

**Metro Agriculture and Urban Food Security:  
An Explicative Symposium with Global Innoversity**  
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Singapore

**Summary Report**

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## **Synopsis**

Singapore imports about 90 per cent of its food supply from various sources. Yet, given the limited resources it possesses, Singapore has scaled up its urban farming efforts for selected food products such as leafy vegetables, eggs and fish in recent years. There is also much ongoing R&D by public and private entities on various aspects of food production, processing and technology. With its unique features, Singapore has been identified along with six other cities<sup>1</sup> to be part of the Global Innoversity for Metro Food/Metro Ag. This project brings together member cities to share their experiences and foster food systems innovation to enhance their capacity to meet current and emerging food, agriculture and resource needs in new, sustainable and resilient ways.

The Explicative Symposium with Global Innoversity on 5 September 2013 brought together the key players in Singapore's food sector. It included representatives from the government, the private sector, research and academia and civil society. The Symposium reflected the diversity of different food activities and players in Singapore, from those directly involved in the production of key food commodities to those creating new technologies to make farming more feasible in the country. These diverse actors shared a common interest in establishing a Community of Practice (COP) in Singapore through which stakeholders can share information and communicate their interests on policies, technologies and innovations relating to urban food security. The COP can also serve as a medium to discuss issues that affect the food sector and propose feasible recommendations for addressing them.

The Global Innoversity project can complement the Singapore COP by bringing forward resources, ideas and opportunities for collaboration from other consortium partners. Linking Singapore to other members can foster information sharing on best practices, technological developments and policy strategies relating to urban food security. This will help Singapore's urban farming sector and R&D efforts to increase the capacity to meet current and emerging food, agriculture and resource needs.

Nanyang Technological University (NTU) was nominated by meeting participants to take the lead and act as the convenor for Singapore's fledgling COP on urban food security. Through the S. Rajaratnam School of International Studies' (RSIS) Centre for Non-Traditional Security (NTS) Studies, NTU can help foster dialogues among stakeholders and assist industry with technical expertise and policy analysis.

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<sup>1</sup> The other Global Innoversity members are The Netherlands, Detroit, Hyderabad, Johannesburg, Nairobi and Sao Paulo.

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## Introduction: Urban Food Security in Singapore and the Global Innoversity

The global population is projected to reach 9 billion by 2050 and 70 per cent will be located in cities. Asia is now home to approximately half of the world's urban population and seven out of the world's 10 largest cities. Rapid urbanisation brings about challenges in feeding growing numbers of city dwellers in a sustainable manner. The increasing scarcity of agricultural resources such as land and water further necessitates new thinking and solutions for feeding the world's cities, and there is growing evidence that cities can be part of the solution.

The Food and Agriculture Organization of the United Nations (FAO) estimates that cities produce 20 per cent of the world's food. Asian experiences reveal that there are opportunities to expand urban and peri-urban agriculture (UPA). Urban farms or rooftop gardens are expanding in cities such as Singapore and Beijing through the use of maturing technologies such as hydroponics (growing plants in water), aeroponics (growing plants suspended in air) and aquaponics (hydroponics with fish culture).<sup>2</sup> Similarly, Hanoi produces up to 80 per cent of its intake of fresh vegetables, 50 per cent of its demand for pork, poultry and freshwater fish and 40 per cent of its egg requirements within the city's environment. Shanghai likewise produces the bulk of its needs for vegetables, milk, eggs and poultry.

However, there are pervasive challenges inherent to upscaling urban agriculture. Space for food production comes into competition with other land uses such as housing, transportation infrastructure, schools, hospitals and other public and private parts of the urban landscape. Urban and peri-urban farms also draw on scarce resources such as water, which are already stressed in many Asian cities. Establishing and maintaining urban spaces for food production likewise entail the need for labour, which can be difficult in cities with growing labour demand and opportunities. Urban agriculture is therefore only part of the food security equation for metropolitan regions in Asia and beyond.

Cities have the opportunity to upscale urban agriculture at the same time that they work to make their rural supply chains more robust and sustainable. Singapore demonstrates both of these opportunities. As an urbanised country comprised of 63 islands with limited land and water resources, it produces a small but significant proportion of its agri-food: 26 per cent of the eggs, 8 per cent of the fish and 5 per cent of the vegetables for domestic consumption.<sup>3</sup> Singapore is seeking to increase these percentages, and policies to promote economically competitive food production are in place. For example, financing is made available to local producers; and efforts to identify land for agroparks and aquazones continue.

Singapore also pursues strategies outside of agricultural production to shore up its domestic food security. It is pursuing extensive stockpiling and seeking to reduce food wastage. Singapore is also increasing its connectivity with food producing zones in areas of rural Southeast Asia and China to improve the resiliency of its food supply chains. Moreover, the city-state possesses knowledge resources such as research institutions, universities, polytechnics and think tanks involved in food R&D which allows it to further develop urban food production and supply chain management capabilities.

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<sup>2</sup> Teng, Paul S., 'Food security: Cities as part of the solution and not the problem', *RSIS Commentaries No. 142/212* (Singapore: S. Rajaratnam School of International Studies, 2012).

<sup>3</sup> Agri-Food and Veterinary Authority, 'Singapore's Food Supply', Accessed from <http://www.ava.gov.sg/Singapore+Food+Supply.htm> on 10 September 2013.

There are strong reasons for Singapore to be part of an international multi-city project through the Global Innoversity for Metro Food/Metro Ag. This project complements the establishment of a COP within Singapore, which can facilitate the exchange of information, accelerate innovation and foster collaboration within and among its members. Singapore can also be an important player in the Global Innoversity as a partner and collaborator with member cities. In tandem, these efforts can lead to innovation in the form of new products, services, processes and technologies that can benefit consumers through accessible and affordable food.

## Stakeholders' Panel Discussion

The Symposium hosted a stakeholders' panel discussion with Emeritus Professor Lam Toong Jin, Dr Lee Chee Wee and Mr Lee Van Voon. Prof. Lam and Dr Lee represented academic and research institutions in Singapore, while Mr Lee gave a private sector perspective on urban food production.

1. Emeritus Professor Lam Toong Jin, National University of Singapore, key points:

- Land-based aquaculture systems have the potential to help Singapore substantially upscale sustainable aquaculture.
- Current aquaculture practices are not sustainable because of negative externalities such as algae bloom and large fish kills.
- A re-circulating system that is multi-trophic and involves multiple species is feasible for Singapore and other cities involved in the Global Innoversity project.
- Prof. Lam's team is currently conducting research on what species will be best for a multi-trophic re-circulating system for aquaculture.
- There are many academics who currently shy away from applied research and collaboration between institutions in order to fulfil key performance indicators (KPIs) such as the number of research publications. Changing this paradigm could lead to more tangible food security outcomes for Singapore.

2. Dr Lee Chee Wee, Temasek Polytechnic, key points:

- A serious issue affecting the urban food production is the lack of trust and collaboration among the stakeholders. Instead of fostering collaboration and cooperation, stakeholders are more inclined to compete with each other in order to attain KPIs.
- Temasek Polytechnic changed their KPIs to include tangible efforts to promote food security, such as helping farms increase their productivity.
- This shift has affected outcomes and changed the behaviour of stakeholders by encouraging them to work together.
- Temasek Polytechnic is also leading a programme on aquaculture for retirees and those who are interested in making a career change. This can have dual benefits in food security and social welfare spaces.
- There is a potential for national and global collaboration in the case of Singapore, particularly through combining the comparative advantages of stakeholders from partnering cities.

3. Mr Lee Van Voon, Managing Director, Singapore Aquaculture Technologies Pte Ltd, key points:

- Fish cultivation in Singapore's coastal areas is hindered by poor water quality. In response, Singapore Aquaculture Technologies (SAT) began cultivating fish in elevated tanks, which also gave them flexibility and mobility in their farm.
- Despite the feasibility of land-circulation aquaculture systems, the production of fish in tanks comes with a cost. Land is valuable and scarce in Singapore, and land policy in Singapore is tilted towards shorter-term leases, especially for the aquaculture sector. SAT avoids these problems through its floating farm approach and it is now developing a sustainable project that combines fish and green algae production (Green Waters).
- SAT's experiences show that sustainability is important to achieving profitability, especially given Singapore's limited resources. The Green Waters project, for example, has reduced the organisation's costs by eliminating land leasing requirements.

## Issues and Recommendations for Urban Food Security in Singapore

The Symposium was also a venue for various stakeholders to share their experiences and discuss Singapore's existing and potential relationship with the Global Innoversity. This was conducted through open discussion and issue mapping sessions, and yielded the following key points:

### **1. There is a need for the COP to conceptualise food security within a specifically Singapore context.**

The FAO definition of food security describes the condition wherein it 'exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. This global definition can serve as a point of assessment for Singapore as to whether it can meet the above conditions for food security. In the case of Singapore, the stakeholders have different conceptualisations of food security. For consumers, the definition of food security is highly subjective. The private sector, which imports 90 per cent of Singapore's food, is largely concerned with profitability while the government is inclined to ensure that there is a sustainable supply of food for the population.

**Recommendation/s:** The definition, ultimately, rests on the combined efforts of the government, private sector and civil society. Hence, there is a need to continue the dialogue among stakeholders to arrive at a common working definition for food security for Singapore. It will then be the charge of the COP to help demonstrate the utility of this definition to government policymaking.

**2. Given limited natural resources, there is a need for more sustainable and innovative food production methods and technologies.**

The issue of the land-use policy is closely tied to the productivity and profitability of existing farms and food production areas in Singapore. One way to overcome natural resource constraints is through innovation and the development of new technologies in farming and aquaculture. At present, there are existing projects such as rooftop gardens, vertical farming (Sky Green) and aeroponics (Aero Green Farm) that can be expanded, duplicated or called upon for guidance for future policies.

**Recommendation/s:** The COP needs to develop innovative ways of encouraging more R&D in new technologies that would increase farm productivity. It also has a role to play in creating an enabling policy environment for such activities.

**3. The COP needs to invest resources and existing capacities into a functioning knowledge network.**

Combining the strengths, expertise and experiences of diverse food sector actors will help Singapore realise its food security goals. The degree of success that the COP will enjoy, however, hinges upon the individuals and groups that comprise it.

**Recommendation/s:** There is a need for a 'champion' that would act as a lead convenor to the COP. This champion will also act as a facilitator of information and technology exchange at the national level.

**4. The Global Innoversity offers a promising avenue for Singapore to enhance its collaboration with key international players. Further dialogue could help clarify the specific role(s) of Singapore in the project.**

The goals and objectives of the Global Innoversity have significant potential for Singapore. For instance, the use of incentives or grants for research into new metropolitan food production practices can enhance both multi-stakeholder collaboration and urban food security. Questions remain about the current and future operational character of the Global Innoversity, however, and Singapore has a chance to influence the trajectory of the overall initiative.

**Recommendation/s:** The Global Innoversity can solidify its platform through a number of avenues: (1) enhancing credibility through the provision of certifications for research and technology design projects; (2) creating incentive systems to foster cooperation and collaboration among stakeholders; and (3) enhancing the capacity of member cities to collaborate and exchange information, even during a period of funding uncertainty for the overall initiative.

## **Opportunities for NTU and Singapore**

The Global Innoversity offers Singapore the opportunity to be part of a multi-city project that can ultimately help the country meet its food demands. Being part of the Global Innoversity expands opportunities for Singapore to learn from other cities' experiences on sustainable urban farming and food production. It also can provide access to technologies and innovations from other areas that can be adopted by Singapore's urban farming sector. Over

time, such measures can help Singapore become a leading hub for knowledge and technology for urban farming in the Asia-Pacific region.

As one of the leading universities in Asia on technology and innovation, NTU can play an important role in convening the Singapore food security COP and acting as a knowledge partner to the Global Innoversity. NTU's wide-ranging capacities can yield practical results in food R&D, productivity and processing improvements, and through RSIS, policy analysis. The university is therefore in a position to become a national and international leader on issues of urban food security.

## Appendix A: Issue Mapping of the Urban Farming Industry in Singapore

	<b>Food Security</b>	<b>Innovation Agenda</b>	<b>Community of Practice (COP)</b>	<b>Global Innoversity</b>
<b>Issues</b>	A conceptualisation of food security applicable to Singapore's case has to be established.	Given Singapore's limited natural resources and growing population, there is a need for sustainable food production methods and technologies.	A COP is needed to facilitate the exchange of information and accelerate technological innovations in urban farming.	The Global Innoversity represents a strong opportunity for advancing Singapore's food security agenda, but further clarity is needed on the operational character of the initiative and Singapore's specific role(s) within it.
<b>Recommendations</b>	The definition of food security by the Food and Agriculture Organization of the United Nations (FAO) can serve as a baseline for assessing the objectives and targets of Singapore's food security policy, and as a foundation for dialogue between relevant stakeholders on what food security is for Singapore. Resulting concepts will influence the allocation of natural resources, and the objectives and indicators for food security.	Resources for technological progress in urban farming in Singapore should be upscaled. This should be undertaken in conjunction with regular dialogue that seeks to create an enabling environment for innovation to thrive.	It is imperative that a champion or lead convenor must be identified to lead a collective that is willing to invest in its own strengths and share knowledge, experiences and capacities.	The Global Innoversity can further strengthen its platform by: (1) enhancing credibility through the provision of certifications for research and technology design projects; (2) creating incentive systems to foster collaboration and cooperation among stakeholders; and (3) enhancing the capacity of member cities to collaborate and exchange information. There are avenues for pursuing this final point even during a period of funding uncertainty for the overall initiative.

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## About the RSIS Centre for Non-Traditional Security (NTS) Studies

The Centre for NTS Studies based in the S. Rajaratnam School of International Studies (RSIS) was inaugurated by Association of Southeast Asian Nations (ASEAN) Secretary-General Dr Surin Pitsuwan in May 2008.

The Centre maintains research in the fields of Climate Change, Food Security, Energy Security, Health Security, as well as Internal and Cross Border Conflict. It produces policy-relevant analyses aimed at furthering awareness and building capacity to address NTS issues and challenges in the Asia-Pacific region and beyond. The Centre also provides a platform for scholars and policymakers within and outside Asia to discuss and analyse NTS issues in the region.

The Centre is the Coordinator of the ASEAN-Canada Research Partnership (2012–2015) supported by the International Development Research Centre (IDRC), Canada. It also serves as the Secretariat of the initiative.

In 2009, the Centre was chosen by the MacArthur Foundation as a lead institution for its three-year Asia Security Initiative (2009–2012), to develop policy research capacity and recommend policies on the critical security challenges facing the Asia-Pacific. It is also a founding member and the Secretariat for the Consortium of Non-Traditional Security (NTS) Studies in Asia (NTS-Asia).

More information on the Centre can be found at.

[www.rsis.edu.sg/nts](http://www.rsis.edu.sg/nts)

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