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Innovation, Prediction, and Flexibility: Three pillars to ensure a resilient food supply chain for Singapore

07 June 2024 | News

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Since the onset of the pandemic which led to widespread border closures and repeated lockdowns in 2020, global food supply chains have been upset by successive disruptions. The Russia-Ukraine war, which erupted in early 2022, placed 12% of the worldâ??s food trade under pressure. More recently, Red Sea disruptions and the ongoing conflict in the Middle East are also impacting the flows of global supply chains. Combined with the stress that climate change has placed on agriculture and farming, these events undermined food supply chains and food security globally.

The food supply chain in Singapore

In Singapore, the food supply chain has stood up to repeated pressures, ranging from panic-buying and food hoarding during the pandemic to import disruptions due to global disruptions. This is no mean feat, considering over 90% of the food supply is imported and only 1% of the land is earmarked for agricultural use. Through a balanced and strategic focus on innovation,

predictive functionalities, and user flexibility, Singaporeâ??s success offers insights into how to build resilience in food supply chains.

A strong supply chain starts at the source, and Singapore has made heavy investments to ensure a strong safety net against supply shocks, from strengthening trade relationships and investing in self-sufficiency, to strategic stockpiling and public education.

Singapore is party to 27 Free Trade Agreements and continuously works to strengthen trade partnerships focused on minimising disruptions of supplies. For example, in the early months of the pandemic, Singapore was able to leverage its Enhanced Partnership (EP) with New Zealand for an exchange of food and medical supplies when supply chains were disrupted. In April, Singapore reinforced its EP with New Zealand by adding the â??Supply Chains and Connectivityâ? pillar to further secure its supply chain in an increasingly volatile global environment.

Innovating nutrition for the future

The island nation, with its limited arable land, offers strategic assistance to companies that can support its goal of producing 30% of its nutritional needs by 2030. Through its 30 by 30 programme, the Singapore Food Agency provides grants to companies who can increase local production of eggs, leafy vegetables, and fish. Recipients include ComCrop, Singaporeâ??s first and only commercial rooftop farming company, and Chewâ??s Agriculture, one of Singaporeâ??s leading egg producers.

Outside of food production, investments have also been applied to boost the variety of foods to be produced. The Singapore Institute of Food and Biotechnology Innovation (SIFBI) hub at the Agency for Science, Technology and Research (A*STAR) was established in 2019 to focus on researching alternative foods and ingredients. Together with Nurasa, a food-tech accelerator owned by Temasek Holdings, the SIFBI has committed to investing more than S$30 million to boost the work of food-tech startups. The bold investment into innovation pipelines will help boost production and productivity for Singapore long term, potentially reducing any further dependence on imports.

Predictive tools to avert supply shocks

While sourcing is an important starting point, the ability to anticipate and address issues through scenario planning is equally important to shield food supply chain from major disruptions.

Recognising this need, the Defence Science and Technology Agency and the Ministry of Trade and Industry in Singapore came together to develop a monitoring and risk modelling system that incorporates data from government agencies and local supermarkets. Mapping out â??what-ifâ? situations, the system can provide projections of the national food stockpile under different consumption and supply disruption scenarios.

While monitoring systems like the one used by DSTA are extensive and purpose-built for national-level food supply chains, there are opportunities for private businesses to adopt prediction technologies for risk mitigation as well. These can include cutting-edge technology like the TMX simulation or Metaverse offerings.

JCorp owned FarmByte, a digital network that connects the Malaysian food supply chain, leveraged the 3D visualisation function of the TMX Metaverse for the design of its distribution centre, fully optimising it for present and future demands in Johor, Malaysia. By incorporating 3D visualisation at the planning stage, FarmByte was able to pre-empt storage and logistics requirements under various scenarios, circumventing additional costs for future design changes and impediments to the supply chain.

While promising, predictive tools are impractical on their own. They require robust qualitative and quantitative inputs, such as a comprehensive data set, and the experience of supply chain experts who can map realistic probability-based scenarios. With the right elements in place, however, prediction can form the basis of a strong risk mitigation strategy.

Flexibility through education and transparency

Even with the strongest supply lines, an adaptive supply chain can only work if consumers are willing to swim with the tide. To ensure consumers understand and buy in to the national food supply management agenda, the Singapore government transparently and regularly communicates its rationale to citizens through the media and official channels of state agencies, like the Singapore Food Agency (SFA).

When egg supplies were halted temporarily from Malaysia, Singaporean businesses and consumers had to embrace supplies from sources they werenâ??t accustomed to. At the time, SFA worked in tandem with sourcing agencies to encourage

Singapore consumers to be open and flexible to new food sources.

In anticipation of longer-term needs, Singaporeans have also been urged to keep an open mind on novel foods, such as homegrown cultivated meats as alternatives to imported produce.

The right tools and strategies

The value of the global food trade was US$1.7 trillion in 2021, representing about 8% of total merchandise traded globally. With far-reaching consequences, the resilience of supply chains has become more important than ever. Food supply chains must be well-sourced, well-planned for different scenarios, and possess the ability to quickly adjust to changing market conditions.

As we enter a new era of food production and technology, the food supply chain will continue to be challenged and there is no catch-all solution in a dynamic environment. If there is one key takeaway from the Singapore experience, it is to be ready to pivot to the right tools and right strategies at the right time.