GOODDO PRICING VS. CONVENTIONAL FAST FOOD



GoodDO Fried Crispies "GFC" Rs. 149 (US\$ 2.09)



KFC Me Bucket Rs. 238 (US\$ 3.33)



GoodDO Patty Gurber Rs. 99 (US\$ 1.39)

VS



McDonalds McChicken Rs. 117 (US\$ 1.64)

Source: Green Queen Media, GoodDO, KFC India, McDonalds India

GoodDO currently operates 12 kiosks across 3 cities and has plans to open 50 outlets by the end of 2020. They aim to be in all of the major Indian cities as well as several international locations. One of the highlights is that several GoodDO dishes are already lower priced than their fast food equivalents. For instance, in Mumbai, GoodDO's Fried Crispies cost less than a similar dish at KFC, and GoodDO's Gurber is cheaper than McDonalds' McChicken Burger.

According to GoodDO, about ⅔ of its Mumbai customers identify as meateaters.



CASE STUDY

CONNECTOR - GOOD FOOD INSTITUTE (GFI) INDIA

The Good Food Institute (GFI) is a non-profit at the centre of the alternative protein movement. GFI helps establish the plant-based and cultivated meat industries through a plethora of avenues such as supporting research, working with entrepreneurs, and advocating for policy change with teams across the globe. Outside of the United States, GFI's largest team is in India, where the Mumbai-headquartered organisation is conducting essential groundwork to build the infrastructure for the country's alternative protein movement. Their work includes supporting the growth of innovative food processing and the talent pool. The GFI-India team hopes to provide a template for alternative protein growth in other regional countries that have similar economies and consumption patterns.



We founded the [GFI] India office because it's an opportunity for what's known as counterfactual impact, wherein if you didn't exist, there would be no impact. The market side isn't something that we have focused on for the first year and a half. We have focused on the science and policy side, and India has [now] done a lot of investment in this area.

- Varun Deshpande, Good Food Institute India Managing Director

GFI India Project Mission

- Setting up value chains for indigenous crops as ingredients in plant-based meats. Curating an open access database with agronomic information on growing a diverse array of crops that can be used in plant-based foods.
- Working with existing industries to support the alternative protein ecosystem. For example, GFI hopes to harness India's manufacturing potential, especially within the country's existing major pharmaceutical and fermentation industries, in order to help meet demand for cultivated meat.
- Promoting research and commercialization of cultivated meat products in the country.
- Organizing the Future of Protein Summit, which takes place in New Delhi.



MEAT CONSUMPTION AS A SYMBOL OF WEALTH IN CHINA AND INDIA

Research has found, and is commonly accepted, that meat is symbolic of higher socioeconomic status. Individuals in low-income countries where meat consumption may be a commonly-held status symbol will therefore purchase greater amounts of meat when given the opportunity.

One of the supporting theories that visualizes this logic is Bennett's Law. According to Bennett's Law, people tend to shift from eating mostly carbohydrates to a more diversified diet as income increases, with increased meat consumption being a major component in this shift. Applied to developing economies, meat is typically a more expensive food product because cold storage supply chains may not be widespread and meat production may not have reached industrial scale. This means that when people gain access to meat through both income increases and market development, their choice to eat meat may go beyond desire for the product itself.

Of course, this increase in meat purchasing is in no way only attributed to class indicators, as the taste and culinary range of a product takes precedence. However, newfound access to meat is often a celebration of economic progress. For example, before beef was affordable in China, it was commonly referred to as "millionaire's meat". Similar ideas can be found across other countries and different types of meat, such as the custom for a whole roasted pig to be served at Chinese weddings and large celebrations, a practice that has picked up momentum throughout a number of Asian countries.

Altogether, this means that as the region's economy continues to undergo rapid development, particularly in the populous countries of China and India, the corresponding predicted increase in meat consumption will have a massive environmental impact and pose additional strains on our food system.

4

**MEAT CONSUMPTION
CULTURE**

ASIA IN NUMBERS

49

COUNTRIES

157

CITIES

2,300

LANGUAGES

44.5

MILLIONS SQ. KM.

60%

GLOBAL POPULATION

13

MAJOR CUISINES*

* & dozens of regional cuisines



DIFFERENCES WITHIN ASIA

Asia is an incredibly diverse continent, especially when considering the plethora of cuisines and their role in different cultures and traditions. Yet, there are some key differences in the ways Asian populations consume and think about food, a consideration that is highly relevant to the growth trajectory and strategies of alternative protein players.

MEAT PREPARATION

As Asian cuisines utilise more diverse methods of preparing meat than most Western styles of cooking, the typical ground or minced form that most plant-based meats and cultivated meat prototypes may not be appealing to all consumers. This is why some new protein startups in Asia are using technology creatively to enrich the culinary experience.

In Western cuisines, the most common preparations of meat are typically whole cuts of meat or ground meat. On the other hand, meat has much broader culinary applications in Asian cuisines. For example, meat is often mixed into a range of dishes with vegetables and carbohydrates, or used in products like dumplings. In this context, food scientists can focus less on replicating the complex texture of whole cuts of meat, and can develop plant-based meat or cultivated meat products that provide characteristics that make it easily integratable into popular dishes.

PORK

Pork is the highest consumed meat in the world, and the majority of this consumption takes place in Asia. People in Asia consume significantly more pork than any other meat. In some countries, this ratio is dramatic. In China, Hong Kong, and Macao, the pork-to-beef ratio is 6.8:1 and in Vietnam it is 10.8:1. By comparison, the ratio in the United States stands at 1:1, with beef taking a slight lead.

HALAL

Several Asian countries have large Muslim populations, such as Indonesia, India, Bangladesh, China, and Malaysia. Muslims eat food that is halal, meaning permissible in Arabic, which is food that follows Islamic law. Therefore, while pork is the most consumed meat in Asia, it is a non-halal food. Plant-based and cultivated meat startups hoping to achieve mainstream popularity in these countries may need to consider obtaining halal certification, and may also need to take into account the appeal of pork substitute products amongst Muslim populations. Impossible Foods' products and vegan minced pork substitute Omnipork by Hong Kong-based startup Right Treat, which goes by Omnimeat in these countries, are Halal certified.

FOOD SAFETY

Food safety is a much more prevalent concern among Asian consumers than in Western countries. While this concern is most pronounced in China, it remains a priority concern throughout the continent. Since animal products are often the source of food-borne illnesses, plant-based meats and the sterility of cultivated meat production can be appealing to consumers seeking safe products. Western countries are considered to have rigorous food regulations and consequently, Western brands are sometimes considered more trustworthy. As a result, startups with global fame such as Impossible Foods and Beyond Meat may be implicitly appealing to the assumption of safety.

CASE STUDY

CHALLENGE - AFRICAN SWINE FEVER (ASF)

Since its initial outbreak in 2014 in Eastern Europe, African Swine Fever (ASF) has spread across Asia. While ASF has most majorly impacted China, the disease has also inundated pig populations across numerous Asian countries. The World Organisation for Animal Health (OIE), the global agency in charge of coordinating animal disease control, has recently warned that ASF is predicted to kill a quarter of the global pig population.



Pork is a crucial part of the Chinese diet and accounts for over 60% of meat consumption. China is also a massive pork producer, home to half of the global pig population and manufacturing more than 50 million tonnes of pork meat annually. In the past year, the outbreak of African swine fever (ASF) has left the country reeling from over 100 million decimated pigs and a 55% drop in hog production, which has caused a near doubling in pork prices. The current response from the Chinese government has included releasing “emergency pork reserves” to deal with the shortage and have called on citizens to reduce their pork consumption, but little more has been announced, which makes the need for alternative protein sources even more crucial.

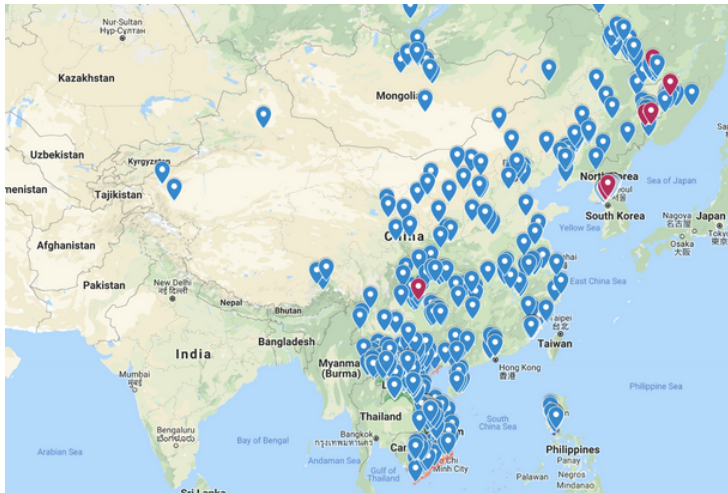
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African swine fever probably won't last that long, but that idea that our animal protein supply chain is extremely vulnerable and unsustainable will.

-David Yeung, Green Monday Founder & CEO

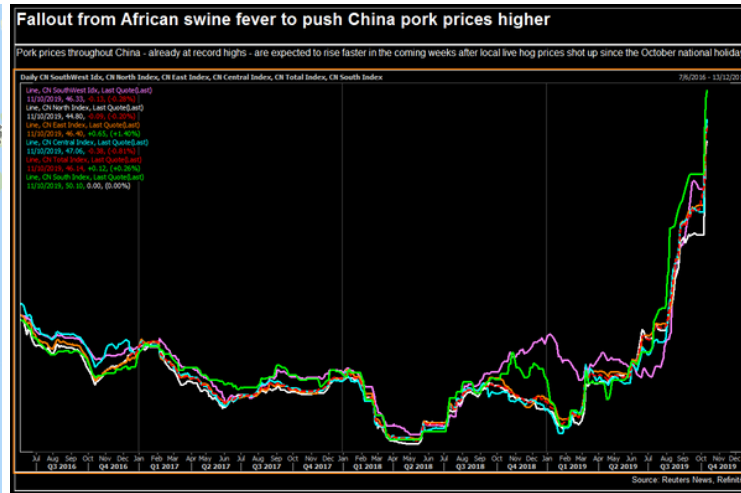
Typically, newly launched plant-based meats are more expensive than their industrially-farmed counterparts. Therefore, rising pork prices driven by the ASF crisis in China and across Asia present an opportunity for plant-based meat startups to offer products closer to price parity. The epidemic may also ignite latent anxieties about food safety and stability, which will help position alternative proteins as not only a environmentally sustainable choice, but as a reliable and affordable one.

ASIA ASF OUTBREAKS



Source: Pig Progress

CHINA PORK PRICE INDICES



Source: Reuters

Green Monday's Omnipork, Asia's leading plant-based pork product, has launched in mainland China, and non-Asian brands are following suit. Pat Brown, the CEO of Impossible Foods stated that the Chinese market is the company's top priority for expansion. In late November last year, Impossible held the first official tasting of their plant-based burgers at Shanghai's International Export Expo. This was quickly followed by the company's debut of their new Impossible plant-based pork products, which was unveiled at the 2020 Consumer Electronics Show (CES) in Las Vegas.



5

HISTORY OF MEAT ALTERNATIVES

RICH TRADITIONS, STORIED HISTORY

Media coverage of the alternative protein movement in Asia often cites the region's rich history of plant-based meat alternatives as one of the key positives for new protein players. Plant-based mock meats and other soy-based products have existed in Chinese cuisine since at least the 10th century. Appetites across Asia are therefore familiar with meat alternatives such as seitan, tofu, soybean tofu skin, fermented legumes, tempeh, as well as seaweed and vegetable starch-based meat alternatives. To this day, these ingredients feature regularly on restaurant menus and Asian family dinner tables.

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Those products in China have been there for decades. It has not changed anything. So, they are proven failures. We need to find out why they failed. Yes, people know that these are mock meats or vegetarian meats. Acceptance as in they accept this. It's nothing new to them. That doesn't mean that they are going to switch to these products.

- Elaine Siu , Good Food Institute APAC Managing Director



GREAT STARTING POINT OR LOW-TECH LIABILITY?

Whether the precedent for plant-based meats is a benefit or a burden to those trying to replace traditional agriculture animal foods with new protein products remains debated. While some have sided with the mere-exposure effect, a psychological term used to describe increased affinity resulting from repeated exposure, others have argued that Asia's history of traditional plant-based mock meats will negate the novelty that excites American and European consumers about alternative protein products. Both of these perceived benefits and burdens can co-exist and have varying effects on different consumer groups, and are important to consider when marketing these products.



Generally, we would consider it more of an asset than a challenge. In the US, the perception of plant-based proteins is so bad. In Asian cultures, they're already more open to plant-based protein just by nature of having eaten them already

- Ester Cohn, Impossible Foods Head of International PR

TRADITIONAL RELIGIOUS INFLUENCES

Asia's history of plant-based meat, not to mention its long relationship with vegetarianism, is linked to several cultural and religious traditions. Many adherents of Asian religions such as Buddhism, Hinduism and Jainism are committed to vegetarian diets, mainly for animal welfare and ethical

reasons. In China, both Buddhism and Taoism traditionally require monks and nuns to eat an egg-free and allium-free vegetarian diet. In practice, such a diet is close to a vegan diet, since dairy was not a part of Chinese food culture until modern times – with the exception of nomadic Northern Asian cultures such as Mongolia – when the influence of Western foods and culinary trends created a market for animal milk, cheese and yoghurt.



CASE STUDY

STARTUP - PHUTURE FOODS

Phuture Foods is a plant-based meat company designing products that cater especially to Asian consumers. Based in Malaysia, Phuture Foods is developing a minced plant-based pork that will launch in Singapore in collaboration with several chefs in March 2020. Jack Yap, Phuture Foods' CEO emphasizes that during the R&D process, the startup is focused on how chefs will use their products in dishes. The team hopes to expand throughout Asia in the coming years.

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If you really want to be successful in China, you have to work with the local partners. They understand the culture. China is a very fragmented market with several cultures that eat differently.

- Jack Yap, Phuture Foods CEO & Co-Founder

Phuture Foods plans to develop plant-based versions of every part of a hog that is commonly consumed in Asia, such as the pig's intestines. In doing so, the startup aims to cater to the culinary diversity of Asia and providing a product that is versatile and widely consumed. This approach goes beyond mere differences between countries and applies to the regional variations within large countries such as China.

Phuture Foods has participated in both the Brinc and Big Idea Ventures accelerators, both of which are based in Asia and focused on alternative proteins. Localizing ingredient sourcing and manufacturing is one of Phuture's primary goals.



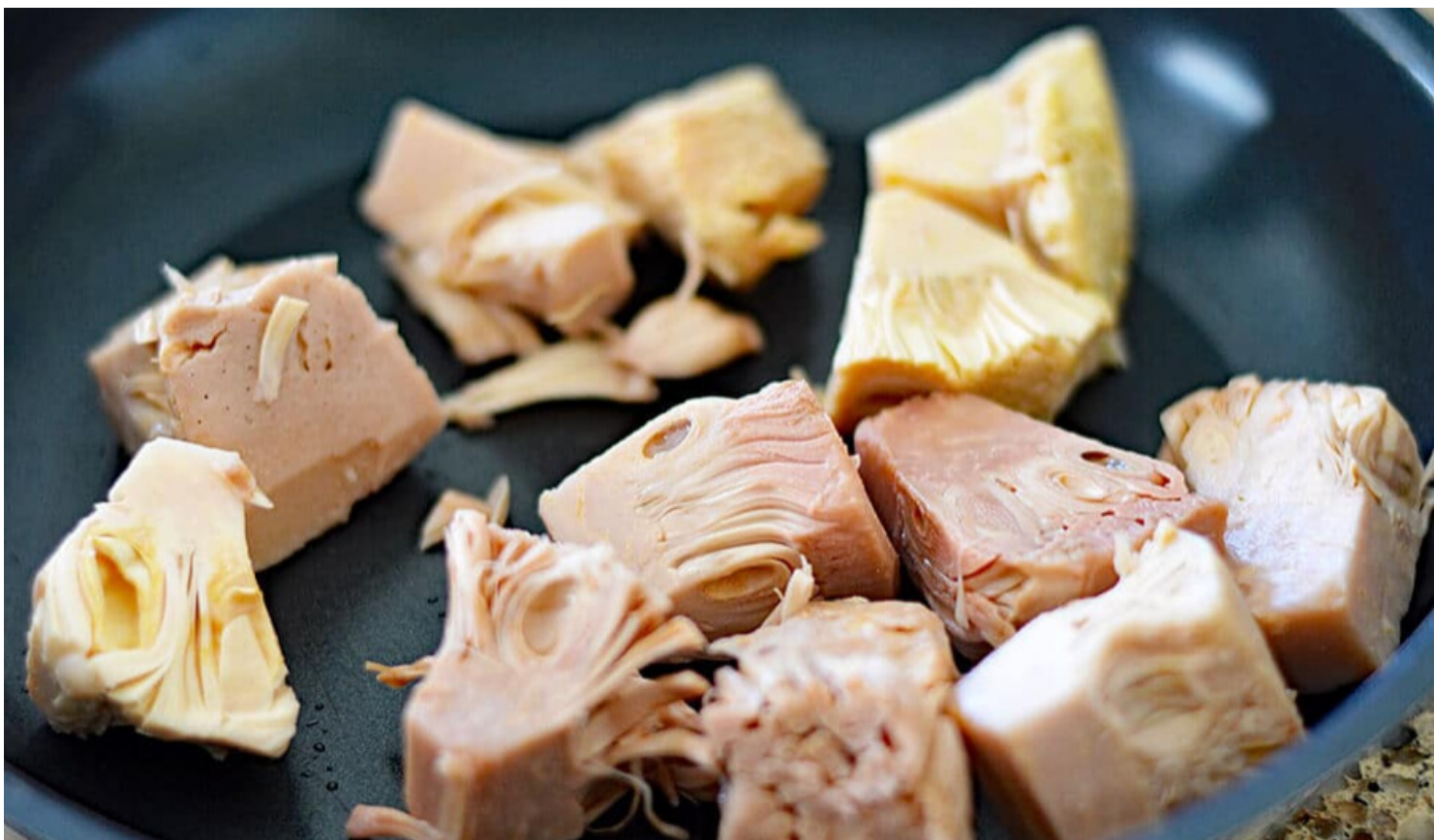
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**WHOLE FOOD
ALTERNATIVES**

WHOLE FOODS AS MEAT ALTERNATIVES

While the majority of new protein startups garnering attention fall into either the plant-based or cultivated meat categories, whole food protein alternatives too are experiencing a wave of innovation. Well-known products in this category include jackfruit and tempeh. They offer a substitute for meat that does not attempt to precisely biomimic meat, an aim of other plant-based startups such as Impossible Foods and Beyond Meat.

Whole food protein alternatives may serve as a bridge between various health food movements and sustainable protein movements. They can also help lead the charge to diversify our diets. In addition to the narrow scope of animals conventionally eaten, humans have also only consumed a tiny percentage of available edible plants. While around 200 plant species are commonly consumed, scientists estimate that there are up to 300,000 plant species that are edible.



CASE STUDY

STARTUP - KARANA

Singapore-based startup Karana is using the regionally abundant young jackfruit crop to create a sustainable and minimally processed plant-based meat alternative tailored for iconic Asian dishes. Found across Southeast Asia and popular in South Asian cuisines, jackfruit can be considered a fairly under-utilized plant. The fruit is naturally drought and pest resistant, thus requiring no herbicides or pesticides to cultivate, and as such has the potential to improve global food security. On the basis of texture, taste and appearance, jackfruit works well as a substitute for certain animal products, including 'shredded' chicken or pork, despite containing small amounts of protein (1.72 grams of protein per 100 grams).





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One of our core tenets is finding ingredients that allow us to tell a very transparent story that creates value down to the farmer level. Jackfruits require pretty much no irrigation nor inputs. It's very friendly and easy for smallholder farmers who don't have a lot of capital nor technology.

- Daniel Riegler, Karana Co-Founder

There are added social advantages to jackfruit cultivation. With an uptick in the popularity of jackfruit, the demand could benefit smallholder farmer communities in the region if managed appropriately.

The Karana team is seeking ingredients that are sustainable, can support biodiversity and sourced transparently, and are aiming to build a platform for identifying and commercialising these plant-based ingredients. They have plans to launch a new range of products by the end of Q1 of 2020.



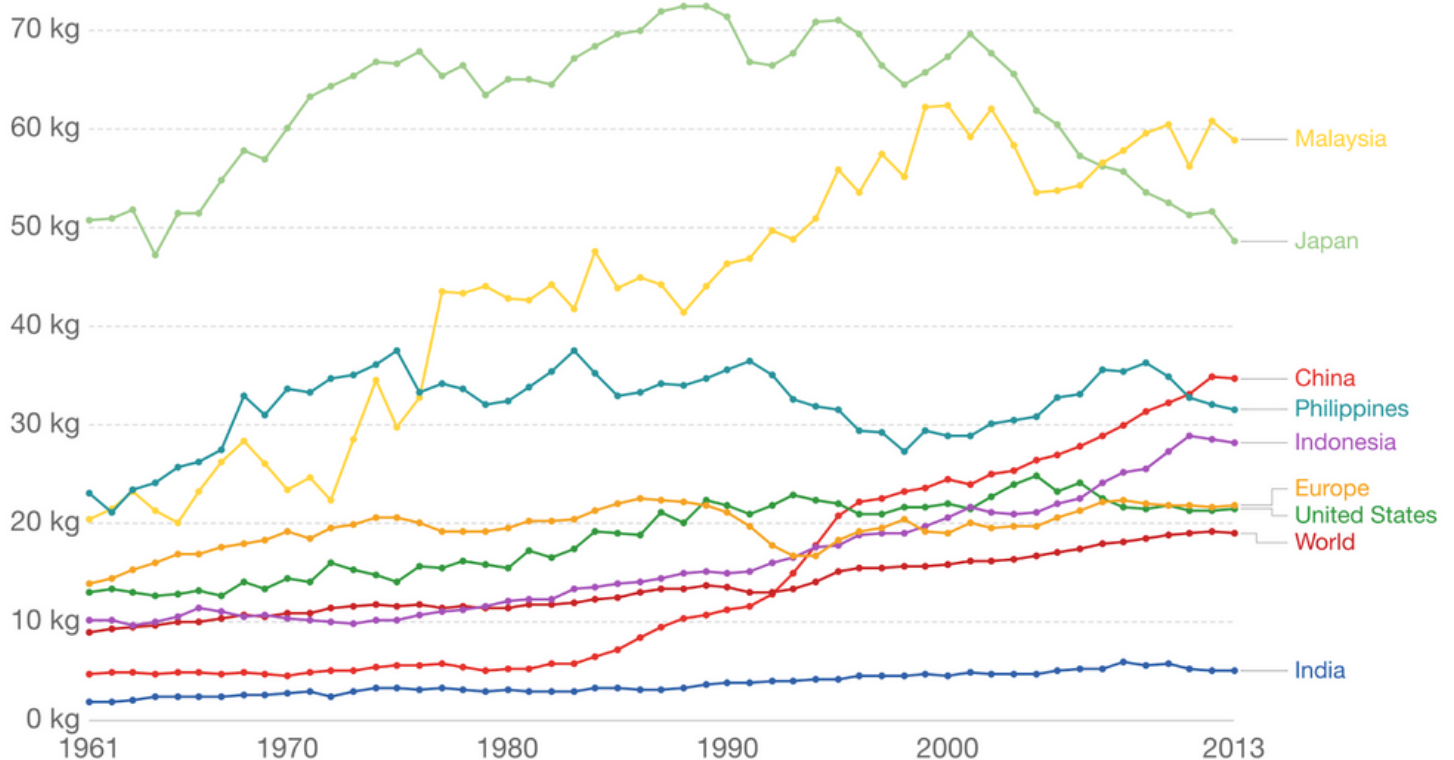
**(UN)SUSTAINABLE
SEAFOOD**

SEAFOOD CONSUMPTION IN ASIA

Asian people eat significantly more fish and seafood than the rest of the world, with notable variations by country. Variations can be dramatic, and can be demonstrated through 2013 figures, which show that Malaysian people consumed an estimated 60 kilograms of fish and seafood per capita while the Indian population consumed around 5 kilograms per capita.

GLOBAL FISH & SEAFOOD CONSUMPTION PER CAPITA

Data is inclusive of all fish species and major seafood commodities, including crustaceans, cephalopods and other mollusc species. Data is based on per capita food supply at the consumer level, but does not account for food waste at the consumer level.



Source: UN Food & Agriculture Organization (FAO)

CULTIVATED SEAFOOD

At the time of this report, around half of the cultivated meat startups in Asia's first products were seafood, although it should be noted that the sample size is admittedly limited with only 5 cultivated food startups based in the region.

Both the CEOs of Avant Meats and Shiok Meats cited the high consumption rates of seafood in Asia and the problems in the seafood industry as the rationale for launching cultivated seafood products. The companies' strategies represent clear examples of how cultivated products can be customized for varying cultures and markets.

CASE STUDY

STARTUP - AVANT MEATS

Founded in 2018 by Carrie Chan and Mario Chin, Avant Meats is developing cultivated seafood products fit for Asian cuisines, and aspires to be a leading cultivated meat company that provides a variety of seafood products to address the impacts of overfishing and pollution to marine ecosystems. They are based in Hong Kong, with operations across the Greater Bay Area of China as well, and have been supported by personal contributions and a small pre-seed round of funding.

Avant Meats' first product is well-fitted to its Hong Kong roots: fish maw. Fish maw, the swim bladder of a fish, is a popular dish associated with Chinese medicine and traditional culinary delicacies, but it is a product rife with ethical and environmental complications. Some fish as long as 7 feet are caught just for their swim bladder, and demand for the delicacy has driven some popular species to near-extinction. Cultivating fish maw additionally solves the rampant issues of traceable origins and safety in many seafood delicacy products.

Because fish maw is composed of only one cell type and has a homogenous texture, it is a relatively simple product to cultivate



compared to other products. This has enabled Avant Meats to develop its first prototype in a short time frame – the startup is currently able to scale-up a fish cell into a fish maw product within 6 weeks.

Fish maw is a premium product and Hong Kong's market, with prices fetching up to HK\$1 million per kilogram (US\$130,000). This means that Avant Meats' aim to reach price parity with traditional fish maw is much more realistic than other cultivated meat products such as beef or chicken. The team hopes to be able to debut their initial fish maw product offering in 2023 in Hong Kong and Guangdong, China.

Avant Meats plans to start generating revenue from fish maw to fund the development of other products, such as a fish fillet product, which the team hopes to demo in 2020. According to the startup, creating a cultivated fish fillet is a priority to achieving their mission, and they have plans to launch in Singapore and other South East Asian markets such as Malaysia as well.

CASE STUDY

STARTUP - SHIOK MEATS

Founded in 2018 and based in Singapore, Shioh Meats is working to establish itself as the leading startup harvesting cell-based crustaceans. Sandhya Sririham, CEO of Shioh Meats, cites her visit to a shrimp farm where she saw shrimp grown in sewage then cleaned in bleach as the motivation for starting the company with co-founder Dr Ka Yi-ling.

Shioh Meats uses cellular technology to harvest lab-grown seafood that is a more sustainable and ethical alternative to traditional seafood farming. They are currently focused on their cultivated shrimp product, which they debuted in April 2019 in samples of shrimp *siu mai* dumplings, highly popular Cantonese dim sum dish. To date, Shioh has received a total of US\$5.3 million in funding, and has the notable distinction of having raised the largest foodtech seed round in Asia, US\$4.6 million back in April 2019, with support from Big Idea Ventures, Aera VC, Beyond Impact, Boom Capital and Y Combinator.



Shiok Meat's strategy highlights how cultivated meat can be positioned as a significantly more sustainable and ethical product in several ways. Not only does cultivated meat require fewer resources, combat plastic pollution and prevent ecosystem destruction, it can be produced essentially anywhere to significantly cut the carbon footprint of distribution.

Cultivated seafood also tackles human rights issues associated with the conventional seafood industry and the crustacean sector in particular, which includes modern slavery involving the enslavement of migrant workers in Thailand, as well as child labour, prevalent across global seafood supply chains.





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The idea is not to make meat in Singapore and ship it all the way to Taiwan or Japan which would make it less sustainable. The idea is to have five manufacturing plants in different regions of Asia, to feed that region, so that you don't have to spend as much on shipping or aircraft, reducing fuel and mileage.

- Sandhya Srirham, Shiok Meats CEO

Looking ahead, the startup is planning on making their cultured shrimp commercially available in supermarkets in 2020. They are additionally working on harvesting cell-based crustacean meat, such as crab and lobster.

Once commercialized, Shiok Meats does not plan to directly oversee all of their manufacturing. Instead, the company says it will license its technology to regions where the team does not want to set up manufacturing themselves. They currently have plans to set up at least five manufacturing plants in the next 5 - 7 years within different Asian countries.

CONSUMER INSIGHTS

In a survey that Shiok distributed that included 70% Asians, about 86% of the participants responded that they are excited to try cultivated meat and would buy it but only if it is sold at a 10 to 20% price premium. Of the Asians included in the survey, most of them were located in Singapore, Malaysia, Thailand, and Indonesia.



8

ECOSYSTEM

SPECIAL FEATURE

GREEN MONDAY GROUP

Headquartered in Hong Kong, the Green Monday organization is at the center of Asia's alternative protein movement. Founded in 2012, Green Monday takes a multi-channel approach to educating Asian consumers on plant-based eating and bringing them leading plant-based products. The Green Monday Group's multi-pronged model has created profound change across Asia's food systems. They were the first to launch the Beyond Meat burger outside of the US, and it can be argued that the plant patty's successful Hong Kong launch started the 2.0 alternative protein revolution in Asia.

THE GREEN MONDAY UNIVERSE



Source: Green Monday

Green Monday itself is an open-source movement supported by their foundation's non-profit work to create the cultural context for plant-based eating. They lead advocacy outreach, educational programs, and provide a framework for behavior change, with an understanding that they must first meet consumers where they are and introduce to them gradual positive changes. With this goal in mind, their core Green Monday campaign encourages participants to opt for a plant-based diet every Monday of the week.

Green Common is Green Monday group's chain concept of cafés and grocery stores, which provides a destination for consumers to buy and try new protein and dairy brands. It also operates as a B2B business to distribute iconic plant-based brands and products throughout Asia including in their own Green Common stores. Some of these brands include Daiya Cheese, Gardein, Miyoko's and Califia Farms. Green Common notably distributes Beyond Meat products in Hong Kong, Macau, Singapore, Thailand, Taiwan, Philippines and other Asian countries. Having worked on building the foundations of a market-ready product launching platform in Asia for several years with teams across the region, the group has plans to continue expanding internationally. By the of 2020, the group will be present in 15 countries/regions including Japan and UAE and have over 40,000 point of sales (POS).

We are creating a disruption but the approach is not disruptive

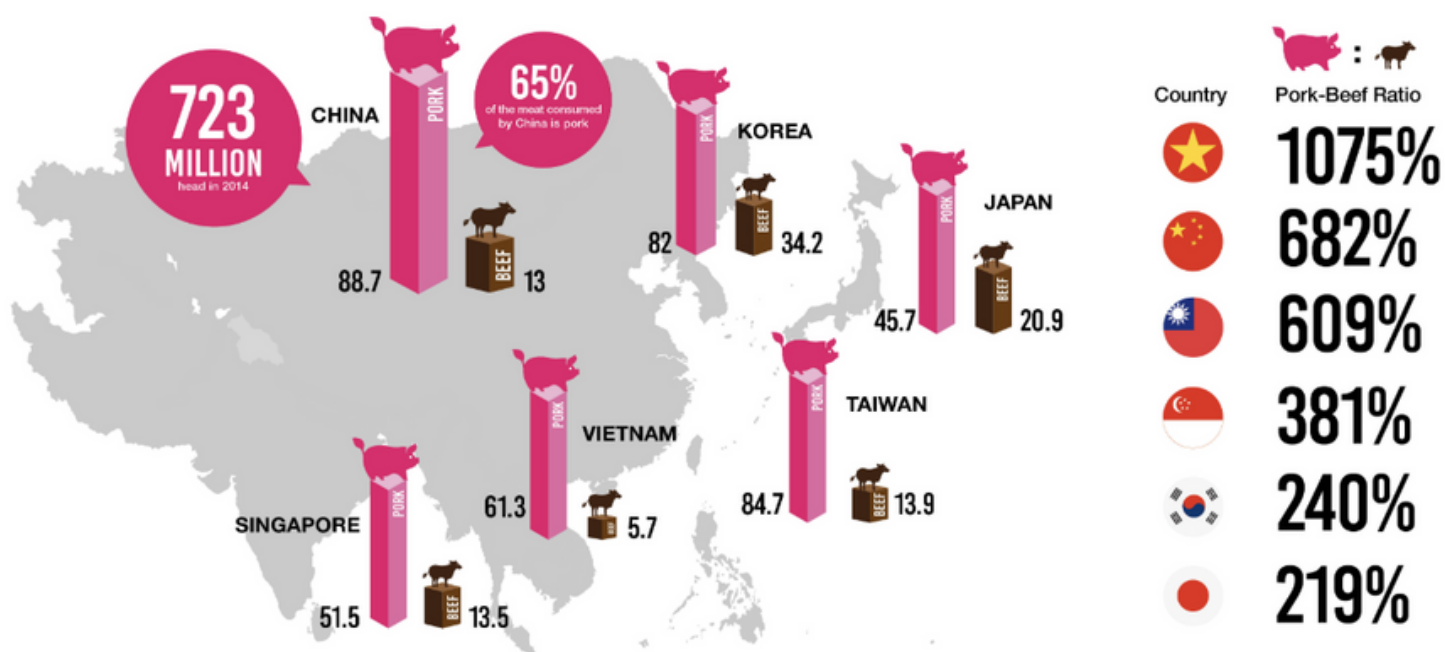
- David Yeung, Green Monday Group Co-Founder & CEO

Green Common's distribution arm that makes it possible for the Green Monday group to instantly and simultaneously have people working on the launch of new products in those specific markets. This applies to both their original products and other brands' products, as well as product launches through partnerships with other restaurant chains, such as their recent collaboration with Taco Bell in mainland China to launch their subsidiary product, the vegan pork mince substitute Omnipork.

Right Treat is the plant-based food innovation arm of Green Monday, and their first product was Omnipork, a vegan pork mince made from soybeans, rice, mushroom and peas. While headline grabbing plant-based meat products tend to offer cow meat imitations, such as the beef patties developed by Beyond Meat and Impossible Foods, Omnipork addresses the demand for pork, the most consumed meat in Asia (and globally) to offer the region a sustainable, healthy and ethical pork alternative.

As a mince vegan pork product, Omnipork is versatile and can be adapted in many local Asian dishes such as dumplings and dim sum dishes, and is already widely available across restaurant venues and outlets in multiple Asian countries, from luxury hotels to fast food chains such as Fairwood and Tsui Wah in Hong Kong, in addition to being sold across their Green Common grocery chain stores. Recently, Omnipork made their significant expansion into China in November 2019 through Tmall Global, Alibaba's ecommerce platform, as well as through restaurant partnerships in Shanghai. Omnipork has been hugely successful and is by far the leading branded plant-based meat alternative. A recent launch in Taiwan with the country's leading Quick Service Retail chain saw over 1 million Omnipork dumplings sold per week.

PER CAPITA BEEF & PORK CONSUMPTION IN 2018 (LBS)



Source: Green Monday

Yeung and his team are expert marketers who place great emphasis on customized product presentation. Green Monday's ability to customize products for local markets leads them to pair novel products with familiar flavours and dishes, a key factor for their success across the region. Multiple instances can exemplify this, including their re-imagining of the Beyond Burger into an Asian-style dish in their cafes, which outperformed another dish that prepared the Beyond Meat patty in traditional Western burger style. Another example is the team's choice to launch Omnipork in Taco Bell in China using a local seasoning, offering Taco Bell customers access to a familiar flavour profile despite Omnipork being a novel food to Chinese consumers.

In Malaysia, Indonesia, and Singapore, Omnipork is branded as Omnimeat because these countries have large Muslim populations who do not consume pork. Omnimeat, as it is sold in these countries, is Halal certified. While the vegan pork mince substitute contains no animal products, the company understands the impact of associating a product with pork for Muslim consumers. According to Yeung, “calling a product pork may offend people and cause it to be automatically written off in many markets and religious communities.”

Green Monday’s attention to cultural sensitivity and the importance of presentation that has helped define its success. These subtle but key differences may require a learning curve for startups based outside of Asia who are looking to enter the Asian market, and will need to take into consideration these regional cultural factors in their marketing strategy. US-based major plant-based player Impossible Foods too must grapple with cultural variations in Asia, and while the company’s CEO Pat Brown said that it would “surprise me if [a plant-based product] raised any issues [by] just being called pork,” both their pork and beef products are still designed with Halal and Kosher certification in mind.





*The type of support we have in Singapore is at another level, it is one of the reasons why we stayed here instead of being in Silicon Valley. In Singapore, we actually get to sit in the same room as the Singapore Food Agency, A*STAR who are saying, “How do we help you guys get this to market?” We believe that by working with Singaporean government, we can actually get to market faster and have a much higher success rate compared to being in the States.*

- Max Rye, TurtleTree Labs CTO

SINGAPORE: ASIA'S INNOVATION HUB

Although the new protein movement is still in early stages in Asia, Singapore has already emerged as a regional central innovation hub. The Singaporean government is taking several measures to support new protein startups and to work with them on developing regulatory frameworks, particularly on the cellular agriculture front. Several leading startups are based in Singapore, and the city has been a source of significant funding.

The Singaporean government is actively supporting alternative protein in multiple ways. Firstly, the government has set up an ambitious “30 by 30 goal” – backed by up to SG\$140 (US\$101) million in funding – to produce 30% of Singapore’s food domestically by 2030, an increase from the current 10% of food that is being locally produced. Secondly, the government is

committed to matching the amount of funding Singaporean startups raise, with several interviewed for this report referencing this initiative as an added benefit. Thirdly, authorities in Singapore are currently working closely with new protein startups on creating regulatory frameworks and help bring products to market, including Shiok Meats, a startup producing cultivated shrimp. Furthermore, Workforce Singapore (WSG), a statutory board under Singapore's Ministry of Manpower, offers a career trial program to subsidise the salaries of employees wishing to enter the burgeoning startup space. Ricky Lin, CEO of Life3 Biotech, a Singaporean plant-based meat company utilizing algal proteins, cited work trial as a perk of being based in Singapore. Finally, Singapore's government has hired a full-time Alternative Proteins Analyst, signalling the dedication to promote and aid the growth of the industry.

Aside from governmental support, Singapore is home to Big Idea Ventures, one of the only venture capital firms and accelerator programmes focused exclusively on alternative proteins. The city state is also the host city for several of Asia's leading food tech events like Asia-Pacific Agri-Food Innovation Week.

SINGAPORE: STARTUP LAUNCHING PAD

Singapore is a premium market with an international population and a government working closely with entrepreneurs. Several non-Asian new protein startups have listed Singapore as a top choice for international expansion, and many Asian entrepreneurs also plan to launch in Singapore. For example, Impossible Foods chose to expand to Singapore around the same time as their launch in Hong Kong. Phuture Foods, a Malaysian startup, plans to first serve their plant-based pork in Singaporean restaurants. Many leaders in cultivated meat predict that cultivated meat will be first sold to consumers in Singapore, although Hong Kong has played a similar role given its similar socioeconomic context.

CASE STUDY

ACCELERATOR - BIG IDEA VENTURES (BIV)

Big Idea Ventures (BIV) is the only venture capital firm and accelerator focusing exclusively on plant-based products and new protein alternatives. BIV has offices in both New York City and Singapore. Startups participating in the accelerator can choose in which office to work, depending on where they want to launch and their needs. The goal is to give startups the support they need to grow from a product concept to a complete business, from research and development to finding manufacturers. One of the key highlights of BIV is that they are the only accelerator with investment from Tesamak, a government-backed sovereign wealth fund for Singapore.



Singapore wants to take the lead on regulation, and it ticks all the boxes that we need.

- Nicolas Morin Forest, Gourmey CEO

There are a number of benefits that BIV offers to startup members. Startups can, for example, draw on BIV's operations experience at various large food companies and leaders in alternative protein, such as the makers of plant-based egg

substitute JUST, as well as investment experience at pioneering companies including Impossible Foods and Beyond Meat. Not only does the accelerator have 2 PhDs on staff who can work closely with startups on product development, the cohort can additionally access over 120 mentors from diverse perspectives and expertise. Furthermore, BIV's unique focus on plant-based products and new protein alternatives means that their program and team are built specifically for helping food tech products succeed.



CASE STUDY


CONNECTOR - COUNTRY FOODS

Country Foods, a subsidiary of SATS Food Services (SATS), is a one-stop go-to-market platform with a focus on alternative protein and dairy products. Country Foods leverages SATS' global network as one of Singapore's largest food importers, distributors and manufacturers. Country Foods is another example of the Singapore government's enthusiasm for new proteins as it collaborates with Temasek and Singapore's Economic Development Board, and it is working with Enterprise Singapore (ESG) to support start-ups in their development in Singapore and Asia. Of the products in Country Foods' portfolio, Impossible Foods and JUST are the most well-known.

Country Foods offers turn-key solutions to food tech startups who might be unfamiliar with export and import procedures in Asia, enabling the products to be sourced almost anywhere in the world and exported to a wide variety of Asian destinations. The connector also helps food tech companies expand across Asia through their extensive experience from branding and sales marketing to developing businesses, as well as its distribution network of over 6 countries and SATS' presence across 13 countries. Besides their existing expertise in marketing and distribution, Country Foods offers manufacturing and customization support for companies. They can customize plant-based products to different form factors, packages and products, as well as help develop food tech startups' production capabilities in different countries as they scale their businesses.

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DISRUPTING DAIRY



While the primary focus of this report is alternative and the majority of startups across the region are focusing on meat and seafood alternatives, we believe it is important to highlight the alternative dairy industry. This is especially crucial given that Asia is the largest consumer of dairy globally, accounting for 39% of the world's consumption, mostly due to India and China, according to a 2014 report by Bright Green. In addition, dairy Concentrated Animal Feeding Operations (CAFOs) are springing up across the region at an alarming rate. These CAFOs bring with them hundreds of thousands of animals who are subject to inhumane practices, an increase in zoonotic diseases, a financial blow to local small-scale producers.

Despite the misapprehension that people in Asian countries do not consume dairy products as part of their regular diet, Bright Green finds that by 2025, the global South, which includes much of Asia, will consume almost twice as many dairy products as it did in 1997. It is therefore imperative for homegrown alternative dairy startups to take on conventional dairy manufacturing and offer consumers healthier and more environmentally sound choices.

It is further worth underlining that Asia is home to many white-label production facilities that make plant-based milk and dairy product alternatives for global brands. That being said, at present, there are only 3 startups in Asia working on disrupting the region's dairy industry that have a recognized brand. The most established is the India-based GoodMylk. The company has been in operation since 2015 and offers plant-based milk made from oats and cashews, as well as yoghurt made from peanuts, a vegetable oil butter alternative and egg-free mayonnaise. The company has also raised one of the largest seed rounds in Asia so far. In South Korea, The PlantEat is currently selling mayonnaise made from yak-kong beans (a type of black soybean) and working on plant-based milk. While there are other small scale companies across the region working on plant-based cheeses, they are on a small-scale and can be defined as artisanal in nature, thus unsuitable for the purposes of this report.

CASE STUDY

STARTUP - TURTLETREE LABS

Singapore-headquartered TurtleTree Labs's cellular technology has enormous potential to disrupt both the dairy and infant milk markets.

TurtleTree Labs is the first company globally to create cell-based dairy with the final product being biologically identical to cow's milk. This is done through their biotechnology that differentiates bovine stem cells into mammary glands, which are then fed the necessary nutrients to produce dairy milk. The overall goal of the startup is to end industrial dairy farming with a more sustainable and ethical solution.

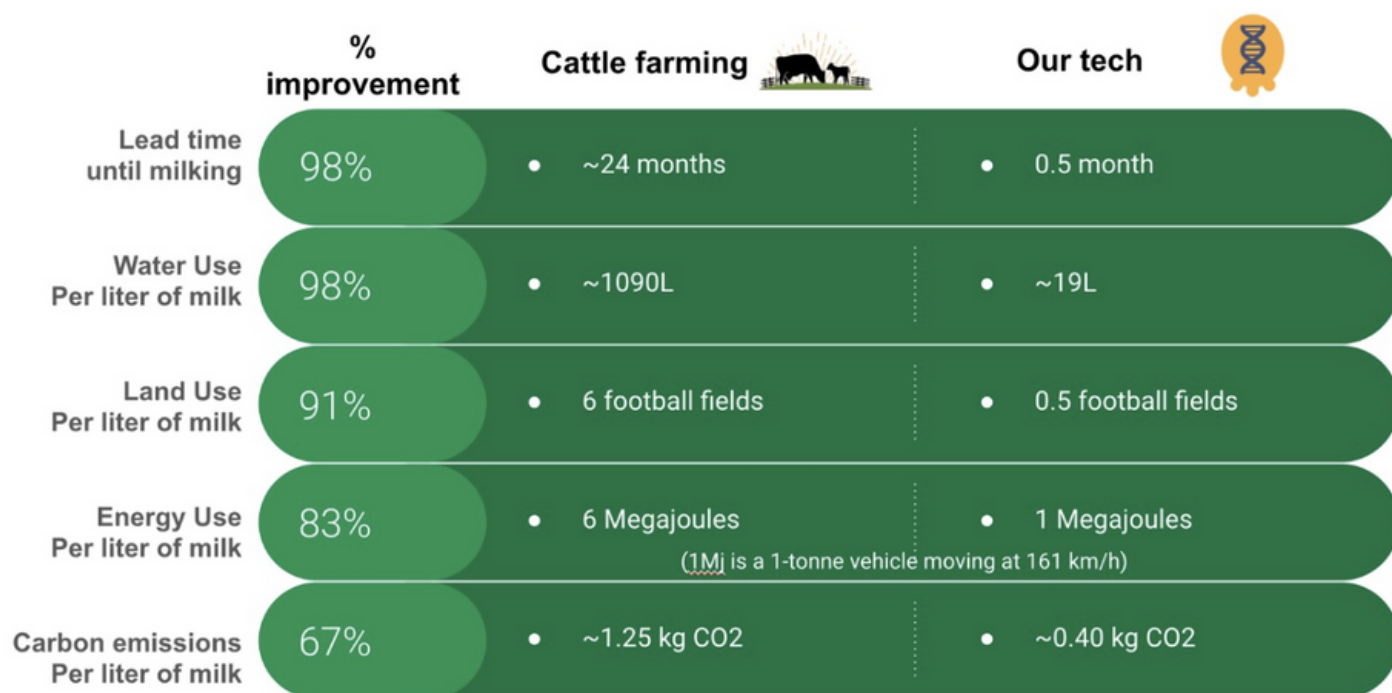
“

In five years from now, we would love to be the most trusted, biggest company in the dairy industry, that's able to help dairy companies do what they're used to doing but in a sustainable way.

- Max Rye, TurtleTree Labs CTO

The founders of TurtleTree Labs emphasize that the opportunity to work closely with the Singaporean government on designing a regulatory framework and bringing their product to market is a major benefit of being based in Singapore.

TURTLETREE TECHNOLOGY VS. CONVENTIONAL AGRICULTURE



Source: TurtleTree Labs

Possibly even more noteworthy, TurtleTree has set its sights on a less expected yet very ambitious launching product: infant milk formula made with cell-based human breast milk. This is a lucrative market to expand into, given that the infant formula industry was valued at US\$45.12 billion in 2018, and is predicted to be worth US\$103.75 billion by 2026.

TurtleTree plans to use Singapore as a testing ground of sorts as Singapore is home to 3 of the 4 largest baby formula companies. The city also boasts a strong reputation in Asia for producing safe baby formula, a rarity in an industry with a long history of scandal, corruption and counterfeits, particularly in China.

TurtleTree has lowered its manufacturing costs dramatically in a short period of time. As of the first quarter of 2020, TurtleTree is producing milk at a cost of US\$30-35 per litre. While this price is



still significantly higher than dairy milk, it is far less than cultivated meat counterparts at equivalent stages. More importantly, this price is in stark contrast with human breast milk sold to hospitals for premature babies, which costs about US\$800 per litre, according to TurtleTree.

Looking ahead, TurtleTree hopes to partner with dairy companies through licensing its technology. Instead of spearheading all manufacturing and distribution efforts themselves, the team believes that partnering with industry leaders is the fastest and most effective way to achieve their mission.

In late January, the company secured pre-seed funding with the actual amount remaining undisclosed. The financing was led by alt-protein specialized Lever VC and includes KBW Ventures and K2 Global, and capital will be used to hire more scientists and create more prototypes.

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THE CASE FOR CULTIVATED

A UNIQUE OPPORTUNITY

Cultivated (also known as lab-grown or cell-based) meat offers a unique opportunity to increase domestic meat production, especially when available arable land is limited. A Life Cycle Assessment (LCA) published by researchers at Oxford and the University of Amsterdam estimates that cultivated meat produced requires 99% less land than conventional meat production, presenting a solution for import-dependent cities in Asia in particular.

While Singapore is a clear beneficiary of this technology, Hong Kong is positioned to benefit as well. Hong Kong's food supply is heavily dependent on imports. In 2016, the Hong Kong Agriculture, Fisheries and Conservation Department (AFCD) reported a low self-sufficiency rate for various food supplies, such as pork (6.8%), marine (33%) and freshwater fish (4%) and vegetables (1.7%). In sum, around 90% of the total food supply in the city is imported rather than locally grown or produced.

According to some of our first-hand research and several off-the-record conversations with government officials, it is likely that either Singapore or China will be the first country in the region to approve lab-grown meat or seafood for human consumption and commercial distribution. Both countries are said to be working on regulatory frameworks to this end.



This is bolstered by the development underway in Singapore, the Asian region's main hub for alternative proteins. The city-state of Singapore is not only home to a number of food tech startups, but the alternative protein industry is backed up by significant government support with potential to create regulatory frameworks to govern the cultivated protein sector's growth.

Because cultivated meat is not commercially available nor has it scaled up, it is difficult to visualize the land efficiency and potential for local production. In collaboration with experts, the Cellular Agriculture Society (CAS) has created to-scale visualizations of industrial cultivated meat production. The image on page 87 is CAS's design for a cultivated meat production facility that could supply the entire population of New York City's projected meat demands for 2040.

Beyond geographically limited places such as Singapore and Hong Kong, other Asian countries could benefit tremendously from the reduced land devoted to animal agriculture as well. Mainland China, for instance, has seen consistent declines in arable land resulting largely from development and pollution, as well as numerous health and safety challenges stemming from its current animal agriculture practices. This makes cellular agriculture an attractive and viable solution for the country to use to meet the increasing demand for animal protein as China continues to experience economic and population growth.

JAPAN AS A CELLULAR AGRICULTURE HUB

Mostly concentrated in Tokyo, Japan is home to a growing community of cellular agriculture enthusiasts. Japan's only cultivated meat company, Integriculture, was born out of the Shojinmeat project, a citizen science initiative promoting cellular agriculture to the public. The country is also home to non-profit Cellular Agriculture Institute of the Commons, which was recently founded to advance research and advocacy in the cultivated space, though its exact goals are still evolving over time. There is frequent overlap between members of these organizations, and their respective work may be intriguing to anyone following developments in new protein.

CASE STUDY

STARTUP - INTEGRICULTURE & SHOJIN MEAT

Integriculture

Integriculture is a Tokyo-based cellular agriculture startup founded by Dr Yuki Hanyu developing products across the cell-based spectrum. Integriculture's goal is to commercialize cultivated meat as well as to provide a technology platform for cellular agriculture companies. Their first commercial product is Space Salt, which doubles as food-grade culture medium and a seasoning for food, while their first cultivated meat product was foie gras, which the team debuted at an August 2019 tasting. The company notably received government investment (through one of the country's funds) in their seed round, which was a strong show of support for such a young industry.

Because Integriculture does not use growth factors or genetic modification, its foie gras falls under the classification of “pickled foods” according to Japan's food regulations. Consequently, it can technically be sold legally in Japan at the time of this report.



Shojinmeat Project

Prior to Integriculture, Dr Hanyu founded the Shojinmeat Project, a non-profit initiative that is loosely organized and open to the public and whose aim is to educate students and youth about cellular agriculture. The group hosts community meet-ups in Tokyo where participants discuss the sector in a casual setting or learn to cultivate meat at home. The Shojinmeat Project has also authored manga books about meat cultivation, which are currently sold in Japan.

In addition, the group maintains a website providing informational resources on meat cultivation, much of which is in Japanese, ranging from economic models that include traditional farmers in cultivation to a DIY cultivation manual. Integriculture founder Dr. Hanyu believes that in order for our food system to undergo transformation at the scale necessary to combat global challenges, there must be efforts to develop a new food culture that celebrates and understands cultivated meat in parallel to companies working on research and development. By engaging citizens and providing them with accessible knowledge around cultivated foods, he hopes to dispel fears and garner acceptance for more sustainable and ethical products.



Citizens basically have no idea about genetically modified (GM) technology or how it will be used. This creates fear and non acceptance. Cellular agriculture could fall into this situation. That's why we are demonstrating this is something kids can do."

- Yuki Hanyu, Integriculture & Shojinmeat Project Founder

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CONCLUSION

TURNING TIDES

Cultivated and plant-based meat startups continue to spring up across Asia, grabbing headlines and spurring conversations. So, are Asians going to bite?

This report has already illustrated the growing demand for protein and plant-based products in the world's most populous countries and highlighted generally positive consumer perceptions of cultivated meat.

There are indicators of social change, which implies readiness to purchase new alternative protein sources. Firstly, we are seeing shifting values across the socioeconomic spectrum, most starkly amongst the middle and upper class in Asia, who are reflecting increased consciousness about the impact of their spending decisions. A recent report by HSBC Jade, for instance, found that amongst the bank's most elite membership level, 74% of mainland Chinese clients surveyed want to leave behind a positive impact on the world. Alongside this is the broader trend seeing a rise of flexitarianism and mainstreaming of veganism globally, from the popularity of plant-based campaigns such as Veganuary and successes of documentaries such as Netflix's *The Game Changers*.



The social change isn't just driving an uptick in plant-based meat, but also a higher acceptance of the concept of cultivated meat. A recent study, published in *Frontiers in Sustainable Food Systems*, assessed consumer interest in plant-based and cultivated meat in the United States, India and China. All 3 countries exhibited high levels of acceptance, yet significantly greater levels of approval were observed in Indian and Chinese consumers. It is also worth noting that the sample surveyed was predominantly made up of high-income and well-educated urban participants.



Young consumers, millennials and Gen Z's are driving this change. They are extremely conscious about the world's problems and they will demand that restaurants and retails provide more plant-based options.

- David Yeung, Green Monday Group Co-Founder & CEO

GENERATION CHANGE

Millennials and Generation Z, which represents the generation born between 1996 and 2010, compose 46% of the APAC population. Given the demographic's large market share, corporations should accordingly take their preferences and values seriously.

Among younger generations, vegetarianism and veganism is becoming a marker of social status. To eat a plant-based diet can communicate that one is well-educated and aware of the impacts of meat consumption, can afford fruits and vegetables, and values their health and wellness. This trend is heightened among Gen Zs. In fact, a recent survey found that a third of European Gen Zs would be willing to choose a plant-based diet because their peers found it impressive.

What this could potentially mean is that plant-based eating can become a social currency, at least amongst youth demographics, and be a part of signalling one's socioeconomic status.

While plant-based eating is often characterized as a trend, reducing meat consumption is increasingly becoming a matter of existential necessity for young people. The widespread youth climate strikes and global fame of teenage climate striker Greta Thunberg are the most relevant manifestations of young people's urgent demands for change.

Not only does youth climate action show and awareness and alarm about climate change, they illustrate how internationally interconnected younger generations are. With visible impacts of climate change becoming a fixture of the news cycle, wildfires being a potent example in 2019 and early 2020, young people are demanding climate action from the personal to the policy level, with cutting out meat consumption regularly appearing as one of the top individual change of choice.



GEN Z & THE PLANT-BASED MOVEMENT

At the time of this report, there is very limited data on Gen Zs in Asia with regards to plant-based eating. However, some of the findings from surveys of the same demographic in North America and Europe may be relevant when considering broad trends. Despite vast socioeconomic and cultural differences within Asia and between Western countries, there is an element of relative transferability thanks to the ubiquity of social media, where Asia-based Gen Zs are frequently exposed to the same global trends, people, and products as their Western counterparts.



According to a survey amongst Gen Zs in Europe conducted by BOL Foods, 44% agreed with the statement that eating plant-based is cooler than smoking, a third surveyed would choose plant-based if their peers found it impressive, and 25% had already attempted or are currently practicing a plant-based diet in the past year.



Similar trends were found in a survey commissioned by Impossible Foods on intergenerational consumption of plant-based meat. The results were clear: Gen Z is eating plant-based meat, and this trend will likely gain momentum. Over 50% of the Gen Z population in the United States reported eating plant-based meat at least once a month, compared to only 20% of the baby boomer generation who could say the same.

These trends will continue to strengthen as the Millennial population are becoming parents themselves. The Impossible Foods survey found that millennials are more likely to eat plant-based meats after having children, and these children – likely falling in the category of Generation Alpha – have a high chance of being even more mission-driven in their food choices than previous generations. While Generation Alpha respondents are indeed in their early years to provide reliable market insights, some clear themes are emerging. A 2019 report from Wunderman Thompson Commerce found that 67% of 6 to 9 year olds say that saving the planet will be the central mission of their careers in the future, joining the fight that current Gen Zs are leading.

All of the startups interviewed for this report emphasized the importance of appealing to young planet and ethics-driven consumers. The interest in plant-based meat and eventually cultivated meat amongst younger generations is predicted to accelerate as they age, and as climate-related natural disasters intensify.

AREAS FOR OPPORTUNITY

Blended products

A few companies in the United States have launched blended products that feature a mix of both plant-based meat and animal meat. For example, Tyson Foods, the country's biggest chicken and beef supplier, recently introduced Raised and Rooted, a new brand that features products like plant-based chicken nuggets and burgers that are a blend of beef and plant-based meat. Blended products may be appealing to Asian consumers who may wish to gradually reduce their meat consumption or to test out plant-based options.

Cell-ag supply chain

Cultivated meat requires a complex combination of technologies and scientific expertise. If this industry is to scale-up to compete directly with traditionally produced meat, it will require a proportional supply chain. The majority of cultivated meat companies have been sourcing medical-grade technology from the pharmaceutical industry which poses a barrier to scaling and lowering costs. Given that Asia has only a few cultivated meat startups, it is not surprising that a supply chain to support this industry does not yet exist. That being said, Tokyo-based Integriculture has developed a few technologies that other cellular agriculture entrepreneurs can use to create their own products. The cell-ag supply chain is currently a wide open space that cannot be ignored and can offer numerous opportunities for existing industries to evolve and for new companies to emerge.

A recent announcement from Mosa Meats, a Dutch cultivated meat startup, demonstrates the need and available opportunities for a robust cultivated meat industry that goes further than producing a final product for consumers. In the announcement, the company revealed that they will be partnering with Nutreco, a large animal feed company, to source the nutrients for cultivating meat. According to Maarten Bosch, the CEO of Mosa Meat, the primary reason that motivated their decision to collaborate with Nutreco was their mission to realise a global supply of quality raw ingredients whilst achieving a competitive price level.

Plant-based eggs

While meat consumption is still on the rise to meet the average consumption levels of Western countries in many Asian countries, egg consumption is often on par or even outpaces that of Western countries in much of Asia. Of the new protein startups in Asia, only one, Evo Foods, is focusing on plant-based egg and it is still in concept stage. India-based GoodDot offers a product called Protein, which they have said can replace egg, but this is not the product's main marketed function.

US-based JUST appears to be the only 2.0 plant-based egg product available in Asia and has launched at some restaurant venues in Hong Kong, Singapore and mainland China. The gap in plant-based egg development could perhaps be attributed to the varying definitions of vegetarianism. Generally in Asia, eggs fall within the scope of a self-identifying vegetarian's diet, and it may follow that there is therefore less of a focus on innovating egg alternatives.



Plant-based seafood

As mentioned earlier in the report, Asia has high rates of seafood consumption that will continue to rise. However, there has not been a corresponding proportion of plant-based seafood companies. Globally, plant-based fish lags behind plant-based meat in innovation and availability. A number of US startups have emerged with products comparable to the most lauded plant-based meats, including Ocean Hugger Foods (plant-based sushi), Good Catch (several alternative seafood products such as canned tuna), and New Wave Foods (vegan algae-based shrimp).



Over the next ten years, we need to wake up in a big way. We are in such a deep crisis; we have no choice. We need to quite dramatically change the way we live to still have a habitable planet.

- David Yeung, Green Monday Group Co-Founder & CEO

FAMOUS LAST WORDS

Current industrial agriculture systems are broken and deeply problematic and Asia, with its rapid urbanization, massive economic mobility and booming population, is up against a challenge of epic proportions: feeding its people safely and sustainably.

Asia is home to some of the world's most impressive universities, forming a huge pool of talented technology and scientific graduates and researchers. There are plenty of opportunities for pioneering R&D that could benefit the region and the greater global community.

But future alt protein innovators face an uphill battle, with challenges that include:

- access to funding (there's simply not enough money in this space)
- a conservative investor community (the sector is under-valued & undiscovered)
- an over-reliance on traditional supply chains (food retail is controlled by a handful of MNCs and without their support, it's tough to break in)
- a lack of awareness from consumers when it comes to alternative protein products (most Asian shoppers/eaters are committed to industrial protein); and
- a dearth of talent to recruit from (graduates are not yet interested in the space).

That being said, what these entrepreneurs need most and above all is a stronger network effect in the form of support: from the government (grants and better regulation), from the wider business community (accelerators and commercial opportunities) and from academia (research facilities and publications).

Asia is no doubt poised to undergo a major disruptive food revolution and by all accounts, it has already begun.

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APPENDIX

ASIA ALT PROTEIN STARTUP DIRECTORY



Avant Meats

2018

Hong Kong SAR, China

Cultivated

*Fish, Fish Maw, Sea
Cucumber*

Avant Meats is the first cultivated meat company in Greater China. With a focus on high-value ingredients in Chinese cuisines, Avant is working on cell-based fish maw (successfully taste tested in late 2019) and sea cucumber. The team plans to demo a fish filet sometime in 2020.



ClearMeat

2018

New Delhi, India

Cultivated
Chicken

ClearMeat is India's only cultivated meat company at the time of this report. It has yet to unveil any prototypes but is currently working on developing a cell-based chicken product.



Evo

2019

Mumbai, India

Plant-Based
Eggs

EVO is based in Mumbai, and is still in the concept-stage of developing a plant-based egg made from lentil protein. It has been revealed that their first product prototype will be a liquid egg substitute.



GoodDot

2016

Udaipur, India

Plant-Based
*Beef, Chicken, Eggs,
Mutton*

GoodDot is India's leading plant-based meat company with a focus on affordable meat alternatives. With a wide range of shelf-stable products designed for Indian cuisine, GoodDot prioritizes taste, accessibility, shelf stability and affordability. They also run a chain of vegan kiosks under GoodDO where they sell their products and have partnered with RCM, India's largest direct to consumer distributor, to market their range.



Plant-Based
Milk, Butter,
Yogurt, Mayonnaise

GoodMylk by Veganarke **Enterprises, Bangalore, India**

2015

GoodMylk is India's leading plant-based dairy alternative brand by Veganarke Enterprises and also the country's most funded alternative protein startup. They offer a range of vegan dairy-free products, including cashew and oat milk, vegan mayo and peanut curd (yogurt).

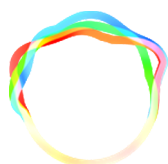


Plant-Based
Pork

Hong Chang Bio-Tech **Suzhou, China**

2010

Formerly named Suzhou Hongchang Foods, Hong Chang Bio-Tech produces over 300 kinds of soy-based vegetarian frozen and non-frozen food products, such as sausages, meatballs and ham, as well as sauces, soups and snacks.



Cultivated
Foie Gras

Intregriculture **Tokyo, Japan**

2015

Integriculture's first product is cell-based foie gras, and the company is also working on Japan's first commercial cultivated meat plant, as well as offering an open-source cultivation platform that other startups. The founder is also behind the not-for-profit Shojin Project whose mission is to encourage the study of cellular agriculture in school and university curricula, as well as help people grow their own cultivated meat at home.



Whole Foods
Jackfruit

Karana **Singapore**

2018

Karana is a whole food plant-based startup in Singapore offering young jackfruit processed so as to resemble a shredded meat. Their technological advantage lies in making the fruit food service texture-ready, offering chefs and manufacturers a consistent result.



Plant-Based
Chicken, Fish

LIFE3 Biotech

Singapore

2016

Life3 Biotech creates plant-based meat products using biotechnology, with a mission to optimize its products for both nutrition and sustainability. They are collaborating with Temasek Pol microalgae both in the indoor as well as outdoor bioreactor in its initial research collaboration with Temasek Polytechnic



Plant-Based
Yogurt

Marvelous Foods

Beijing, China

2016

Marvelous Foods is a Beijing-based startup, the first in China to produce a dairy-free vegan coconut yogurt called Yeyo, currently raising a US\$500,000 seed round.

LOGO N/A

Plant-Based
Pork, Chicken

Ningbo Sulian Foods

Zhejiang, China

2013

Ningbo Sulian Foods is a major vegetarian manufacturer in China making various soy-based mock meat products, such as vegetarian chicken and ham.



Plant-Based
Pork

OmniPork by RightTreat

Hong Kong SAR, China

2018

OmniPork by RightTreat subsidiary of the Green Monday Group, is a minced plant-based pork made from mushrooms, peas, rice and soy developed with Asian cuisines in mind. OmniPork (known as OmniMeat in regions where halal foods are in large demand) is the most widespread Asian plant-based protein brand. It is currently available in retail and wholesale format in over 8 territories at thousands of POS at fast food chains and high end restaurants alike.



Plant-Based
Pork

Phuture Foods

Malaysia

2018

Phuture Foods is aiming to become the premier plant-based pork company in Asia, and is currently working on producing plant for every form/cut of pork. They have not released a product as of now.



Shiok Meats Singapore

2018

Cultivated
Crustaceans, Seafood

Shiok Meats is working on cell-based crustacean meats including shrimp, crab, and lobster. They are the first company to demo a cultivated product in Asia (they tested a shrimp *siu mai* mixed with Quorn). They have also raised the largest alternative protein round in the region.

LOGO N/A

Starfield Beijing, China

2019

Plant-Based
Beef, Mooncakes

Starfield is a startup based in Beijing developed by researchers at Beijing Technology and Business University. They launched their vegan mooncake product in September 2019 in Shenzhen and are currently working on a beef burger patty alternative for restaurants.

TurtleTree Labs

TurtleTree Labs Singapore

2019

Cultivated
Dairy Milk,
Human Breast Milk

TurtleTree Labs is the first company in the world to cultivate a 1:1 composition of real cow's milk. They are also the first to work on developing cell-based human breast milk, which they hope to showcase in Spring 2020.



The PlantEat Inc. Anyang, South Korea

2017

Plant-Based
Mayonnaise, Milk

The PlantEat Inc. is working on a range of plant-based products using functional plant ingredients and DNA analysis. Products in the pipeline include plant-based milk, crackers and ketchup. Their eggless mayonnaise made from yak-kong soy beans is already available for retail.

UNLIMEAT**Unlimate by Zikoooin**
Seoul, South Korea

2017

Plant-Based
Beef

Unlimate is a plant-based beef product developed by Zikoooin Company, and uses upcycled grains that would typically be thrown away for not meeting cosmetic standards, fighting both the environmental impact of animal agriculture and the issue of food waste.

**Whole Perfect Food**
Shenzhen, China

1993

Plant-Based
Beef, Chicken, Fish,
Pork

Whole Perfect Food, also known as Shenzhen Qishan Foods, is a veteran of China's plant-based meat industry and the first to establish a range of modern plant-based meat alternatives in the country. The company recently signed a partnership deal with Wal-Mart to develop and distribute meat alternatives in the mainland.

**WTH Foods**
Manila, Philippines

2019

Plant-Based
Beef, Pork

Worth the Health (WTH) Foods produces plant-based meat products that can be prepared as ground pork or beef and easily integrated into classic Asian dishes with a strong focus on their native country's cuisine.

**Zero Meat by Otsuka Foods**
Osaka, Japan

2018

Plant-Based
Beef, Pork

Zero Meat is a plant-based meat brand under Otsuka Foods, part of a large Japanese conglomerate, offering sausages and burgers. Although most of their products are meat-free, one of their burger patties contains a cheese filling.

**ZhenMeat**
Beijing, China

2019

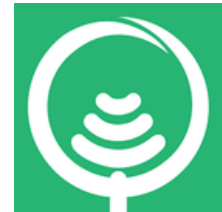
Plant-Based
Beef, Mooncakes,
Pork

Based in Beijing, ZhenMeat is creating modern plant-based meat products such as mooncakes, dim sum and mince meat tailored for Chinese cuisines.

ASIA ALT PROTEIN STARTUP MAP

Plant-Based Meat & Seafood

OMN!PORK



UNLIMEAT

Phuture



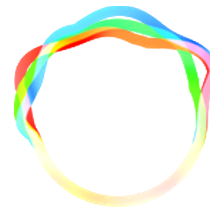
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Plant-Based Dairy & Eggs

GOOD
MYLK

evo

MARVELOUS
神苗食品 FOODS



ASIA ALT PROTEIN ACCELERATORS DIRECTORY*



Big Idea Ventures - Singapore

US\$125,000 cash + US\$125,000 in services/benefits, in exchange for equity



BITS×BITES

Bits x Bites - Shanghai, China

Undisclosed investment terms



Brinc - Hong Kong SAR, China

US\$80,000 cash (US\$30,000 joining fee) in exchange for equity at a priced round or following the most recent convertible note



GROW - Singapore

Up to US\$120,000 cash + US\$80,000 in services/benefits in exchange for equity



Innovate 360 - Singapore

US\$50,000 to US\$250,000 cash + office space, equity varies



Space-F - Bangkok, Thailand

Investment on case by case basis + office space, does not take equity

*Note: this list is for FoodTech focused programs; it does not include AgTech.

ASIA ALT PROTEIN CONNECTORS DIRECTORY

Cellular Agriculture Institute of the Commons (CAIC)

Japan

Cellular Agriculture Institute of the Commons (CAIC) is a Japanese non-profit promoting the expansion of cellular agriculture research and regulatory frameworks.

Center of Excellence in Cellular Agriculture

India

Institute of Chemical Technology (ICT) and the Good Food Institute (GFI) India have joined forces to promote the plant and cell-based meat sector through research and commercialisation and will establish a lab facility in Mumbai by 2020 to be named the 'Centre of Excellence in Cellular Agriculture' and will in a second phased establish a larger research facility by 2021.

Good Food Institute (GFI)

Global

The Good Food Institute (GFI) is a non-profit at the centre of the alternative protein movement. GFI helps establish the plant-based and cultivated meat industries through a range of avenues such as supporting research, working with entrepreneurs, and advocating for policy change with teams across the globe including offices in India and China.

Green Monday

Hong Kong SAR, China

Green Monday is an open source movement backed by a non-profit foundation. Seeking to create the cultural context for plant-based eating, Green Monday leads advocacy, education, and provides a framework for behavioral change. The Green Monday movement is currently active in over 30 countries.

Singapore Economic Development Board

Singapore

The Singapore Economic Development Board (EDB) is responsible for strategies that enhance Singapore's position as a global centre for business, innovation, and talent.

ASIA ALT PROTEIN KEY EVENTS CALENDAR

EVENT	LOCATION	HOST	MONTH
Vegetarian Food Asia	Hong Kong SAR, China	Baobab Tree Event Management	March
KET Singapore	Singapore	KindEarth.Tech	April
Korea Food Tech	Seoul, South Korea	Korea FoodTech Association	May
Sustainable Food Proteins	Singapore	Centre for Management Technology (CMT)	June
Future Food Asia	Singapore	ID Capital	June
Food's Future Summit	Hong Kong SAR, China	Foodie Magazine	September
VeggieWorld Hong Kong	Hong Kong SAR, China	VeggieWorld	October
Asia-Pacific Agri-Food Innovation Week	Singapore	Rethink Events	November
VeggieWorld Beijing	Beijing, China	VeggieWorld	November
Future Food Forum	Beijing, China	China Plant Based Foods Alliance	November
Future Of Protein	New Delhi, India	GFI & Humane International	November

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Jinesh Shah, Plant-Based Food Consultant

ABOUT GREEN QUEEN MEDIA

Founded by serial social entrepreneur and eco activist Sonalie Figueiras in 2011, Green Queen is an award-winning impact media platform advocating for social & environmental change in Hong Kong. Our mission is to shift consumer behaviour through inspiring & empowering original content in Asia and beyond.

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SUPPORTING RESOURCES

- *Good Food Startup Manual: Singapore, The Good Food Institute*
- *China Plant-based Meat Industry Report 2018, The Good Food Institute*
- *The Investment Case for Alternative Protein, AgFunder*
- *Plant-based Profits: Investment Risks & Opportunities in Sustainable Food Systems, FAIRR*
- *Future Food Now: newsletter offering coverage & analysis of APAC alternative protein and dairy industry*
- *Green Queen Media*

TEXT REFERENCES

1. <https://www.adb.org/sites/default/files/evaluation-document/36135/files/food-security.pdf>
2. <https://www.ewg.org/meateatersguide/a-meat-eaters-guide-to-climate-change-health-what-you-eat-matters/climate-and-environmental-impacts/>
3. <http://www.fao.org/3/i2425e/i2425e00.htm>
4. <https://www.adb.org/sites/default/files/evaluation-document/36135/files/food-security.pdf>
5. <https://www.greenqueen.com.hk/the-amazon-crisis-isnt-just-about-beef-its-also-about-cheap-soy/>
6. <https://doi.org/10.1016/j.scitotenv.2015.07.022>
7. <https://www.greenqueen.com.hk/hong-kong-tops-list-of-worst-emissions-polluters-due-to-excessive-meat-dairy-consumption/>
8. <https://www.pnas.org/content/112/18/5649>
9. <https://www.worldbank.org/en/news/press-release/2016/09/18/by-2050-drug-resistant-infections-could-cause-global-economic-damage-on-par-with-2008-financial-crisis>
10. <https://www.who.int/features/qa/cancer-red-meat/en/>
11. <https://www.thelancet.com/commissions/EAT>
12. <https://www.channelnewsasia.com/news/business/plant-protein-startups-vie-to-tap-china-s-hungry-market-11362368>
13. <https://www.theguardian.com/environment/2018/mar/19/water-shortages-could-affect-5bn-people-by-2050-un-report-warns>
14. <http://www.fao.org/3/i3440e/i3440e.pdf>
15. <http://www.fao.org/news/story/en/item/210621/icode/>
16. <https://www.investmentbank.barclays.com/our-insights/carving-up-the-alternative-meat-market.html>
17. <https://www.investmentbank.barclays.com/our-insights/carving-up-the-alternative-meat-market.html>
18. <https://static1.squarespace.com/static/59d1440029f1874f709cc95b/t/5a8c7f30f9619a3b63e36945/1519157050945/FAIRR+Report.pdf>
19. <https://qz.com/1075989/china-wants-to-import-israels-vegan-meat-technology/>
20. <https://www.mckinsey.com/industries/retail/our-insights/mapping-chinas-middle-class>
21. <https://www.ecolab.com/-/media/Ecolab/Ecolab-Home/Documents/DocumentLibrary/Presentations/ExternalComms/HelpingChinaAddressFoodSafetyChallenge.pdf?la=en>
22. <http://www.fao.org/3/i9540en/i9540en.pdf>
23. https://www.admcf.org/wp-content/uploads/2019/11/20180904_Charting-Asias-Protein-Journey_Report.pdf
24. <http://dg.cnsoc.org/article/04/8a2389fd54b964c80154c1d781d90197.html>
25. <https://medium.com/cellagri/integriculture-completes-seed-funding-to-bring-cultured-meat-to-japan-bc3b2ab8fb25>
26. https://www.gfi.org/chinas-role-in-the-plant-based-industry?utm_campaign=Future%20Food%20Now%3A%20Asia-Pacific&utm_medium=email&utm_source=Revue%20newsletter
27. <https://frontera.net/news/asia/starbucks-aims-for-china-to-overtake-the-us-but-not-as-quickly-as-some-expect/>
28. <https://economictimes.indiatimes.com/news/politics-and-nation/india-likely-to-add-273-million-people-between-2019-and-2050-un-report/articleshow/69830509.cms?from=mdr>
29. https://www.huffingtonpost.in/2016/06/14/how-india-eats_n_10434374.html
30. <https://economictimes.indiatimes.com/opinion/et-commentary/with-85-trillion-how-india-can-become-worlds-largest-economy/articleshow/10699821.cms>
31. <https://www.gfi.org/2019-04-26>
32. <https://www.worldbank.org/en/news/feature/2013/05/13/helping-india-combat-persistently-high-rates-of-malnutrition>
33. <https://doi.org/10.1016/j.appet.2018.08.027>
34. <https://www.smithsonianmag.com/science-nature/will-chinas-growing-appetite-for-meat-undermind-its-efforts-to-fight-climate-change-180969789/>
35. <https://www.nationalchickencouncil.org/about-the-industry/statistics/per-capita-consumption-of-poultry-and-livestock-1965-to-estimated-2012-in-pounds/>
36. <https://www.ft.com/content/4f846fba-ce07-11e9-99a4-b5ded7a7fe3f>
37. <https://www.statista.com/statistics/273232/net-pork-production-worldwide-by-country/>
38. <https://edition.cnn.com/2019/09/04/business/china-pork-swine-fever-pigs/index.html>
39. <https://www.reuters.com/article/us-china-swinefever-hogs/chinas-hog-herd-may-drop-by-55-from-fatal-swine-fever-rabobank-idUSKBN1WH2IG>
40. <https://www.reuters.com/article/us-china-swinefever-pork/chinas-pork-prices-slump-on-higher-supply-falling-consumption-idUSKBN1XM1PW>
41. <https://www.smh.com.au/world/asia/african-swine-fever-china-opens-emergency-pork-before-holiday-pig-out-20190909-p52pif.html>
42. <https://www.reuters.com/article/us-china-food-meat/impossible-foods-says-china-its-top-priority-meat-substitute-market-idUSKCN1VU0T3>
43. <https://www.greenqueen.com.hk/impossible-burgers-lands-in-mainland-china-impossible-pork-on-its-way-2/>
44. <https://www.greenqueen.com.hk/breaking-impossible-foods-plant-pork-ces-vegas-asia-market/>
45. <https://eprints.soas.ac.uk/21946/1/Buddhist%20Vegetarianism%20and%20the%20Changing%20Meanings%20of%20Meat%20in%20Urban%20China.pdf>
46. <https://dictionary.apa.org/mere-exposure-effect>
47. <https://www.greenqueen.com.hk/singapore-startup-karana-on-a-mission-to-popularize-jackfruit-as-healthy-meat-alternative/>
48. <http://www.fao.org/3/i9540en/i9540en.pdf>
49. <https://www.scmp.com/news/hong-kong/health-environment/article/1810125/its-even-more-lucrative-cocaine-hong-kong>
50. <https://www.cnet.com/news/trying-impossible-foods-pig-free-plant-based-pork-as-a-practicing-muslim-was-super-weird/>
51. <https://www.startupdecisions.com.sg/singapore/incentives/startup-funding-sources/>
52. <https://www.reuters.com/article/us-china-agriculture-land/chinas-total-arable-land-falls-for-fourth-year-in-2017-resources-ministry-idUSKCN1IK059>
53. <https://impossiblefoods.com/insights/generationaltrends/>
54. <https://www.greenqueen.com.hk/generation-alpha-67-of-6-9-year-olds-want-to-make-saving-the-planet-their-career-mission/>
55. <https://www.tysonfoods.com/news/news-releases/2019/6/tyson-foods-unveils-alternative-protein-products-and-new-raised-rooted>
56. <https://www.tysonfoods.com/news/news-releases/2019/6/tyson-foods-unveils-alternative-protein-products-and-new-raised-rooted>
57. <https://www.forbes.com/sites/christinatroitino/2018/11/08/impossible-foods-bleeding-burgers-to-make-grocery-store-debut-in-2019/#63e009ab98ba>
58. <https://www.cnn.com/2019/01/21/how-bill-gates-backed-vegan-beyond-meat-is-winning-over-meat-eaters.html>
59. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CDhttps://brightergreen.org/dairy/>
60. <https://www.vox.com/2014/7/2/5865109/study-going-vegetarian-could-cut-your-food-carbon-footprint-in-half>
61. <https://koreatechtoday.com/food-tech-start-up-company-the-planteat-attracting-1-34m-usd-in-investment-from-three-venture-capitals/>

IMAGE REFERENCES

1. https://assets.weforum.org/article/image/large_sSekaozCwmpzaFjHoqZNlPp9TA5IS31m00YSWm9jNjL.jpg
2. https://media.wired.com/photos/5d57249c74a011000904ba12/master/w_2560%2Cc_limit/science_cattle_957346770.jpg
3. <https://arc-anglerfish-washpost-prod-washpost.s3.amazonaws.com/public/ZAET6OGH4UI6TFQVR4NDFFROAQ.jpg>
4. https://miro.medium.com/max/12032/1*RFEAKGl4Ro2nMdfIRlxzgw.jpeg
5. https://www.plantbasednews.org/image/c_limit%2Ccs_srgb%2Cq_auto:good%2Cw_1104/MTY1NTk1NzkxOTAxMTQwMjU1/image-placeholder-title.webp
6. <https://archinect.imgix.net/uploads/c8/c86917daffff9368c385c86361b2aa0d.jpg?auto=compress%2Cformat>
7. <https://img2.chinadaily.com.cn/images/202001/09/5e15ff1aa310cf3e97afdf6d.jpeg>
8. <https://www.foodsource.org.uk/book/export/html/10>
9. https://cdn1.i-scmp.com/sites/default/files/styles/1200x800/public/images/methode/2019/02/21/0fee4c4a-35a5-11e9-b09f-892c410303c7_image_hires_161920.JPG?itok=t51USiY0&v=1550737166
10. https://www.meatpoultry.com/ext/resources/MPImages/07-2018/07302018/StarbucksChina_Lead.jpg?1533065625
11. <https://cdn.techinasia.com/wp-content/uploads/2017/02/Starbucks-China.jpg>
12. https://cdn.i-scmp.com/sites/default/files/styles/1200x800/public/d8/images/methode/2019/12/17/ca602b0a-1e2c-11ea-8971-922fdc94075f_image_hires_013310.JPG?itok=lBIQbYM0&v=1576517598
13. https://www.foodbusinessnews.net/ext/resources/2019/4/PorkProcessing_Lead.jpg?1555081111
14. <https://www.mercurynews.com/wp-content/uploads/2020/01/porkpossible.jpg?w=862>
15. [https://cdn.vox-cdn.com/thumbor/_jRfye-tOV3YITxxbKePpRritk=/0x0:7952x5304/1520x1013/filters:focal\(3340x2016:4612x3288\):format\(webp\)/cdn.vox-cdn.com/uploads/chorus_image/image/66037736/IF_2020_IMPOSSIBLE_PORK_BAO_min.0.7.jpg](https://cdn.vox-cdn.com/thumbor/_jRfye-tOV3YITxxbKePpRritk=/0x0:7952x5304/1520x1013/filters:focal(3340x2016:4612x3288):format(webp)/cdn.vox-cdn.com/uploads/chorus_image/image/66037736/IF_2020_IMPOSSIBLE_PORK_BAO_min.0.7.jpg)
16. <https://www.kyotogram.com/wp-content/uploads/2017/08/new-delhi-landscape.jpeg>
17. <https://pxhere.com/en/photo/554844>
18. <https://www.eco-business.com/media/cache/02/37/0237b810ac5ec7b5f20f28147d3f8f20.jpg>
19. https://www.gimselacademy.nl/wp-content/uploads/2017/11/Tofu-Tempeh-Seitan-Fu-Stocksy_txp7f5eeb28SVk100_Medium_575200.jpg
20. https://assets3.thrillist.com/v1/image/2829137/size/gn-gift_guide_variable_c_2x.jpg
21. https://upload.wikimedia.org/wikipedia/commons/5/5f/Koufu_%28Wheat_Gluten%29_Dish.jpg
22. <https://images.squarespace-cdn.com/content/59b0a49a1f318d0ea9c6eeae/1579228468287-TB7PUEOBL1CG7UHUILIB/minced+2.jpg?format=1500w&content-type=image%2Fjpeg>
23. <https://www.hakaimagazine.com/wp-content/uploads/header-china-seafood.jpg>
24. <https://pbs.twimg.com/media/ELogaylU4AAuKas?format=jpg&name=4096x4096>
25. <https://macaulifestyle.com/wp-content/uploads/2018/12/Wing-Lei-Palace-Braised-Fish-Maw-Sea-Cucumber-and-Guinea-Fowl-Soup.jpg>
26. <https://dialogochino.net/wp-content/uploads/2019/05/HWBPDE-1440x720.jpg>
27. <https://magarticles.magzter.com/articles/11937/344630/5cd1a05ec4c50/Shiok-Meats-Seafood-Meat.jpg>
28. <http://en.hanas.com/wp-content/uploads/2017/05/news-Singapore-skyline.jpg>
29. <https://1usaeh37xc8k42ejdw3evw3c-wpengine.netdna-ssl.com/wp-content/uploads/2020/01/Rabail-Chief-Scientist-scaled.jpg>
30. <https://turtletreelabs.com/static/media/about.0faf3d4d.jpg>
31. <https://assets.rbl.ms/18405011/origin.jpg>
32. https://www.foodbusinessnews.net/ext/resources/FBN-Features/7/LabGrownMeat_Lead.jpg?1531247541
33. <https://www.ju.st/img/just-egg/just-egg-sandwich-2.jpg>
34. https://i1.wp.com/www.icanyoucanvegan.com/wp-content/uploads/2019/02/fullsizeoutput_6093.jpg?w=3000&ssl=1
35. <https://sv-hk.org/wordpress/wp-content/uploads/Green-Monday-3.png>
36. https://www.ejinsight.com/wp-content/uploads/2019/07/2192435_f9effa16e4d980a9b90feb0e3cc73818.jpg
37. From press release from Green Monday
38. <https://www.racksolutions.com/news/app/uploads/Tokyo-Skyline.jpg>
39. <https://cms.qz.com/wp-content/uploads/2017/10/meatbox.jpg?quality=75&strip=all&w=3200&h=1802>
40. From press release from KARANA
41. From press release from KARANA
42. https://chinadialogue-production.s3.amazonaws.com/uploads/content/image/11600/Howey_Ou_climate_activies_in_mainland.png
43. <https://i.ytimg.com/vi/xqTTmJeo65E/maxresdefault.jpg>
44. https://images.squarespace-cdn.com/content/v1/5cc9ed17348cd94e4ecfcd9c/1557262557323-2VTOYSOUDYS69ZWPSBYH/ke17ZwdGBToddI8pDm48kLkXF2pIyv_F2eUT9F60jB17gQa3H78H3Y0txjaiv_ofDoOvxcdMmMKkDsyUqMSsMWxHk725yiiHCClfrh801z4YTzHvnKhyp6Da-NYroOW3ZGjoBKy3azqku80C789l0iyqMbMesKd95J-X4EagrgU9L3Sa3U8cogeb0tjXbfawd0urKshkc5MgdBeJmALQKw/PopcornShrimp-6088*.jpg?format=2500w
45. <https://d.newsweek.com/en/full/446984/04-22-gs-shrimp-01.webp?w=737&f=75f79edddc4c5480b3333a8568845dd9>

THE ASIA ALTERNATIVE PROTEIN INDUSTRY REPORT 2020

NEW DECADE, NEW PROTEIN

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