

Densely-populated Singapore has never been a huge livestock producer. But now it's eyeing to become a leading maker of lab-grown animal protein

By Zoe Han

It all starts with a feather.

A technician scissors the root of it and immerses it in a test tube. The liquid separates the cells. They are swimming in the tube, then one by one, transferred to a culture dish.

No difference from feeding a chicken, lab technicians come by regularly to feed the cells in an environment mocking the inner one of a chicken. Cells grow in the constant warmth and moist, gulping in the nutrients coming from plant extracts, a substitute of the animal serum that nurtures cells.

For about 14 days, cells multiply, eventually to a containerful of minced chicken, aggregated by cells. The facilities take it and blend Mung bean protein in to stabilize the wobbly mixture. Later, the machine compresses it to a nugget patty.

Kaimana Chee, 44, walked in wearing a lei made of kukui tree around his neck, the Hawaiian state tree. He set the oil to 375 degrees, deep fried the chicken nugget until it is golden brown. Just like he would with any other nugget. White flour baos are in steamer baskets and waffles are on the stove top. Outside of the kitchen, Chee's guests are waiting for the climax of the night.

Chee sliced the nuggets and placed them on top of the baos and waffles and walked out to serve his guests. In the past few years, as the chef ambassador of Eat Just, he flew over 40 countries to present the cooking to businesses and investors. Now, he felt a bit emotional inside that he is serving the first batch of guests in the world to taste lab-grown chicken.

"Oh my god, it tastes like chicken," Chee's guests exclaimed.

That was already four months ago, recounted Chee while preparing a new menu for the next partner restaurant of Eat Just in Singapore.

Since last December, Chee has served thousands of guests. He once hosted a group of executives from a large chicken company. "They tore it apart and cut it up and even they were equally as astounded by how it just felt like chicken," said Chee.

With the taste matching, the new production process of cultured chicken all happens in the buildings. No farmland involved, no countryside-to-city mass truck transportation required, nor any live animals. And that's great for the city-state that is the same size as New York City minus the Manhattan borough.

Singapore has never been a center of food production — small, urban and heavily-populated, it currently imports more than 90 percent of its food consumption from outside. But for the first time in its history, it stands close to the possibility of reversing the direction of food delivery: It might be able to feed itself and the surrounding countries, all from its laboratories.

Eat Just was the first to get regulatory approval from the Singapore government, making both of them a world-first. Now, a flock of cell agriculture startups are on their way, announcing R&D plans in the compact city-state.

The CEO of Eat Just, Josh Tetrick, said in a recent webinar, “the Future of Meat, Delivered”, that one of the advantages of lab-grown meat is reducing land use, as industrial meat production takes hundreds of acres of land.

To Singapore, it is attractive enough.

Supporting 5.7 million people, Singapore only has 1 percent of the land suitable for agricultural use, roughly the equivalent to two New York's Central Parks. Although a city surrounded by ocean, Singapore has limited fish farming areas because it has some of the busiest shipping portals. Local seafood production is 10 percent of what the citizens consume every year, even lower than the vegetable percentage and the meat percentage.

For years, the Lion City's approach to food security has been diversifying its imports: it has over 170 food partners from different countries and regions. It worked well, as the Global Food Security Index ranked it as the first for 2018 and 2019, and even when the pandemic closed borders and caused supply chain shock for multiple countries, Singapore was fine.

Li Ting Ho, the regional director of Singapore Economic Development Board's Chicago office, said her family and friends back home were able to get their food supplies as usual. Yet, it is the fragility of the global food supply chain that has the government long concerned about.

In 2019, the government set up a target of producing 30 percent of the city state's food consumption by 2030, from the current level of 10 percent, pouring SG\$140 million as funding.

Novel space is one direction that people turn to for new agriculture sites as lettuces and sweet nai bai, an Asian green leafy plant similar to bok choy, are sprouting from the rooftop of multi-storey-high car parks and a prison building.

But the more important direction, Ho said, is bringing in new technologies. Not only land, Singapore also has a slim demographics for traditional farming. With the rapid urbanization going on, it would just be harder to convince young people to farm at all, Ho said. Bringing in new technologies would create new, well-paying jobs, and make these roles a lot interesting. And these range from the vertical aquaculture tanks that have flocks of whitefish and shrimps swimming in, to cell agriculture in the labs.

That's when the new alternative protein technology found its new home.

Ever since the public has realized that industrial meat production is the number one contributor to carbon emission, tech-savvy business people including Bill Gates are pouring investment in alternative protein. And recently, in cell-based protein, because it could go even further in taste, texture and nutrients than the plant-based ones.

In the last five years, the sector has bombarded, with a flock of startups all over the world such as Memphis Meats, Eat Just, Alef Farms, to name a few. A 2019 survey by Barclays forecasts that the alternative meat industry as a whole will reach \$140 billion in a decade. The expenses per pound drastically decreased from millions of dollars to \$23, still expensive, but affordable enough to make a restaurant debut.

Yet, government approval was the main issue. The world had its eyes on three countries to become the first: Israel, the United States, and, small and mighty, Singapore.

Singapore made the final cut.

Carrie Chan, the CEO of Avant Meats, a cultured-fish startup based in Hong Kong that is also pushing through the regulation stage for its products, said that the Singapore government offers much clearer instructions compared to the US government she has interacted with.

"We can ask them questions," Chan said. She described that Singapore Food Agency provides "a lot more approachable kind of interactions with relevant regulators", where the back and forth between company and the regulator is expedient and efficient.

SFA has set up a "Novel Food Safety Expert Working Group" to provide scientific advice, whose expertise ranges from food toxicology, bioinformatics, nutrition, epidemiology, public health policy, food science and food technology. And in the early stages, SFA also conducted interviews with lab-grown meat startups to flush out a framework, including local startup ShioK Meats that focuses on cultured crustacean.

But even so, the world-first's novelty makes the approval process tedious and ambiguous.

Ying Jie Chen is the Consumer Centric Innovation Manager at Food Innovation & Resource Centre of Singapore Polytechnic. Before Eat Just's lab-grown chicken went into the market, Chen's group collaborated with Eat Just to finalize the format of chicken nuggets, and also helped the business to apply for regulatory approval from SFA, which is the more intensive task.

"It's actually not easy, because there's nothing like that in the world," Chen said. The process required various documentation to make sure it is safe for human consumption, focusing on each step of the food production process: where the cells and the chicken came from, the type of the chicken, the temperature and humidity of the environment that the cells grow in and the equipment the team uses.

Chee the chef ambassador of Eat Just said that for them, the whole process took two years. Yet they became the first to get approval among the few others that were also in conversation with SFA. Chen from FIRC said it might be that Eat Just had the right people, another group of technologists, to help navigate through what each documentation means, a process that slows other startups down. As the regulations are still at the beginning stage, assessing each product is more of a case-by-case, process-dependent approach, and it might take years to materialize into a final form, just like vegan food.

A domestic startup, Shiok Meats benefits from the local efforts to push forward alternative protein production. Big Idea Venture, one of the few venture capital and accelerator programs that focuses on alternative protein, is Singaporean and an early investor of Shiok Meats. In the \$12.6 million funding Shiok made last October, SEEDS Capital, an investment arm of the government agency Enterprise Singapore, is also a backer.

It has already developed a cultured shrimp siew mai, a traditional dim sum dish, which is expected to be released in restaurants in late 2021.

Sandhya Srirham, CEO and Co-founder of Shiok Meats, told the Green Queen Media that supporting food security in the APAC region is part of the company's vision.

"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," Srirham said. "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."

It is crucial to the region. By 2050, the United Nation forecasts that Asia's population will reach 5 billion, and the protein demand is too: a report by Asia Research & Engagement found out that in the same period, the meat and seafood consumption in the region will rise by 78% .

And that's why a lot of the cultured meat startups see Singapore as an entry point. They hope to get a hold of the lucrative opportunities in the Asia Pacific region, an alternative protein non-profit the Good Food Institute pointed out in an email.

The past April saw a whirlwind of international alternative protein corporations announcing their plans going into the Singapore market, including Chan's Avants Meats. It just announced its R&D plans in Singapore. Chan is also in talks with SFA for its first product in the line, a cultured fish maw, also known as the swimming bladder.

Different from a lot of other cultured meat products, fish maw has a special, premium status in the Asian food culture: it is related to traditional delicacies as well as a high-end medicine ingredient. In markets in Hong Kong, vendors sew dried up maws in strings and sell it. After soaking it up in water, the maw can be cooked in soup and stew in a variety of Asian dishes ranging from southern part of China, Hong Kong, Cambodia, to even southern part of Asia such as Malaysia and Indonesia.

The deals are so lucrative that the cost per pound of the traditional maw can reach hundreds of thousands of dollars. Illegal fishing sprees have thus driven a species of fish, totoaba, the most premium fish kind to get the maw, near to extinction in the Mexican gulf. A Greenpeace Mexico spokesperson once described the price of maws “more lucrative than cocaine”.

Chan’s business sees the exact reason, the premium value of fish maw, as a means to accumulate some revenue to support their efforts launching other products such as the fish fillet.

And the demand has already reached Chan even before Avant Meats started selling. Several restaurants in Hong Kong called Chan and went straight ahead asking for the price and samples of fish maw. Being sustainable is one attractive thing, as well as that it might standardize costs for each dish, as traditional maws are hard to trim, and they come in different shapes, sizes and thicknesses.

Chan had to decline, as a market price was not yet solidified, nor have they gotten the regulatory approval to sell. But she compared the mined diamond and lab-grown diamond to the possible price outcome. She referred to a McKinsey report that it might settle on 50 percent or 60 percent of the price of the traditional ones.

Utilizing the fish bladder cell of a different species in the same family of the second premium fish for maws, Avant Meats can recreate the popular ingredient without contributing to the legal and environmental issues behind it. In a private tasting event for potential investors, Avant meats served fish maw coconut drink of small samples, and the majority of guests ended up investing: It might benefit Hong Kong, too.

But the key is Singapore.

Chan said that since the Hong Kong legal system is a common law system, it did not forbid the sale of cell-grown meat in the market. Yet, no precedent also means no regulatory framework, and if a company decides to sell in a situation like this, it is exposing itself to too many risks.

And selling in Singapore first might give the Hong Kong government time to pick up. Chan said that the government is usually more open to negotiating with products already released elsewhere. But she hopes to see the products being commercialized in Hong Kong and Guangdong, China in 2023.

Back to Singapore. Recently, Chee just served chicken katsu curry, chicken rice, and Caesar salad all made of Eat Just’s cell-grown chicken nuggets straight to customers’ home via the local delivery app Foodpanda.

For the upcoming launch at JW Marriott’s modern cantonese restaurant, Chee is preparing three cantonese dishes with the cultured chicken: a dim sum, a salad, and a rice bowl stir fry.

He will still be wearing the same lei.

It represents his upbringing in a small makeshift Hawaiian farm, where Chee's grandfather, half native Hawaiian half Cantonese, taught the nine-year-old Chee how to fish, how to slaughter a chicken and how to prepare and cook them. It was the place where he learnt to respect the food and animals more.

"There is a crazy juxtaposition," said Chee.