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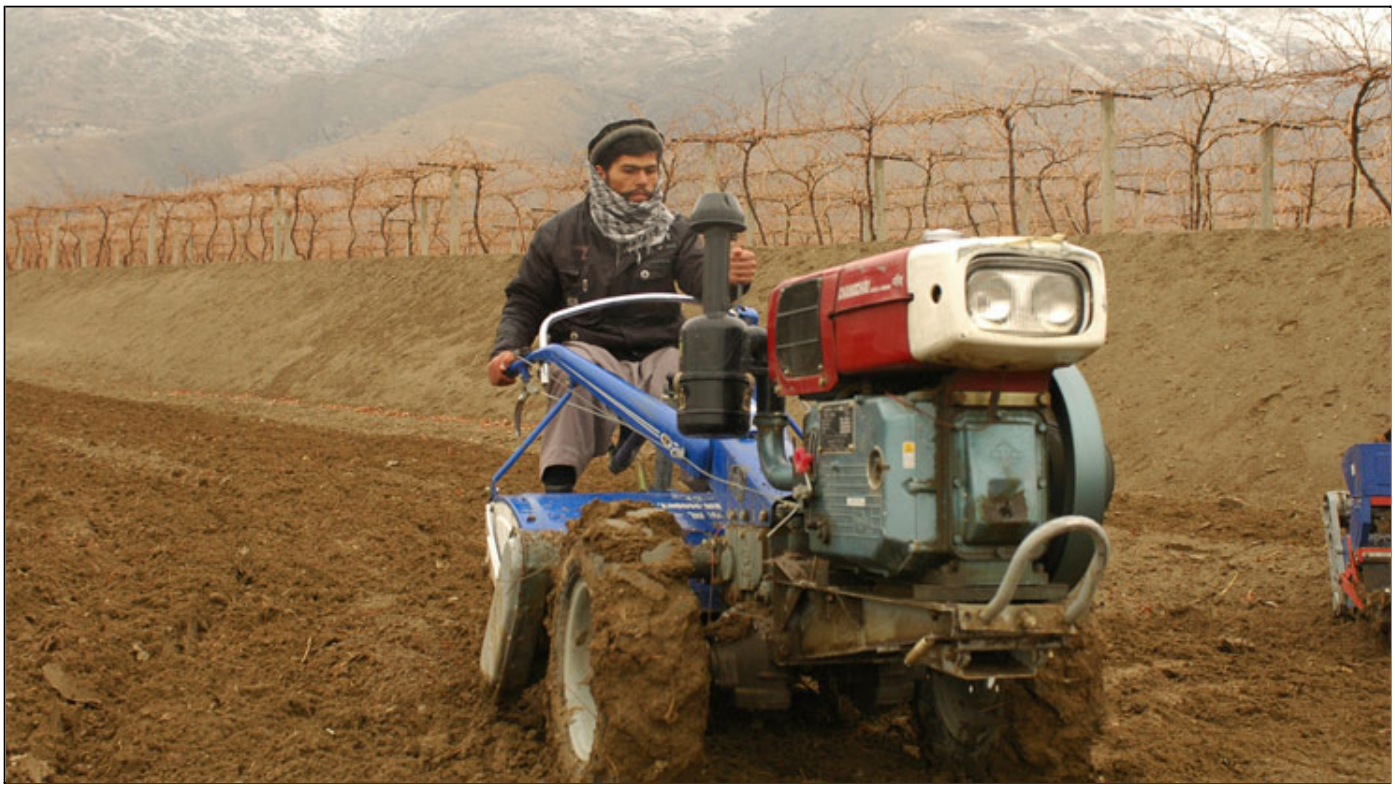
BRAVE NEW WORLD? ASSESSING THE HEALTH RISKS OF MODERN FOOD SYSTEMS IN ASIA

By Ong Suan Ee and J. Jackson Ewing

As the previous instalment of this NTS Alert series demonstrates, changes in food demands in line with demographic and socioeconomic shifts have placed formidable expectations on the food production industry. Food systems in the Asia-Pacific have evolved in response to these expectations as well as the growing inter-linkages that define both global and regional economies. This NTS Alert examines the potential health implications of these trends, and of technological advances in agriculture, in particular, genetically modified (GM) foods. It is argued that, while health concerns related to GM foods and other modern agricultural techniques have been the subject of much attention and debate, the most pressing food-related health challenges facing the Asia-Pacific stem from economic and social conditions.



The increasing mechanisation of farms has played a vital role in shifts in food production trends.

Credit: DVIDSHUB/flickr.com

This NTS Alert is the second issue of a two-part series on the links between food and health in Asia. Issue 1 can be found here.

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Introduction: Tragic Failures in a Sea of Success

On 1 June 2011, Oxfam attracted significant media attention with its launch of the global GROW campaign, an endeavour that seeks to respond to what Oxfam (2011) declared to be a 'broken food system'. The campaign comes on the heels of a report published by the organisation titled *Growing a Better Future*, which predicts rapidly rising food prices, environmentally related food production constraints and accelerating systemic factors that will compromise the food security of hundreds of millions of vulnerable people (Bailey, 2011). Oxfam is not alone in sounding the alarm on food insecurity and the need for increased agricultural production and greater structural access to food. The World Bank, the Food and Agriculture Organization of the United Nations (FAO) and Christian Aid all published substantive reports during the first half of 2011

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stating that food insecurity is accelerating among poor populations and that these problems are steadily becoming more pronounced.

While it is thus abundantly clear that food production must increase to meet the needs of the growing and increasingly urban populations of the Asia-Pacific, from a health and well-being perspective, the accessibility of available food provides only part of the picture. For one, increases in production of the magnitude needed in the Asia-Pacific will require knowledge-intensive approaches that employ modern agrotechnologies, biotechnologies and other cutting-edge farming techniques (Spiertz, 2010; Escaler and Teng, 2010; Ewing, 2011).[1] Off-farm systems for the storage, transportation and processing of food must also become more efficient to ensure that vulnerable populations have access to adequate, nutritious and affordable food. These factors affect consumption trends in ways that initiate a range of attendant health concerns. This NTS Alert explores the primary health concerns related to shifting food systems and trends in the Asia-Pacific by assessing some primary economic, social and agrotechnological sources of food-related health risks.

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The Food Trade and Nutrition-related Diseases

The international food trade, along with foreign direct investment in agriculture and food production, alters the types of food available, their prices, and the ways and locations in which they are marketed and sold. The rise of food advertising, branding and promotion also has a profound impact on shaping evolving global food preferences. These impacts are evidenced by the global trade volume of highly processed foods (the FAO definition includes food items such as canned meat, breakfast cereals, pastries and wine) increasing more than fourfold between 1970 and 2005. Moreover, import growth for this category of food was highest in developing countries, growing more than fivefold between 1970 and 2005 (Rosen and Shapouri, 2008).

Encouraging such changes, some contend, is humankind's 'inherent preference for palatable, sugary, salty, fatty and smooth (finely textured, refined) foods', which are mostly energy-dense and low in micronutrients (Vorster and Gibney, 2009:350). The food production, processing and manufacturing industries have taken advantage of, and responded to, these preferences by making such foods available at increasingly affordable prices. Such increased access to food has coincided with rapid urbanisation, acculturation, global trade, information exchange (particularly in the developing world) and the rise of more sedentary, less active lifestyles (Vorster and Gibney, 2009). Exacerbating these changes, according to Friel and Baker (2009:625), is a liberalised trade system that has distorted food supply in developing countries in favour of 'overproduction of foods that are high in saturated fat, highly processed, calorie-rich and nutrient-poor'. This directly affects food security and health outcomes by influencing consumption patterns and dietary preferences, often in different ways for various socioeconomic groups.

The increased availability combined with the affordable prices of the aforementioned types of food is unsurprisingly associated with a rise in their consumption. The compelling data in Table 1 reveal the degree to which fat consumption has increased in Asia during the last decades of the 20th century. This adds the burden of overnutrition to that of undernutrition in the developing countries of the Asia-Pacific. Overnutrition is a major cause of obesity. It is also a risk factor for many non-communicable diseases, including Type 2 diabetes, coronary heart disease, stroke, hypertension, dental disease, osteoporosis and some forms of cancer – all health risks that are becoming more pronounced within the region (Vorster and Gibney, 2009:350).

Table 1: Daily fat intake in the Asia-Pacific.

Region	Supply of fat (grammes per person per day)				% increase from 1977–1979 to 1997–1999
	1967–1969	1977–1979	1987–1989	1997–1999	
China	24	27	48	79	193
East and Southeast Asia	28	32	44	52	63
South Asia	29	32	39	45	41
Oceania	102	102	113	113	11

World	53	57	67	73	28

Source: Adapted from Friel and Baker (2009:622).

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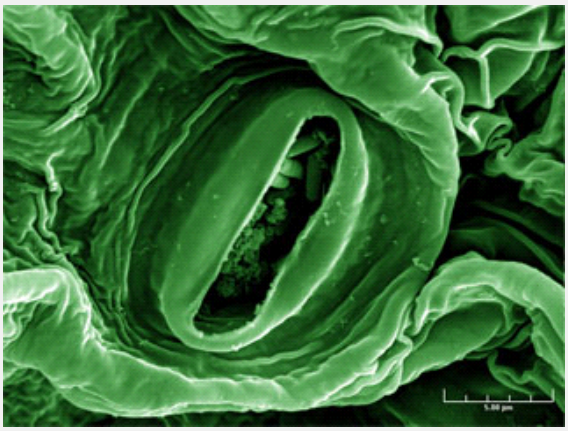
Food Safety as a Public Health Issue



An electron microscope image of green-leaf lettuce showing the rod-shaped E. coli *bacteria inside a minute pore in the leaf. A recent outbreak of* E. coli*, a food-borne pathogen, has made over 3,000 ill across Europe in the past month.*

Credit: agrilifetoday/flickr.com

In addition to problems of overnutrition, modern food systems also foment challenges relating to food-borne illnesses (Reilly et al., 2009:324). The health consequences of food-borne illnesses depend on factors such as individual susceptibility, a pathogen's virulence and the disease type. In most cases, symptoms are mild and most people recover from acute health effects (e.g., vomiting, diarrhoea, jaundice) within a few days. However, in some cases, microorganisms are directly or indirectly associated with long-term health effects such as reactive arthritis, renal disease, cardiac and neurological disorders, and nutritional and other malabsorptive disorders (Reilly et al., 2009:325).

Some groups are particularly susceptible to, and suffer more from, severe food-borne illnesses because their immune systems are in some manner compromised. These groups include infants and young children, pregnant women, the elderly and those who are immunocompromised by disease such as, for example, HIV/AIDS sufferers and cancer patients. Other groups considered vulnerable are those in situations of conflict, war and impoverishment (Reilly et al., 2009:325). In such cases, the limited availability of food and a group's lack of access to it, as well as the questionable safety of the food available in such situations, render them particularly exposed to food-borne disease.

Pathogens

Many common infections with similar symptoms (e.g., diarrhoea and vomiting) can be traced back to food-borne pathogens. Food-borne bacteria such as *C. botulinum*, *Staphylococcus* and *Salmonella* pose serious health risks. Recent outbreaks of *E. coli* in Europe, for example, caused approximately 3,000 people to fall ill and led to a myriad of social and economic challenges, serving as a reminder of the health risks associated with food-borne pathogens (Contaminated Food, 2011).

A host of food-borne viruses also cause serious illness, the best known of which is Hepatitis A which leads to the immune destruction of infected liver cells. Food becomes contaminated with the Hepatitis A virus via infected persons or contaminated water (the virus is often found in shellfish for this reason). Another major group of food-borne viruses, known as rotaviruses, is responsible for an estimated 130 million cases of infantile gastroenteritis worldwide, of which 873,000 are fatal (Reilly et al., 2009:334).

Parasites

Food-borne parasitic diseases affect millions worldwide, predominantly in non-industrialised countries. There is a direct correlation between food safety standards and the incidence of food-borne parasitic diseases; and susceptibility to parasitic diseases increases markedly in places where sanitation and hygiene standards are poor. These infections are endemic in some 20 countries, including Lao PDR, Thailand and China, and affect an estimated 40 million people, mainly across eastern and southern Asia. These infections occur when undercooked, raw or under-processed fishery products or meat are consumed (Reilly et al., 2009:335–8).

Chemicals

Chemicals also pose a range of food safety issues. In many cases, chemicals are naturally present in certain crops due to their occurrence in soil (e.g., cadmium, lead). However, in the context of food safety, the chemicals of greatest concern are artificial and come from pesticides, veterinary drugs, environmental and industrial contaminants in soil, process contaminants which are present during the processing and production of food, and food additives.

At the international level, the World Health Organization (WHO) and the FAO's Codex Alimentarius Commission have worked on developing food safety standards aimed at protecting consumer health and facilitating the international trade in food and animal feed. Expert groups such as the Joint FAO/WHO Expert Committee on Food Additives (JECFA) or the Joint FAO/WHO Meeting on Pesticide Residues (JMPR) advise on acceptable levels of chemical substances in food. The food safety standards developed by these groups serve as a guideline for

harmonising safety standards – through being incorporated into WTO agreements, and by forming the basis for different countries to develop national-level regulations (Reilly et al., 2009:348). However, many developing areas of the Asia-Pacific still have a long way to go in terms of regulatory progress on food safety standards.

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Genetically Modified (GM) Crops and Health

Genetically modified (GM) crops have dominated much of the discussion on the health implications of modern food systems (Spiertz, 2010). GM plants are those in which 'genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination' (Spiertz, 2010:440). To date, GM traits have been primarily introduced in the agricultural systems of the developed world to increase herbicide tolerance or improve resistance to pests and diseases. There has also been significant research progress on using GM technologies to enhance the health benefits of staple crops. Pervasive health concerns relating to the safety of GM plants, however, mean that balanced assessments of their overall contribution to public health are needed.

White rice is compared to Golden Rice, a variety genetically enhanced to synthesise beta-carotene. Golden Rice has been developed to supplement the diets of populations facing health risks due to nutritional deficiencies.

Credit: IRRI Images/flickr.com

Nutritional Content

Much of the vitamin- and nutrient-related GM research has focused on improving the diets of populations in developing nations (Davies, 2007:123). An example is the development of Golden Rice and Golden Rice II. These varieties have been genetically enhanced to synthesise beta-carotene so that they can serve as a fortified staple food to be consumed in areas where there is a shortage of dietary vitamin A. The potential for Golden Rice has been recognised internationally, particularly after the Bill and Melinda Gates Foundation funded the improvement of Golden Rice by increasing its pro-vitamin A, vitamin E, iron, zinc and protein quality through GM technology (Pucie, 2005). While neither variety of Golden Rice is currently available for human consumption, Golden Rice is forecast to reach global markets in 2012 (Potrykus, 2010:561).

Additionally, growing evidence suggests that specific dietary components called nutraceutical metabolites, often found in plant-based foods, may help prevent or control particular diseases and disorders. This has resulted in a drive to develop plants with improved profiles of these metabolites, using GM technologies to accelerate their breeding process. There are already various initiatives underway to harness GM technologies, including efforts to engineer functional foods to improve gut health through reducing anti-nutrients or allergens (e.g., reducing hydrogen cyanide in cassava, a significant crop food in the developing world, without incurring any loss of proteins, vitamins and minerals) and developments in the area of mineral biosynthesis (e.g., increasing iron, zinc and selenium in crops) (Davies, 2007:123–9).

Agricultural Yields

Herbicide-tolerant GM crops can also promote conservation tillage, preserve topsoil and protect water quality. Some plants have even been engineered to enable them to remove toxic waste from the environment. There are also crops which are engineered to draw more nitrogen directly from soil, thus reducing the need for chemical fertilisers and the consequent damage to the environment from fertiliser waste. This could lead not only to stronger, hardier plant varieties and better crop quality, but could also contribute to safely meeting food demands through increased crop yields and decreasing harmful inputs (Uzogara, 2000:190–7).

GM Crops and Food Safety

In spite of these developments, the issue of GM foods has been surrounded by controversy since the 1990s. Among the GM-related food controversies of the last two decades are the bovine spongiform encephalopathy (BSE, more commonly known as mad cow disease) outbreak in Britain in the 1990s and the US Food and Drug Administration's (US FDA) decision to classify GM foods as organic (Uzogara, 2000:181–2).

Those critical of GM technology along health lines are primarily concerned about the allergenicity, toxicity, carcinogenicity and altered nutritional quality of foods (Uzogara, 2000:184; Altieri and Rosset, 1999:156). A general tone of mistrust and trepidation regarding perceived uncertainties pervades much of the anti-GM literature. Arguments challenging the deployment of GM technologies link them to allergic reactions; the development of antibiotic resistance; liver failure; 'deadly epidemics'; and reproductive, sterility and infant-mortality problems (Institute for Responsible Technology, c2011).

More balanced assessments of GM foods, however, reveal that while attention to health implications is warranted (as it is for any food

product), there are strong reasons for confidence that GM-related health concerns are surmountable (Comstock, 2010; WHO, 2011). Rigorous GM safety testing is the key to such confidence and will continue to be the linchpin of efforts to promote food safety and consumer confidence in the GM industry. Currently, testing is strong in areas (primarily North America) that utilise GM foods on large scales, which has implications for the trading of GM food commodities originating from these areas. Discerning this situation, the WHO (2011) asserts that 'GM products that are currently on the international market have all passed risk assessments conducted by national authorities … [t]hese assessments are thorough, and they have not indicated any risk to human health'.

Efforts to communicate these positive assessments of GM food safety to the public have, however, met with significant challenges (Comstock, 2010). On balance, the risk-benefit calculus surrounding GM technologies has been poorly communicated, resulting in many doors to their wider access and implementation across the agricultural sector remaining closed. Given the potential wide-ranging benefits of GM technology, both safety regulatory mechanisms and communication strategies must continue to mature in order for GM crops to be effective on larger scales. It is thus of paramount importance that countries in the Asia-Pacific develop rigorous and transparent testing regulations along with effective communication strategies as they expand further into GM food production.

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Conclusion: A More Logical Hierarchy for Food-related Health Challenges

While modern GM food production technologies certainly require considered regulation and careful monitoring, the potential health threats they pose pale in comparison to the more endemic challenges associated with increasing fat intake and more conventional food safety hazards. Moreover, given the concomitant health challenges associated with hunger, genetic engineering provides powerful tools to enhance agricultural production and crop quality, with all of the potentially positive health outcomes that such enhancements portend.

Sober assessments reveal that the 'brave new world' of food systems poses the greatest health risks not through cutting-edge advances in genetic technology, but rather through the social and economic forces that are influencing nutrition in adverse ways. Addressing these forces will be difficult, but must be pursued in conjunction with hunger eradication as part of a comprehensive strategy to effectively address food-related health challenges in the Asia-Pacific.

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Notes

1. For arguments that oppose this position, see: Holt-Gimenez and Patel (2009) and UK Food Group (2010).

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