

## Review

# Improved food availability for food security in Asia-Pacific region

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Food security requires that all people can access sufficient food for a healthy life. Enough food is produced to feed the global population, but more than 1.02 billion people are malnourished. Malnutrition and chronic food insecurity are widespread in some countries of the Asia-Pacific region; as much as 20 to 60 percent of the region's population lacks sufficient food to meet their minimum energy requirement. Food security greatly depends on food availability, although this alone is not sufficient to secure satisfactory nutritional status. Food security at the national level requires an effective framework of food, health, and economic systems coupled with awareness and consideration of environmental conditions. To improve food availability and security in the short term, lower income countries should focus on increasing productivity in the food system to generate higher incomes for workers on-farm and off-farm in the food chain. Over the long term, sustainable and small-scale farming based on ecologically viable systems should be the emphasis for agricultural development. Nutrition and health sectors should help promote food-based approaches that lead to diversification of crops, balanced diets, and ultimately better health.

**Key Words:** food-based nutrition, food system, food security framework, sustainable agriculture, malnutrition

## INTRODUCTION

### *Defining food security*

All people, at all times, have access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active healthy life. This is the definition of food security according to the Food and Agriculture Organization (FAO) of the United Nations. The definition implies that food should be available, accessible, and consumed to meet nutritional needs. At the national level, food availability – the food for sale in markets, or food produced by consumers – is a combination of domestic production, commercial imports, aid, and domestic stocks.<sup>1</sup> Access to food involves physical access to a place where food is available, economic access to affordable food in markets, and social access to food for all people, without discrimination against gender, age, or other social grouping. Food security is further affected by consumption practices. The way food is prepared affects its nutrient values. Cooking and processing can promote (or interfere with) nutrient absorption and use in the body; this ultimately determines the status of an individual's health. Nutritional status is the overall consequence of food security at household, community, and national levels.<sup>2</sup>

### *Food security framework*

A healthy, food-secure population requires more than food. True food security is the outcome of a multi-sector, multi-disciplinary effort. The conceptual framework of food security encompasses the food system, the health system, the economic system, environmental conditions, and nutritional outcomes. These elements are interlinked (Figure 1). The food system comprises the set of pre- and

postharvest activities including agricultural inputs, outputs, processing, wholesaling, and retailing.<sup>2</sup> Food productivity, availability, and distribution are among the major underlying determinants of the success of the food system. The health system is designed to meet the health needs of target populations; it includes the capacity to care for the health of individuals and families, and their access to health services including health workers, clinics, and insurance coverage. Environmental conditions affect both food and health systems.<sup>3</sup> For example, climate change threatens crop productivity and patterns of infectious diseases. Urbanization reduces the availability of farm labor, increases food demand in urban markets, increases risks of exposure to health hazards, and accelerates the spread of infectious disease.<sup>4</sup> Poverty, which prevents access to food and health services, is at the core of food insecurity.<sup>4,5</sup>

### *Asia-Pacific region*

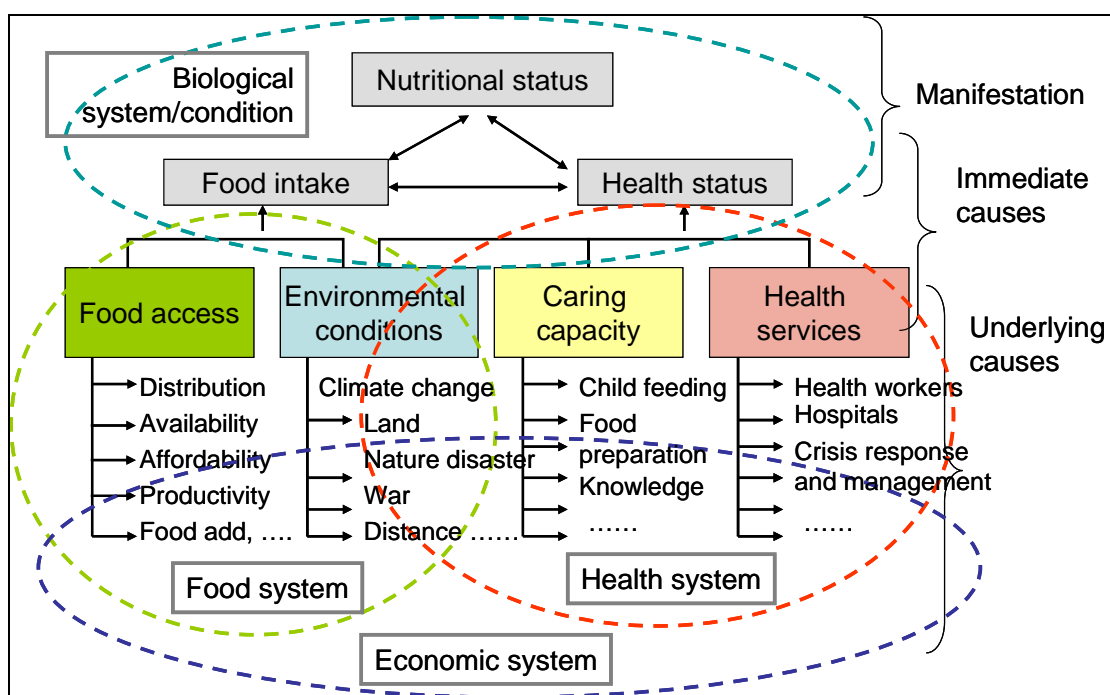
The Asia-Pacific region refers to 58 countries/areas of the United Nations. It includes about 60 percent of the global population, and some of the world's least and most developed nations are found here. The Asia-Pacific region encompasses East and North Asia (China, Taiwan, Japan,

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**Figure 1.** Relationship among food, nutrition, health, environment and economic aspects within the conceptual framework of food security. (Modification from Weingartner 2005)

Korea), Southeast Asia (e.g., Cambodia, Indonesia, Thailand, Singapore, Timor-Leste), South and Southwest Asia (e.g., India, Bangladesh, Pakistan, Sri Lanka, Afghanistan, Iran, Turkey), North and Central Asia (e.g., Armenia, Azerbaijan, Kazakhstan, Uzbekistan, Russia), and the Pacific (e.g., Australia, Fiji, Nauru, New Zealand, Solomon Islands, Tonga). Australia, Japan and New Zealand are industrialized countries.<sup>6</sup>

### Food crisis

Per capita food production in Asia and in the world as a whole has been increasing steadily over the past 50 years.<sup>7</sup> According to the FAO food production index, there is sufficient food to feed all the people in the world; however, food is not always available, affordable, or equally distributed to needy populations. In 2007, 850 million people worldwide were unable to access enough food to fulfil the minimum energy requirement.<sup>8</sup> In addition, more than 2 billion people suffered from micronutrient deficiencies, especially iron, vitamin A, and zinc.<sup>9</sup> The economic and food crises in 2007 led to drastic price increases for agricultural inputs such as fertilizers and outputs such as grains and cereals.<sup>10</sup> This situation worsened global food insecurity and badly hit poor people and poor food-importing countries, including the 641 million people living in the Asia-Pacific on below US\$ 1/day.<sup>6</sup> The crises brought the total number of undernourished people in the world to 1.02 billion in 2009.<sup>11</sup>

### Asia-Pacific countries in severe food insecurity

Food security is not a high national priority for the rapidly industrializing countries in the Asia-Pacific region such as Thailand, Singapore, Korea, and Taiwan, although there are small numbers of people in these countries still

living in hunger and poverty. Recently some Asian countries, particularly China, have made good progress toward attaining the Millennium Development Goals (MDG) target of reducing poverty and hunger. However, in many other Asian countries, two to six people out of 10 still lack access to sufficient food. Countries with high proportions (>20%) of undernourished people include Afghanistan (61%), Tajikistan (34%), DPR of Korea (32%), Mongolia (29%), Bangladesh (27%), Cambodia (26%), Pakistan (23%), Timor-Leste (22%), India (21%), Sri Lanka (21%), and Armenia (21%).<sup>12</sup> Malnutrition is a chronic form of food insecurity; it increases morbidity and mortality, especially among children, reduces cognitive ability, and slows down economic growth.

## CHALLENGES AND APPROACHES

### *Increase productivity and incomes of participants in the food system*

Short-term food security for the Asia-Pacific is a matter of food availability and income.<sup>5</sup> Government action and international efforts to improve food availability in the region should consider the economic, physical, and social access of the poor to food. Because the food system employs significant numbers of the poor in South Asia and sub-Saharan Africa, initiatives that improve the productivity of the food system on- and off-farm will increase incomes for those most in need. Gains in yield will contribute to a more stable flow of food to markets.<sup>2</sup> Improvements in rural and urban markets, postharvest handling, storage, irrigation, roads and other infrastructure, and access to credit will enhance physical and economic access to food.<sup>2</sup> Rapid urbanization and migration will affect the food system; food distribution strategies must take these social trends into account.

### ***Empower women through home gardens and own land production***

Increasing agricultural productivity on smallholdings is one of the most effective strategies to ensure the poorest people have an accessible food supply. For example, a 4x4 m plot can supply a family of five (two adults and three children) with significant percentages of the recommended dietary allowance of protein, calcium, iron, and vitamins A and C. A 10x18 m school garden could provide 142 children with half cup of vegetables per day throughout the school year. Research on market gardens showed that a 10x20 m plot for small farm families can increase family income by approximately 30 percent.<sup>13,14</sup> Market gardens generate income and foster better health in developing countries, where the availability of vegetables at local markets is low, jobs are scarce, and where most of the malnutrition problems exist. Women, girls and children—the most vulnerable to food insecurity—benefit from home gardens to grow indigenous or local food plants. Integrating home garden skills training with health and nutrition education can help families secure their own food supply and improve health. Farmers' adoption of disease resistant, stress tolerant crop varieties with better nutrient content can lead to increased and stable yields, and help raise nutrition levels of the farm family and the larger community.

### ***Food-based approach to improve nutrition and health through crop and dietary diversification***

Food-based approaches, including dietary diversification and modification, are sustainable, economically feasible, and culturally acceptable means to alleviate several micronutrient deficiencies simultaneously without risk of antagonistic interaction.<sup>15,16</sup> A growing body of evidence from epidemiological studies underlines the benefits of a varied diet in improving nutritional quality and child growth in developing countries.<sup>17</sup> New evidence also points to the benefits of a diverse diet in increasing longevity and reducing the rates of chronic degenerative diseases.<sup>18,19</sup> Balanced diets and health depend on dietary diversity, not only in terms of nutrients but also in other functional phyto-components like dietary fibers, antioxidants, immuno-modulators, and glycemic agents. This can have a positive impact on diseases such as AIDS, diabetes, cardiovascular diseases, cancer and vision impairment.<sup>20</sup> One effective way of ensuring access to a healthy diet that contains adequate macro- and micronutrients is to produce diverse kinds of foods in a home garden. Home gardens are especially important in rural areas where people have limited income-earning opportunities and poor access to markets. Home gardens also are becoming an increasingly important source of food and income for poor households in peri-urban and urban areas.

### ***Risk assessment of food in health security and environmental sustainability***

Food and health systems in food security are interlinked. Programs to improve agricultural productivity, if poorly designed, can lead to unintended negative health effects, including increased health hazards from misuse of pesticides, growth hormones for food production, unregulated food additives, and unsanitary processing processes in

food factories. Standing water from irrigation has increased disease vectors such as mosquito and schistosomiasis-bearing snails. Women's involvement in agricultural tasks has resulted in less time to care for children. The design of any food program should carefully examine the risk of vulnerability and potential health as well as environmental effects.

### ***Sustainable, diverse, and small-scale agricultural production for long-term food security***

For the Asia-Pacific region, long-term food security will depend on the active participation of small-scale farmers in sustainable, ecologically viable agricultural production.<sup>5</sup> In high-income countries where labor is expensive and capital is relatively cheap, the expansion of agricultural production through large-scale mechanized farming is economically viable; this is not the case in low-income areas of Asia and sub-Saharan Africa.<sup>2</sup> However, small-scale production can increase local food availability and diversity to reduce risk of sudden shortages. Agricultural development should focus on biodiversity and emphasize health of the ecosystem including soil, environment, and people (ecohealth). Use of local food, including indigenous vegetables, requires less logistics for food distribution, provides food diversity, and supplies a spectrum of essential nutrients and health-promoting phytochemicals that lead to improved nutrition and health.

### ***Ecohealth approach in response to climate change***

Food security relies on the good health of the ecosystem. Yet food production is becoming less stable as extreme weather brought about by climate change damages crops, disrupts farming and fishing, and alters the patterns and movements of diseases that affect plants and livestock.<sup>21</sup> The world's poor, who have contributed least to the causes of climate change, will be the most affected by it; the lack of resources and remedies highlights the stark inequalities between the rich and poor.<sup>3</sup> Agricultural research and development can address climate change by increasing the adaptive capacity of farmers and crops, and by enhancing resilience through ecohealth and purposeful biodiversity management.<sup>22</sup>

## **OPPORTUNITIES AND ACTIONS**

Poverty is the root of food insecurity. Increased purchasing power of the poor will improve their access to nutritious food and health services. Food systems that aim to generate income for all participants in the food chain need greater investment from international donors and governments.

Greater collaboration among agricultural, food, and health research institutions to understand the effect of regional and local food availability on public health, and to foresee and develop adaptive capacities that can help reduce climate change effects on food security at community and national levels.

Establish systematic and comparative national and regional information frameworks linking agricultural production, food systems, and health status for surveillance, assessment, strategy development in designing food and health programs, decision making, and rapid policy responses to food and health crises.

Food security requires multidisciplinary knowledge

and action. Capacity building at the university level to train professionals in trans-discipline issues that cross agriculture, health, socioeconomics, food security, and climate change, for example, would form a critical mass of human resources to lead an effective and efficient response to these important issues.

Research and development in the Asia-Pacific agricultural sector should emphasize expanding crop diversity, food system productivity, and developing small-scale, eco-friendly farming systems.

Many Asian countries such as Korea, Thailand, Taiwan, China, and others have significantly reduced poverty and largely achieved food security. These countries can play significant roles in global development by sharing their experiences in establishing effective food security programs and providing leadership and funding for regional collaboration to improve food and health systems in the Asia-Pacific region. International cooperation should not only encourage collaborations for high technology development, but also promote cooperation in the development of pro-poor technologies to alleviate economic inequities and reduce the gap between rich and poor in terms of access to resources.

Much nutrition research attention has been focused on the health-promoting attributes of global vegetable crops, such as broccoli, tomato, onion, and cabbage. Yet many indigenous vegetables commonly consumed in the Asia-Pacific region have not been studied for positive and negative health factors. Some indigenous vegetables are integrated into local diets, but their health-promoting factors and potential hazards remain unknown. A better understanding of both the positive and negative qualities of indigenous vegetables, particularly for underutilized species, would help to develop evidence-based promotion and dietary strategies. Greater use and consumption of nutrient-rich and safe vegetables can be promoted, while precautions may need to be taken if certain indigenous vegetables contain significant amounts of anti-nutrient factors such as oxalates, alkaloids, and poisonous substances.

Nutrition and health sectors should promote food-based approaches that lead to diversification of crops, balanced diets, and ultimately, better health.

#### AUTHOR DISCLOSURES

Ray-Yu Yang and Peter M Hanson, no conflict of interest.

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## 提升糧食可利用性以促進亞太地區的糧食安全

糧食安全意指所有人皆能獲得充足的食物而達到健康的生活。目前雖然有充足的糧食生產可供應全球人口，但仍有十億兩千萬的人口營養不良。在很多亞太地區的國家營養不良與長期食物缺乏的問題仍普遍存在，嚴重者甚至多達百分之二十到六十的國家人口無法滿足最低生理熱量需求。糧食安全主要取決於糧食供應，但是只靠糧食供應不見得能滿足所需的營養。有效的糧食安全，需要結合有效的食品、衛生及經濟體系，並充分考慮環境條件及因子。在短期內，欲改善亞太地區糧食安全的問題，低收入國家應著重於糧食生產體系之生產力提升以增加農戶及作物食品產銷人員的收入。從長遠來看，以生態導向的小型永續農業則為未來發展的重點。營養與衛生單位應重視並結合農政單位，推廣以糧食生產體系與膳食多樣化為基礎的營養策略，如此將有助於食品、作物多樣化，促進飲食均衡，最終改善大眾健康並永續發展。

**關鍵字：**營養不良，糧食生產系統，糧食安全體系，永續農業