Assuring food security in Singapore, a small island state facing COVID-19

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Abstract

Small island states have features in common which make it difficult for them to assure food security through self-production, notably limited land, fresh water and labour. As these island states grow economically, diet diversification by an increasingly affluent population demands a balance between food imports and self-production. Singapore, a wealthy, small island state has consistently been ranked high in food security in international comparisons, but only under conditions when trade is uninhibited and countries do not reduce food exports. The COVID-19 pandemic has shown vulnerabilities in the country's "Resilience" strategy to maintain food security through importing over 90% of its food needs from over 170 countries. Leading up to and during the pandemic, strategic policy initiatives were announced by the government and new measures were taken to increase the stability of imports, ramp up production from existing farms, increase self-production by 300% by 2030 through increasing the number of high technology urban vegetable and fish farms, and factory-cultured food, and reducing food waste. Singapore offers lessons for other small island states in ways to improve their food security.

Keywords Food security · COVID-19 · Small island state · Singapore

1 Introduction

Because of their geographic limitations, small island states have features which differentiate their food security concerns from those of larger countries with much natural resources of land and water to support agriculture. One such feature is reliance on imported food, especially staples (like rice or wheat) and animal protein. As such, small island states are particularly vulnerable to disruptions in the supply chains of all imported food. Singapore, as a small island state of about 800 km² is reported by its Singapore Food Agency to have imported 90% of its food needs in 2019 from over 170 countries, geographically spread (Singapore Food Agency 2020). The island has also performed well in international comparisons such as the Global Food Security Index (GFSI) published annually by the Economist

Intelligence Unit, U.K. (The Economist Intelligence Unit 2019). In 2019 it was ranked the most food secure country out of 113. Singapore therefore offers a case study on the policies, capabilities and technologies that contribute to assuring food security in a small island state, in non-crisis situations and when challenged by a pandemic crisis.

2 Foundations to achieve a high level of food security

The GFSI rank given to Singapore was based on a multi-rubric scoring system that adopted the 1996 World Food Summit definition for Food Security – that it “*exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*” (Food and Agriculture Organization, United Nations 2009). Singapore scored high on the rubrics concerning availability, affordability, quality and safety, but low on natural resources and resilience.

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2.1 Food availability and physical access to food

As with other small island states, food availability is made possible through limited self-production of some food items, importation of most food and stockpiles. Self-production is done mainly in surrounding coastal waters (for fish) and in six agro-technology parks which collectively comprise about 1.8% of total land area (used to produce fish, vegetables, eggs and miscellaneous minor items like quails and frogs). As of 2019, there were 77 vegetable farms, 3 egg farms and 122 fish farms. These farms met, respectively 14%, 10% and 26% of the island's needs of vegetables, fish and eggs, for a population of 5.7 million (Singapore Food Agency 2000). Singapore, like most middle to high income island states, applied an approach which the Food and Agriculture Organization, United Nations (FAO, UN) called "self-reliance", in which some level of domestic food production is maintained and the capacity is generated to import from the world market as needed (Konandreas 2000). There is no explicit goal to achieve 100% food self-sufficiency.

The second approach to make food available is what Singapore calls its "Resilience" strategy for food import sourcing. This strategy is implemented by importing from a geographically diverse group of countries for each food item. For example, chicken is imported mainly from Brazil, Malaysia, U.S.A. and Argentina while vegetables from Malaysia, China, India and Australia (Singapore Food Agency 2000). The government's food agency routinely sends out "scouting" teams around the world to develop new sources and supply chains. Stockpiles are the third approach used by most countries to ensure availability of key food items during periods of scarcity and a recent study by the Southeast Asian Center for Graduate Studies and Research in Agriculture (SEARCA) showed that every one of the ten countries in ASEAN had stockpiles of, minimally, rice (Teng and Darvin 2019).

2.2 Economic access to food

The affordability of food, as another important dimension of food security, depends on the price of food and the purchasing power of citizens. A policy of zero tariff on food and efficient logistics to handle food are two factors which help prevent the need to raise prices. Empowering its citizens with purchasing power adds to the favorable economic access to food. The average Singapore household has a relatively high Gross Domestic Product (GDP) per household, and with zero tariffs on food, this makes food expenditures a relatively small part of household budgets; by government statistics, less than 10%. This compares well with neighbouring countries in which household expenditures on food are in the range of 30–45% of household incomes (Our World in Data 2020). It may be argued that economically less developed island states

may not have the same capacity to import and provide food with affordable access to most of their citizens because of lower GDP per household.

2.3 Food utilization

Another foundational reason for Singapore's high GFSI ranking is with respect to the next dimension of food security – food quality and safety. It is generally recognized in the Southeast Asian region that the country has one of the strictest and most robust systems to assure food safety, whether it is chemical or biological. Additionally, food handling regulations stipulate procedures to maintain the nutritive value of fresh produce.

As with other small island states, Singapore lacks the natural resources and ecological resiliency in its agriculture base. But the country has attempted to counter this by focusing on space-limited, technology-enabled urban farming which currently provides about 10% of its needs (Singapore Food Agency 2020).

3 Effect of COVID-19 on food security

COVID-19 has generally disrupted food supply chains and consequently, also impacted on the different dimensions of food security. Apart from COVID-19, small island states are particularly vulnerable to other disruptors which reduce the quantum of food available for export from source countries, like severe weather events, natural disasters, and pest and disease outbreaks.

Experience from the 2007–08 food crisis has shown that unexpected agricultural production shocks lead to panic reactions by governments to restrict food exports and accumulate domestic stocks, thereby precipitating a chain of events leading to temporary food shortages, price spikes, price gouging and food hoarding by consumers. These have all been seen in the first months of the current pandemic in different countries (Hossain 2020). The International Food Policy Research Institute (IFPRI) using data from FAO, UN and its own models, have both projected that there are ample food stocks for 2020 and there is no justification for export restrictions (Vos et al. 2020). Both food availability and economic access to food have been affected by hasty reactions to the perceived threat of reduced food stocks.

One common intervention measure adopted by many countries, including small island states, to reduce virus spread has been movement control or "lockdowns". Epidemiologically this is justifiable but as has been seen, the indirect effects have been to reduce farmer ability to harvest and transport their produce to markets, delay planting of crops, prevent agricultural inputs getting to farmers and delaying food retailers like supermarkets from receiving replenishments (Hossain 2020).

Transport capacity of food from exporting to importing small island states like those in the South Pacific via sea and air have also been drastically reduced, reducing the physical access to food (Teng 2020).

“Lockdowns” have further had the unexpected effect of depriving millions of daily-waged workers of their ability to purchase food in many Asian countries. While still not obvious it is anticipated that there will be increased hunger and malnutrition in many developing countries (Hossain 2020).

4 Developing enduring solutions?

Small island states face the reality that, as their populations increase and their economic status improve, there is a need to import a more diverse basket of food and possibly higher quantum. Economists have long argued that countries that are land and fresh water limited do not have the comparative advantage to have high levels of food self-production, especially with respect to “extensive crops” such as rice and wheat. The alternative is to focus on producing food items which do not require much land, water or labour.

Small island states with developing economies face the dilemma of growing enough food for sustenance versus using the limited land and water to engage in higher value economic activities with export potential (e.g. light industries) or potential to earn foreign exchange domestically (e.g. tourism). Examples are many of the countries in the Caribbean and South Pacific. Exiting this dilemma appears to require foreign direct investment coupled with development plans supported by transparent governance.

Singapore offers some lessons of deriving enduring solutions to assure food security with economic growth and a systematic plan to have a food buffer for short periods of supply shortages (Caballero- Anthony et al. 2020). Starting in the mid twentieth Century, agriculture gradually declined in its contribution to national GDP and during the 1980s, a policy decision was made to limit all farming to about 1% of land area and to shift focus to economic activities with higher land and labor productivity such as service industries and manufacturing. This has enabled the island to have one of the highest GDP per capita in the world. However, food supply disruptions and price hikes during the 2007–08 crisis and subsequently, led to the government revisiting the role of agriculture to provide a buffer against such disruptions. Efforts culminated in the launch in March 2019 of an ambitious programme to increase nutrition self-sufficiency to 30% (from 10%) by 2030, commonly called the “Singapore Food Story” and also launching a new Singapore Food Agency (Teng et al. 2019). The Singapore Food Story has three focus areas – Urban agriculture and aquaculture (high technology indoor and outdoor farms), Future food (targeting alternative proteins like plant-based protein and cellular meat, etc.) and

Food science and technology, and would be the basis for innovations in farming and food processing. It taps into all the existing expertise in higher education institutes, government agencies and the private sector and is backed by an initial tranche of Singapore \$ 144 million (about US\$ 101 million). COVID-19 has further led to another Singapore \$30 million (about US\$ 21 million) being made available from April 2020 to ramp up production of vegetables, eggs and fish by local farms in the shortest time possible (Singapore Food Agency 2000). This reflects concerns about the disruption of food supply chains from measures to reduce the pandemic’s progress. Increasingly too, research has been funded to Singapore universities and their overseas collaborators to improve agriculture in neighbouring countries.

As a small island state, Singapore has recognised the limits of how much it can realistically produce, even with the use of efficient technology. To sustain the imports which are responsible for the bulk of its food needs, the country in March 2020 developed binding “Supply Chain Connectivity Agreements” with five other trading partners. Concurrent with this are existing overseas food production collaboration projects which allow a portion of the production to be exported back to Singapore; an example is a 2500 km² agri-food zone in Jilin province, China which has started exporting rice. Admittedly, not all the initiatives taken by Singapore are adoptable by other small island states. Nevertheless they provide indications of what are possible.

5 Conclusions

Singapore’s experience with the COVID-19 pandemic has affirmed several elements of its strategy to maintain food security which offer lessons for other small island states (Caballero-Anthony et al. 2020). Overall, increasing the economic status of citizens, as measured by GDP per capita, is important to assure economic access to food. The GFSI (The Economist Intelligence Unit 2019) clearly shows the strong correlation that as GDP per capita increases, so does household food security. Nationally, this has been backed by the country’s improvements in supply chain logistics and infrastructure to handle food importation and distribution with high quality food safety standards. The “Resilience” approach to food importation has proven to be a sound one, as diverse sources of imports from around the world has largely provided options to ensure food imports have alternative geographically-spread sources. Singapore has also chosen to make food security an important policy issue in national security, with the government giving priority to investments for research and development, and enterprises that strengthen the agriculture and food sectors. These investments have originated domestically and from overseas. Foreign direct investment has been encouraged largely because of the good governance,

sound intellectual property regime and tax incentives legislated by the government. A consistent and coherent policy approach to ensuring food security in the face of disruptors like COVID-19 is one feature of the response, as also shown by many other Asian countries (Hossain 2020).

Stabilizing food security is a goal that most countries have but with small island states, it is a fine balance between supply (imports, self-production and stockpiles) and demand (consumer diets, expectations and wastage). Unlike large countries with arable land, fresh water, labour and availability of inputs, small island states are always vulnerable to external phenomena beyond their control, and have low resiliency. As Singapore has shown, what it can do is to develop solutions which assure a capacity to buffer against supply disruptions for a short period by developing internal capacity to produce currently 10% of its food needs but going up to 30% by 2030. And concurrently, invest to develop the capacity to import from diverse sources and through policy interventions, seek binding agreements with those exporting countries willing to keep supply chains open in times of crisis.

Compliance with ethical standards

Conflicts of interest/competing interests The author declares that there is no conflict of interest

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