



The Centre of Excellence for National Security is a constituent unit of RSIS. Its mission is to develop intellectual capital on selected national security issues, providing useful perspectives for policy makers and the wider national security community. As part of this mission, CENS produces INSIGHT on an occasional basis to bring focus and clarity to select issues and concerns of national security. CENS also produces the thinkpiece, COGNITIO, to examine the various concepts and methods pertaining to strategic foresight.

The Notion of Food Defence

This is the first in a series of reports that the Homeland Defence programme of CENS is publishing on the topic of Food Defence.

Essentially, this policy brief will examine:

- **How “Food Defence” differs from “Food Safety”**
- **Trends in the use of food as a vehicle for causing harm**
- **To consider the viability of Food Defence as a national security strategy of Singapore.**

Widespread media reports in 2007 regarding the safety of food exports highlighted the increasingly global and complex nature of the food supply chain, while reinforcing the fact that “the openness and international dimensions of the food supply chain [contributes] to its vulnerability.” The perception of a threat to the food and/or agricultural industries via biological or chemical agents heightened post-9/11. Reports that materials found in 2002 at Tarnak Farms training camp in Afghanistan indicated an interest on the part of Al-Qaeda in plant and animal diseases—did little to dispel fears of such threats.

This increased risk perception also arises out of food safety incidents in the past that highlight the potential for widespread harm that exists via the food chain. Some examples include: Spain, 1981, with roughly 20,000 people falling ill and 600+ fatalities caused by tainted cooking oil; China, 1991, in which 300,000 people contracted Hepatitis A from contaminated clams; 11 deaths and 10,000+ people falling sick from E.Coli poisoning in Japan in 1993. These incidents spurred changes in the food safety system in Singapore and other countries. Indeed, Singapore’s food safety architecture has created an enviable safety record; the number of food outlet-related poisoning outbreaks has dropped from 298 in 2004 to 89 in 2006, for example.

DEFINITIONS

Food Defence “The steps taken to minimize or mitigate the threat of deliberate contamination of the food supply... thereby making the food supply a less attractive and... less vulnerable target.” This relates to both guarding against the intentional contamination or adulteration of food, as well as ensuring the resilience of the food supply in case of a deliberate incident.

Food Safety “Minimizing or mitigating the risk of the unintentional contamination of food.”

Food Security WHO defines food security as, “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life.”

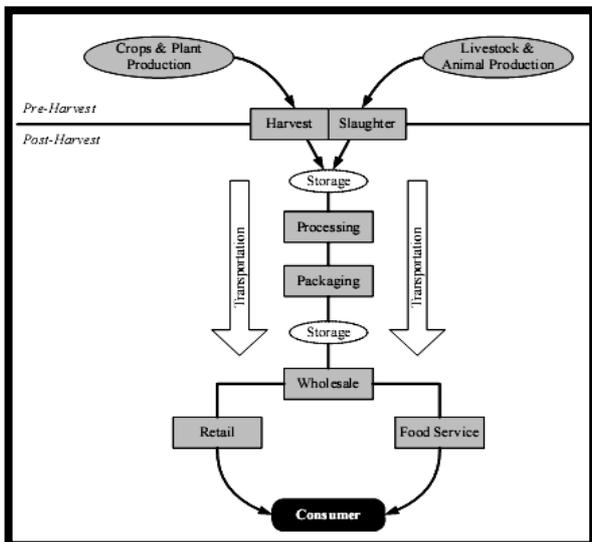
No food safety system is perfect. However, recent cases (e.g. PrimaDeli incident, 2007) show the agencies primarily tasked with food safety incidents in Singapore (AVA, NEA, MOH) have successfully managed on many occasions to quickly detect and respond to suspected contaminated processed food supplies in cases of unintentional food safety incidents.

There is nevertheless also a concern that the global food supply chain can be used as a distribution network for CBRN agents. It is unclear whether human agents could introduce a foreign compound (biological or chemical) on a large enough scale to escape early detection, survive transit and successfully replicate the mass casualties of unintentional food safety incidents. “Limitations on the survivability of some possible threat agents, security measures to prevent product threat abroad, and careful quality controls for many imported goods, combine to reduce vulnerabilities.”

There is no widespread consensus on whether the food supply chain is at risk from terrorist attacks, whether using CBRN weapons or otherwise. While investing in a National Centre for Food Protection and Defence, the Department of Homeland Security (USA) also stated that they “lack credible information to indicate transnational terrorist planning for an attack against food and agriculture” on Al-Qaeda’s part and note that Al-Qaeda is focused on “producing mass casualties, visually dramatic destruction, significant economic aftershocks, [and] fear amongst US population.” The Australian government’s position is that, “Even though the likelihood of a deliberate act against our agriculture or food industries is assessed as LOW to VERY LOW, the potential consequences of an incident are high to extreme and therefore deserve consideration.”

DEFINITIONS	
Food Terrorism	“An act or threat of deliberate contamination of food for human consumption with chemical, biological or radio-nuclear agents for the purpose of causing injury or death to civilian populations and/or disrupting social, economic or political stability.”
Agro-terrorism	“The use of biological, chemical, or radiological agents against crops or livestock, either pre- or post-harvest.”

Vulnerabilities in the Farm-to-Table Continuum



As can be seen from **Figure 1**, if one uses the farm-to-table continuum as a model for the food supply chain, one can see the complexity and vulnerability of such a system, especially in Singapore’s case where this continuum is largely global in nature, with much of this continuum existing outside of Singapore’s borders.

Fig.1 The Farm-to-Table Continuum
 (Source: *The Dept. of Homeland Security’s Role in Food Defense and Critical Infrastructure Protection*)

Vulnerabilities in Food Supply

The U.S. Food and Drug Administration has identified the following four factors as “consistently associated with foods at higher risk of terrorism:”

- Large Batches – large numbers of consumers
- Uniform Mixing – contaminate all servings in a batch
- Short Shelf Life – minimal time to identify problem and intervene
- Ease of Access – accessible targets are more attractive

Vulnerabilities in Livestock

Much attention has also been paid to the threat of Agro-terrorism, given the manner in which animal diseases such as H5N1, swine fever (CSFV), and BSE spread. The belief is that non-zoonotic animal pathogens might be of greater interest to terrorists, being safer to handle for humans. Given the small size of Singapore's agricultural industry, Singapore requires strong ties with the private sector and international cooperation on this issue. AVA has adapted to the fairly recent threat of animal diseases, adopting measures including zonal food supply policies to ensure the continued viability, diversity, and resiliency of Singapore's food supply through its zonal food supply policies and other measures.

Trends and Analysis¹

Criminal vs Terrorist Acts	
79%	Criminal
12%	State
5%	Terrorist
4%	Unknown/Other
Total Fatalities & Injuries	
146 Incidents, 1913 - 2007	
Deaths:	349
Injuries:	7496

Injuries and Fatalities:	
58%:	No Fatalities
31%:	10+ Injuries
6%:	10+ Fatalities
CBRN Data	
88%	Chemical
7%:	Biological
3%:	Foreign Objects
2%:	Radiological

- Majority of incidents are criminal in nature
- Occurs at nodes closest to consumer (stores, restaurants, food stalls, festivals)
- Committed by individuals against those whom they have close daily contact (family, friends, neighbours, co-workers)
- Incidents occurring in food production facilities confined to contamination via physical objects
- High use of rodenticides, pesticides, and insecticides occur in countries with large agricultural sectors and/or where such materials are readily available either via legal or black market means.

Selected Food Defence Incidents	
2002	China Rat poison / Tetramine—38 Dead, 300 inj
1987	Philippines Unknown poison—19 Dead, 140 inj
1995	China Rat poison—18 Dead, 163 inj
1994	Tajikistan Cyanide—15 Dead, 53 inj
2003	China Rat poison / Tetramine—15 Dead, 5 inj
2003	China Rat poison—10 Dead, 23 inj
1964	Japan Typhoid Fever—4 Dead, 200 Inj.
1984	USA S. Typhirium—0 Dead, 751 inj.

¹ From a preliminary dataset of 146 confirmed incidents of the deliberate or intentional use of food as a vehicle for the delivery of a biological, chemical, or foreign object with the intent to cause harm. The range of dates is 1913-2007. An additional 37 incidents reported were discarded due to problems in verifying the incidents. It should also be noted that getting accurate data on numbers killed or injured from some countries is difficult. Incidents where livestock was targeted (11 incidents) were not included (although that data is available upon request). Incidents that occurred in conflict zones were also not included – the bulk of which were attacks against food or water facilities or food transportation vehicles (27 total facility incidents). Data regarding incidents categorized as “product tampering” (which includes tampering of cosmetics and medicines) as well as incidents of extortion using the threat of or actual contamination of food are not widely reported by many authorities due to the fear of copycat incidents. For example, Germany reported on average 2 to 3 tampering incidents per week in 1998 (see: GeneralCologneRe, *Loss & Litigation Report: Recall of Food & Beverage*, January, 2003).

Synergizing Food Safety and Food Defence

There is a large overlap between Food Safety and Food Defence and, as WHO puts it, “Outbreaks of both unintentional and deliberate foodborne diseases can be managed by the same mechanisms. Sensible precautions, coupled with strong surveillance and response capacity, constitute the most efficient and effective way of countering all such emergencies, including food terrorism.”

Much of the food safety infrastructure in Singapore already in place “offer[s] a means of preventing and mitigating sabotages of the food supply.” Food Defence, as a policy and a national security strategy, focuses on defensive and preventative measures to deter outside attackers through the hardening of key nodes along the farm-to-table continuum and supply chain. In practice, this is akin to critical infrastructure protection and includes security screening of food processing staff; limiting access to food production, processing, and packaging facilities; ensuring security during transport; and employing sensors to detect contamination.

In this respect, the strategic response now goes beyond the prevention and mitigation of the effects of possible cases of food contamination to the prevention of deliberate misuse of dual risk biological pathogens, i.e. Agro-terrorism and Bio-terrorism. It also includes measures to strengthen a state’s capability to withstand, recover and restore its food supply (import and export) and distribution network: the economic, social and political aspects of the food industry. After recent experiences with zoonotic diseases, AVA has moved to ensure that Singapore has a resilient food supply network.

While much of the literature on Food Defence is concerned with the threat from outside attackers (and hence an emphasis on physical defences and sensors), there is less literature on the insider threat. The digital security field has examined this issue in depth, and there may be lessons learned and best practices that could be transferable.

There is also evidence to suggest that consumer risk perception can increase during periods of food safety crises. At such times, threats that prove to be hoaxes could reduce consumer confidence, with negative economic and social repercussions. This emphasizes the strong need for robust risk management and crisis communications measures.

Policy Takeaways

- 1) Food Defence is concerned with protecting the food supply from deliberate or intentional acts of contamination or tampering.
- 2) Singapore is in a unique position given its high reliance on food imports.
- 3) This both complicates and simplifies certain aspects of Food Defence. While Singapore may not have to worry about the threat of Agro-terrorism within its borders, the food supply could be affected by deliberate food contamination in exporting countries.
- 4) As such, close cooperation and partnerships with regional governments and private industry is necessary to ensure the defence of food production overseas and the resilience of the supply chain.

- 5) The USA, Australia, and Chile have co-sponsored an APEC Food Defence Initiative to “mitigate the terrorist threat to the APEC food supply” and strengthen food defence methodologies.
- 6) A Risk Management approach using Threat, Vulnerability, and Criticality Assessments in the farm-to-table continuum is a useful approach to identifying capabilities and intentions of actors.
- 7) Open-source information on the intentions and capabilities of terrorist or criminal organizations in Food Defence is weak, and historical incidents of a terrorist nature are low. The threat of terrorist organizations in this area is unproven, and the greatest threat may well be from insiders.
- 8) Vulnerability is widespread and arises out of the length and complexity of the global food supply chain.
- 9) Nodes nearest the consumer are most vulnerable.
- 10) Attacks against these nodes are least controllable, but the effects may be more localized and containable.
- 11) Finally, Food Defence is truly an area that requires a "whole-of-government" or "networked" action by government agencies. The prevention, detection, and response to an intentional food tampering or contamination incident would require not only agencies responsible for food safety and health that may initially detect such an incident, but also the relevant intelligence and security agencies to deal with any subsequent investigations.