Ngiam Tong Tau, Chairman of Sky Greens.

INTERVIEW

Ngiam Tong Tau

Keep the Food Coming

Cities can take their easy access to cheap, abundant and safe food for granted. But changing environmental and other conditions can quickly threaten food availability. Drawing examples from Singapore and around the world, former Chief Executive Officer of Agri-Food & Veterinary Authority **Ngiam Tong Tau** reflects on strategies cities can adopt to ensure a safe and sustainable food supply, now and in the future.

How important is it for cities to maintain a continuous food supply?

People living in cities take food supply for granted because it is always easily accessible from the supermarket. But lately, concerns about climate change have made some of us realise that food may become unavailable if producing countries suffer natural disasters that affect food production. So we do need to keep an eye on the supply of food in the world, to ensure that food can be continually transported to the city and sold at prices that are affordable enough for the poor. If we don't maintain a continuous supply, it could lead to malnourishment and famine.

Famines have occurred throughout history. While they can be due to environmental changes, they can also be caused by policies, by inequality of wealth, or by diseases in the food supply chain. During China's "Great Leap Forward" in the 1960s, it is estimated that 10 million people died of malnourishment—they starved to death. People were made to go to the communes, everybody worked on the farms, and productivity was very low. Coupled with wealth inequality between the cities that grew from the steel industries and the rural areas, it led to a great famine. Another example: Irish farmers in the mid-1900s suffered losses from potato blight, a fungal disease, and people starved from malnourishment. As a result, many of the Irish migrated to America.

01

02

03

So the lesson in all this is to keep an eye on the production of food around the world, and be aware of how it might change because of natural disasters or political decisions. Just imagine if Singapore's sea routes were cut off: we wouldn't get food.

What early challenges did Singapore face in terms of food access and how were they overcome?

Singapore is a very small country with very little land for farming. In the 1950s until mid-1970s we were able to produce enough fresh food for ourselves: things like pork, chicken, eggs, vegetables and fish. Of course, our population was only about two million at that time.

But as Singapore industrialised, much of the farmland was taken away—from about 15,000 hectares of farmland in the 1960s, we now have less than 1,000 hectares. Just for fresh food alone—and not even considering staple foods like rice—we knew from the very beginning that we would never be able to produce enough food: from the very outset we would have to buy food from overseas.

> "...it is not ideal to produce 100% locally. You need some competition from imports to keep prices affordable."

So we went out and looked for food supply sources. One of the important things we considered was that food supplied to Singapore must be safe. They cannot contain contaminants, poisons or infectious bacteria.

We also decided to continue producing fresh foods in Singapore, as a means of controlling prices and quality. For example, if we grow vegetables in Singapore, we can demand the same quality from exporting countries: it has to be pesticide free. For eggs, it has to be salmonella enteritidis-free. Producing our own fresh foods means we can increase our own production in cases where our food supply sources is unable to supply us with safe, cheap food.

But in terms of food supply it is not ideal to produce 100% locally. You need some competition from imports to keep prices affordable.

What food does Singapore produce or not produce?

In the 1960s and 1970s in Singapore, we promoted the production of pigs and were very successful. Singapore was self-sufficient in pork. But the smell from the pig farms was not tolerated by city folks, and there was pollution of the waterways by pig waste, so the government decided to phase out pig farming. We had to look overseas for supply, from Australia, Thailand, Malaysia, Europe and America. We started a pig farm in Pulau Bulan, south of Pulau Batam. It is the largest pig farm in the world: a quarter million pigs in one place, supplying Singapore with slightly more than a thousand pigs a day for slaughter.

Likewise, for eggs, in the 1980s we had six egg farms, but nearby residents always complained about the smell from the poultry farms. The government decided to compensate the poultry farms and they closed down. But three persisted and stayed on. Today, one of the major farms, Seng Choon, can control the smell by housing the poultry indoors, scrubbing the air that comes out from the buildings, and treating the waste. With three egg farms, we can produce almost 30% of the five million eggs we need for consumption in Singapore every day.

Although multi-story farming of pigs is a possibility, you still have to work out the economics of it. But even so I think the problem of smell will be tremendous because pigs produce a lot of waste.

How has Singapore's high-density environment created opportunities in food production?

I think our environmental conditions and scarcity of farmlands have pushed our farmers to innovate.

One of our innovations, Sky Greens, is a vertical farm that can produce 10 times more vegetables per unit area of land compared to traditional farming. Sky Greens is the first commercially viable vertical farming system for vegetables in the world, and it has won many awards.

We don't have enough land for farming, so for fish, vegetable and egg farms we have gone vertical. There are many indoor farms in Singapore now, like Sustenir. They control the environment for lighting, carbon dioxide, temperature, and so on, and can grow any vegetable in Singapore, even strawberries, all year round.

01 The abundance of food in supermarkets belies challenges in food supply.

02 Sustenir's indoor growing technology achieves clean produce free of soil, pesticides and pollution.

03 Trucks of live ducks are delivered into Singapore daily from Malaysia.

If we had large expanses of land, nobody would think about indoor farming or vertical farming. The infrastructural cost is high. But these are things that put us one step ahead of other countries. In 20, 30 years' time, they will also have the same land concerns, and will have to use technologies like what we are using now to produce food.

How does Singapore keep food relatively affordable?

Having free trade and an open market helps to keep food prices down in Singapore and allows us to have ready access to food. We have local production to buffer the prices, and we have our importers who are very skilled in buying from overseas, from accredited, safe sources.

For example, Americans do not like to eat chicken wings and legs, so we buy these parts from America for very cheap. About 60% of the pork consumed in Singapore today is imported frozen pork: it is cheaper and of the same quality. Our grain traders also go round the world to buy the cheapest rice, wheat, corn, soya bean and so on.

How can technology be leveraged to address urban food needs?

Singapore's biotechnology industry is very well developed and we can influence food production around the world. We are not looking just to benefit farmers in Singapore—because we know we cannot grow enough—but we can help other countries which are selling food to us to produce at a cheaper cost.

For example, even though Singapore doesn't grow rice, we have the technology to produce disease-free rice, drought-resistant rice. We anticipate that in the future, with climate change, our rice will be in demand. This rice, developed by our Temasek Life Sciences Laboratory, is being grown in Indonesia and in China right now. This will help ensure that there will be a supply of rice back to Singapore.

Is it possible for cities to be self-sufficient in food?

Cities can selectively produce some foods, where there's economic advantage for them to produce. For example, vegetables cannot travel very far; they have to be fresh. But cities cannot produce all the food that they require, because there's not enough land for growing food, especially crops; they must always look for other highly productive areas to supply food to them.

The logistics and supply chain, which has improved around the world, has made it much easier for cities to gain access to food. In Singapore we have our fish auction markets, fishing ports, vegetable wholesale centre, as well as our three months' supply of rice stocked in warehouses.

01 Seng Choon Farm is one of three local farms and produces almost 30% of eggs consumed in Singapore.

"We don't have enough land for farming, so for fish, vegetable and egg farms we have gone vertical."

01

02

Beijing says it can produce enough food in the surrounding hinterland for the whole city of 21 million people. Personally I observed how they brought the vegetables into the city. During winter, truckloads of vegetables are brought in everyday from Yunnan, from Guangzhou and so on to Beijing, by road. Vegetables are auctioned off to buyers in whole lorries.

So for cities like Beijing and New York, being on a continent, their hinterland is the whole continent, in addition to their own country. Singapore is a small island; the Southeast Asian region is our hinterland. We look to our neighbouring countries to supply us with fresh food.

What would be needed for Singapore to become self-sufficient in some foods, such as leafy vegetables, fish or eggs?

We would need to set aside some land for intensive farming. With 100 ha of land, we can provide 100% of the leafy green vegetables consumed in Singapore. Right now we have three egg farms producing on 60 ha; we would need another seven more farms: 140 ha more land, to produce all the eggs we want.

> **“Cities can achieve food security by simply having food available and affordable.”**

Studies show that by 2030 there will be a decline in the fish population of South China Sea, which we rely on for a lot of our fish supply. So it is incumbent on us to farm fish right now. We can actually produce the fish we need if we maximise the use of our land and sea space, as well as some of the coastal areas for inland fish farming.

The key is to make sure we have a stable supply to meet our needs for critical foods during times of emergency. There is benefit in having some local supply, but over the long term, we cannot actually rely on our own production for all our food needs.

What can Singapore learn from other cities about food security?

Cities can achieve food security by simply having food available and affordable.

We need to learn from other countries how they bring in food, the logistics of it. We worry in Singapore about what happens if we cannot import a lot of food by ship, so we need to look into alternative logistics of food coming over land.

We need to anticipate what the food supply is going to be like worldwide. With satellites, markets can now estimate how much farm produce is going to be available in six months' time. AVA has an intelligence unit looking into this, so that we can take action to overcome problems if they should arise.

What happens if Thailand is flooded and cannot sell us rice? You need to know alternative areas to get rice from. And you must cultivate this trade. So we need to diversify our sources.

In some cities, small plots of land are given to citizens to grow their own food. In Germany this started after World War II, when food supply was very low. It has become a tradition, and today it is the students who farm in the city. In Japan, the policy is to have rice produced in Japan, because it's their culture. Every empty piece of city land is used to grow rice. But the quantities grown are quite limited, and they are still forced to import some rice.

Watch the interview here:

https://youtu.be/oMFbnCrhqH8

01 People in China go to wholesale markets to shop for fresh produce.

02 Fish are reared locally at Apollo Aquaculture Group without the use of antibiotics and hormones.