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DYNAMISM IN ASIAN FOOD SYSTEMS

HOW URBANISATION AND ENVIRONMENTAL STRESS ARE AFFECTING REGIONAL FOOD SECURITY

J. Jackson Ewing

Asia[1] faces escalating food challenges. Significant food price fluctuations in 2007–2008 and again in 2010–2011 have served as the most recent reminders of the potential volatility of regional food systems. These highly publicised events have underscored the stakes involved in the food security sector.

With regard to food security, greater Asia is a region of contrasts. It is home to the world's largest rice exporters, as well as to the largest importers and consumers of rice per capita globally. Asia continues to enjoy the benefits of vibrant regional economic growth and poverty reduction, yet the number of hungry people in the region has been on the rise. since the mid-1990s, and a large majority (62 per cent) of the world's undernourished continue to live in Asia. Strong economic growth has propelled a number of Asian countries towards middle-income status. However, the same countries are home to an overwhelming share (86 per cent) of the region's undernourished, with India accounting for 43 per cent and China for 24 per cent.[2]

Environmental stresses and urbanisation are the two primary factors shaping Asia's food security picture. The region is deeply endowed with natural resources that are

1 | The scope of this chapter necessitates that Asia is dealt with broadly, but its varied communities, states and regions are disaggregated at various points to draw out regional complexities.

2 | Cf. RSIS Centre for Non-Traditional Security (NTS) Studies, 2011, International Conference on Asian Food Security 2011 – Feeding Asia in the 21st Century: Building Urban-Rural Alliances (10-12 Aug 2011), Report, Singapore, 2012.

valuable for agriculture, yet environmental stresses continue to threaten many key environmental systems and, by extension, future food production. Increased constraints on natural resources in Asia, such as land degradation and water scarcity, put severe pressure on agricultural sustainability and food security in the region. Moreover, these environmental challenges are set to become more pronounced as food demands continue to rise. Climate change will put additional pressure on natural resources and food security by giving rise to higher and more variable temperatures, changes in precipitation patterns, and increased occurrences of extreme weather events. According to recent projections by the International Food Policy Research Institute (IFPRI), Asia's production of irrigated wheat and rice could be 14 and 11 per cent lower respectively in 2050 than in 2000 due to climate change.[3]

Asia is home to the world's largest rice exporters, as well as to the largest importers and consumers of rice. | Source: Philipp Manila Sonderegger (CC BY-NC-SA).

The population of the region's developing countries is projected to increase from 3.6 to 4.5 billion between 2010 and 2050. Most of the growth is in cities, with the urban population set to surpass the rural population in 2028. As a result of the growing and changing population, demand for

3 | Cf. P. Teng, M. A. Sombilla and J. J. Ewing, "Feeding Asia in the 21st century: building urban-rural alliances: summary of the main findings of the international conference on Asian food security held in Singapore on 10-12 August 2011", *Food Security*, Apr 2012, 141-146.

more and higher quality food will continue to rise. Asia has a rich agrarian history upon which to draw, yet urbanisation trends and modernisation in food production are changing traditional connections between the region's countryside and its people.[4]

In addition to these challenges, the role of agriculture is transforming when it comes to supporting Asia's food security. Agriculture's contribution to the economy in relation to other sectors has been in decline over the last few decades, with the agricultural share of the gross domestic product (GDP) falling from 43 to 18 per cent between 1961 and 2009. The proportion of developing Asia's economically active population employed in agriculture has also steadily fallen from 70 to 55 per cent between 1980 and 2010, and is projected to further fall to 49 per cent in 2020.[5]

However, it is important to emphasise that still a significant share of the workforce is employed in the agricultural sector, and this is not likely to change in the foreseeable future. In terms of farm size, small-holder agriculture not only continues to dominate the Asian farming system – 87 per cent of the world's 500 million small-holder farms are in Asia – but land holdings in the region are getting smaller as a result of population growth and inheritance-based fragmentation. There is also a rapid transformation of supply chains with 40 per cent of agricultural products going into retail in supermarkets. These trends reflect the urbanisation and modernisation of food systems, which is dramatically reconstituting questions about Asia's food security.

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In response to the threats of food insecurity, Asian countries have implemented several measures to soften the impact of food-related risks, particularly on the most vulnerable segments of their populations. These include export restrictions, price controls, price subsidies and import facilitation. Such approaches are understandable

4 | Cf. RSIS, n. 2.

5 | Cf. Teng, Escaler and Ewing, 141-146; J. J. Ewing, "Contextualising Climate Change as a Cause of Migration in Southeast Asia", in: Lorraine Elliott (ed.), "Climate Change, Migration and Human Security in Southeast Asia", *RSIS Monograph*, 24, S. Rajaratnam School of International Studies (RSIS), Singapore, 2012, 13-27.

and at times seemingly the only option available to governments. However, there are both costs and benefits from these types of state intervention in food markets, as these strategies potentially involve competing objectives, such as protecting consumers versus assisting agricultural producers to benefit from rising prices.

URBANISATION AND ITS SIGNIFICANCE FOR FOOD SECURITY

Urban locations draw people away from their homes in response to the challenges which they may be battling in rural settings, such as reductions in water access, declining sanitation conditions, and economic and food insecurities.

The significance of urbanisation for food security in Asia is difficult to overstate. Throughout the region's history the lure of social connectivity and economic opportunity has brought people to cities and exurban fringes,[6] and these movements have hastened in real and relative terms during the twentieth and twenty-first century. The resulting more urbanised populations are creating new demands on regional food systems. Cities offer logical destinations for many people who are compelled to move in part because of protracted environmentally-related challenges (such as droughts) or sudden events (such as storms). As centres of culture, commerce, trade and family relations, cities are places where the immediate and longer term needs of such populations can be most readily met.[7] The pull of urban locations thus has the power to draw people away from their homes in response to the challenges they may be battling in rural settings, the most pronounced of which are often changing agricultural trends, reductions in water access, declining sanitation conditions, and economic and unreliability of food supplies.

Evidence of this powerful urban draw in Asia is already quite apparent. The overall rapidity and scale of urbanisation in Southeast Asia and China is historically unprecedented,[8] and the multifarious drivers behind it certainly transcend food and environmental factors. Nevertheless, challenges facing the rural agrarian areas of the region can serve to speed urbanisation and in doing so hasten the regional

6 | Cf. Anthony Reid, *Charting the Shape of Early Modern Southeast Asia*, Silkworm Books, Chiang Mai, 1999.
7 | Cf. n. 3.
8 | Cf. Peter J. Rimmer und Howard W. Dick, "The city in Southeast Asia: patterns, processes, and policy", *NUS Press*, Singapore, 2012.

reshaping that is already well underway. The region's urban population has increased from roughly 15 per cent of the total in 1950 to almost 42 per cent by 2010, and the upward trend continues.[9] Much contemporary urbanisation is occurring in the least urbanised states such as Laos and Cambodia even as the cities of these countries struggle to manage the rapid influx of people. Large megacities such as Jakarta, Manila and Bangkok will continue to prosper, while many small and medium-sized cities and towns, which are inhabited by roughly 67 per cent of the region's urban populace, will grow even faster.[10]

Large megacities such as Jakarta will continue to prosper, while many small and medium-sized cities and towns will grow even faster. | Source: Smulan77 / flickr (CC BY-NC).

Feeding growing and increasingly urban and affluent populations poses unique challenges. Inescapable development trends mean that more food must be produced by rural communities that continue to decline in size relative to their city-dwelling neighbours. This is true both domestically, where rural hinterlands feed urban centres, and internationally, where countries with high rural agricultural capacities supply countries with significant food importing needs.[11] Globally, arable land has shrunk from 0.45

9 | Cf. ISEAS (ed.), "Urbanisation in Southeast Asian Countries", Singapore, 2009.
10 | Cf. ibid.
11 | Cf. J. Jackson Ewing, "Food Production and Environmental Health in Southeast Asia: The Search for Complementary Strategies", *NTS Policy Brief*, May 2011, 1-6.

hectares per person in the mid-20th century to 0.25 hectares per person in 1997.[12] While perhaps alarming, this trend is unsurprising given the world's rapid population growth, mercurial gains in global economic production and the attendant land conversions that these changes necessitated. The trend is about to continue and estimates suggest that arable land per person will drop to 0.15 hectares by the mid-21st century.[13]

Particularly land-use changes are a major challenge because as cities expand, prime agricultural lands are being converted into residential and industrial areas. Most cities in developing countries have great difficulties coping with the fast pace of development. As cities struggle to absorb ever-increasing numbers of people, more informal housing arises and the population of poor urban citizens increases. This population is exceedingly vulnerable as they spend a major part of their income on food.

Moreover, as populations in Asia become more urban and affluent, diets are changing to include more meats, fish and processed foods; which can intensify environmental stresses stemming from food production.[14] Sustained economic and urban growth in countries such as China and India entails these changes in consumption patterns. With higher disposable incomes, people move away from diets based on staple grains, vegetables and fruits, and limited foods of animal origin towards more varied diets that include more pre-processed food and more foods of animal origin (particularly in East Asia). The diversion of grains to feed livestock has therefore impacted on the availability of cereals. Unlike those living in rural areas, most urban dwellers are net food buyers and spend a large part of their disposable income on food. This makes them highly susceptible to fluctuations in food prices and disruptions in the global food supply chain. Addressing these risks requires an understanding of the linkages between urban and rural areas.

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12 | Cf. Huub Spiertz, "Food production, crops and sustainability: restoring confidence in science and technology", *Environmental Sustainability*, Feb 2010, 439-443.

13 | Cf. ibid.

14 | Cf. Sharon Friel and Phillip I. Baker, "Equity, Food Security and Health Equity in the Asia Pacific Region", *Asia Pacific Journal of Clinical Nutrition*, 18(4), 2009, 620-32.

Decades of faltering public commitment to agricultural investments have hindered the ability of farmers to pull themselves out of poverty, or cope with price volatility, and climatic and economic shocks. To have the greatest impact on food productivity and ultimately on poverty reduction, public spending on agriculture must be complemented with investments in non-farm rural development, soft and hard infrastructure development, better education and effective healthcare. Urban centres of trade, finance and research provide the traditional and logical sources for such investment funds.

Urban agriculture will of course not be able to fully meet the growing demands for food in cities, but it could play a role in supplementing rural agriculture with measures such as agro-parks, vertical farming, or rooftop farming.

Finally, urban areas are also growing their own food. Urban agriculture will of course not be able to fully meet the growing demands for food in cities, but it could play a role in supplementing rural agriculture. Urban and peri-urban agriculture (UPA), which encompasses the growing of plants and the raising of animals within and around cities, offers a way to improve urban food security. The practice of UPA can take many forms: agro-parks, vertical farming, rooftop farming, aquaponics, aeroponics and the like. The areas surrounding urban centres or extended metropolitan regions in particular are crucial for the provision of food to urban consumers, and the proximity of these areas to urban markets lowers the cost for both food transport and storage. There are promising examples from Shanghai to Hanoi to Manila that demonstrate the possibilities of UPA, and there is a great potential for expansion in the sector.

ENVIRONMENTAL STRESSES AND SUSTAINABLE AGRICULTURE

Asia's modernising and urbanising trajectory frames a fundamental question surrounding food production on the continent: how can more food be produced on less land and with acceptable environmental and social impacts? The region already has a large agricultural footprint, with the world's largest producer and consumer of rice (China), two of the largest rice exporters (Thailand and Vietnam) and significant production and exportation of a range of fruits, vegetables and processed foods. Unlike the agricultural zones of Europe and North America, much of this

food is produced at local levels and on small scales, which ensures that agriculture plays a vital role in the economic and social structure of the region. As such, continuing to make farming economically viable, warding off pervasive hunger problems and responding to the changing food needs of a growing and developing region are paramount goals for governments and other stakeholders throughout the region. While environmental considerations can easily get lost in the shuffle of these pursuits, there is a growing recognition that mitigating environmental stresses is necessary for future agricultural progress. Such recognition amplifies an already clamorous debate on what role technology and advanced agricultural methods should play in regional food production.

Urban and peri-urban agriculture (UPA) as in this case in China offers a way to improve urban food security. | Source: Sustainable Sanitation Alliance (SuSanA) / Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

When talking about modern (and often large-scale) farming methods, environmentally-focused voices call attention to the high greenhouse gas emissions released by some food production and distribution practices, the degradation and depletion of freshwater systems to meet agricultural needs and the conversions of valuable ecosystems that

accompany many modern farming operations.[15] Decades of agricultural intensification have certainly had serious side-effects, with the overuse of nitrogen-based fertilisers and high inputs of phosphorus, insecticides, fungicides and heavy metals all creating lasting problems for soil and freshwater systems and for overall nutrient flows throughout food chains. These conditions certainly encourage arguments for a return to, or a perpetuation of, more "traditional" small-scale farming techniques. Countervailing voices argue that agrotechnology provides environmentally prudent tools for managing the ecological footprint of food production.[16] Burgeoning new technologies, according to the proposal, could reduce water usage through targeted low-volume irrigation systems, combat soil erosion through less invasive tilling practices and increase yields so that less land has to be brought under cultivation. New approaches also present opportunities to mitigate greenhouse gas emissions and genetically modified plants could require fewer external inputs such as fertilisers and insecticides.

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Over the last half-century, remarkable changes in agricultural practices have increased food production across the world. Since the genesis of the Green Revolution in the early 1960s, gross world food production (cereals, coarse grains, roots and tubers, pulses and oil crops) has grown from 1.84 billion tons in 1961 to 4.38 billion tons in 2007. This increase is due to changes in crop varieties (day-length insensitive, partitioning of carbohydrates to grain rather than straw, disease resistance), changes in agricultural practices (fertilisers, water management, pesticides), and broader social, economic and political shifts.

These changes have had many positive effects as well as significant costs. Increases in yield have been achieved without great expansion in land use, but this high-energy crop production has involved sharp increases in the use

15 | Cf. L. G. Horlings and Terry K. Marsden, "Towards the real green revolution? Exploring the conceptual dimensions of a new ecological modernisation of agriculture that could 'feed the world'", *Global Environmental Change*, 21(2), 2011, 441-452.

16 | Cf. Spiertz, n. 12; Ewing, n. 11, 1-6.

of fertiliser, pesticide and water, which has in turn led to increased emissions of nitrates and pesticides into the environment and the depletion of ground-water aquifers. The increasing mechanisation of farming has replaced labour and therefore worsened poverty in some rural areas. Climate change has been exacerbated by modern agricultural production, which is mostly greenhouse gas intensive. This production is now amplifying many of these food security challenges and therefore creating emergent problems. Agriculture-based livelihood systems that are already vulnerable to food supply unreliability face an immediate risk of increased crop failure, new patterns of pests and diseases, a lack of appropriate seeds and planting material, and a loss of livestock.

There is an urgent need to rethink food security, and to promote sustainable agriculture on a far greater scale. Sustainability rests on the principle of meeting the needs of the present population without compromising the ability of future generations to meet their own needs. Not only does sustainable agriculture address many environmental and social concerns, it also offers innovative and economically viable opportunities for growers, labourers, consumers, policymakers and many others in the entire food system.

One way of achieving sustainable agriculture is by transitioning to a bioeconomy. A bioeconomy can be thought of as a world in which biotechnology contributes to a significant share of economic output. The use of biotechnology in agriculture is an evolving success story. By 2015, approximately half the global production of the major food and industrial feedstock crops could come from plant varieties developed using one or more types of biotechnology.[17] Research into agronomic traits to improve yields and resistance to stresses such as drought, salinity and high temperatures has increased rapidly since the early 1990s, as shown by the increase in the number of GM field trials of agronomic traits by small and large firms and by public research institutions.

Biotechnologies other than GM can also be widely used to improve the quality and health of livestock for dairy and meat products. There has also been an increasing emphasis

17 | Cf. RSIS, n. 2.

on biomass as an energy source because the continued reliance on traditional energy sources such as petroleum is not sustainable. Biomass is obtained primarily from plants, animals and their by-products. The most important feature of biomass is that it is a renewable source of energy, unlike hydrocarbon-based resources. Agricultural products such as switchgrass, soybean, corn, sugarcane, sugar beet, wheat, cassava, sorghum, miscanthus, palm oil and jatropha are now specially grown for the production of a wide range of biofuels such as biodiesel, bioalcohols, ethanol, biogas and syngas. If these fuels could become more efficient, avoid displacing important agricultural activities and not lead to serious food price distortions at the same time, they could become a greater part of future food and energy security calculations.

Issues surrounding GM are particularly contentious, and raise questions about ethics, biosafety, consumer choice, intellectual property and monopolistic controls.

However, many obstacles to the efficacious employment of agrotechnology in Asia remain. They must be effectively grappled with if future agricultural systems are to become more sustainable and efficient. Issues surrounding GM are particularly contentious, and raise questions about ethics, biosafety, consumer choice, intellectual property and monopolistic controls, to name a few. Ethical arguments question the morality of this new frontier of changes to "natural" agricultural patterns, consumer voices question the health impacts of GM, and economically-based positions warn that the domination of multinational corporations such as Monsanto creates intellectual property problems, leaving both consumers and producers susceptible to the whims of private businesses.[18] Asian countries and other stakeholders are now attempting to learn lessons from past efforts to employ new agricultural methods and technologies elsewhere, and to find ways to take advantage of modern science without compromising environmental or social systems.

Importantly, meeting the needs of agricultural production in an environmentally sustainable way is possible, and both traditional and modern strategies bring valuable tools.[19] Asia will continue to host a mishmash of farming methods

18 | Cf. Ewing, n. 11, 1-6.

19 | Cf. The Royal Society (ed.), "Reaping the benefits: Science and the sustainable intensification of global agriculture", The Royal Society, London, 2009.

and strategies that meld tradition with modernity. Looking broadly, however, it is clear that food-related decisions made at subnational, national and regional levels will continue to have implications for environments throughout the region. Moreover, as food demand continues to shift, the importance of the agricultural sector to regional environmental conditions will become more pronounced.

Overlaying these already difficult environmental questions are the looming challenges of climate change. The planet's warming will affect natural systems that are essential for sustaining the viability and progress of agricultural systems in Asia; particularly those which lack the means to adapt effectively to the changes. The Intergovernmental Panel on Climate Change (IPCC) predicts that during the coming half century, drought-affected areas will expand while other locations will experience greater heavy precipitation events and flood risks, river runoff will decrease between 10 to 30 per cent across many dry regions and mid-latitudes, and glacially-stored water supplies are expected to decline, reducing water availability for over one-sixth of the global population. The changes in rainfall patterns and ice volumes at the source of these problems will affect both freshwater availability and agricultural production.[20]

For Asian populations dependent upon local agriculture for food and income, smaller crop yields can lower individual caloric intake, which negatively affects human health, while reducing vitally important household incomes.[21] For areas of water abundance, major precipitation events, flooding and greater runoff and erosion will have negative consequences for agricultural production, rendering many previously productive lands at least temporarily unviable for habitation and human utility.

Such scenarios understandably lead to notions that climate change will cause widespread hardship; particularly in parts of developing countries that will struggle to feed

20 | Lenny Bernstein, Peter Bosch, Osvaldo Canziani et al., "Climate Change 2007: Synthesis Report", IPCC Plenary XXVII, Valencia, 2007, http://ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (accessed 10 Oct 2012).

21 | Cf. UNDP, *Human Development Report 2007/2008: Fighting climate change: Human solidarity in a divided world*, Palgrave Macmillan, New York, 2008 .

their populations as climate-induced challenges take hold. Adaptation to climate change is not a simple or straightforward issue, but rather encompasses a range of activities from basic coping to advantageous pursuits in response to the changing climate. The ability of a system to "adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with consequences" is defined by the IPCC as the system's "adaptive capacity".[22] Primarily in developing countries, vulnerability is often high, whereas adaptive capacities regularly tend to be low, and livelihoods are frequently tied closely to natural resources where climate change has the most acute impacts.[23] These dynamics have clear and significant implications for regional food security.

Primarily in developing countries, vulnerability is often high, whereas adaptive capacities regularly tend to be low.

Vast areas of Asian soil face risks to freshwater availability and agriculture deriving from warming temperatures and changing precipitation patterns. Warmer temperatures for longer durations can alter germination periods and growing cycles in agricultural zones such as those in the Greater Mekong Subregion and the large islands of the archipelagic states.[24] Changing precipitation patterns may lead to dry days being drier and wet days being wetter, and bring rains that facilitate erosion and runoff. Existing weather fluctuations, such as the El Niño phenomenon, already contribute to droughts during Asia's dry seasons and floods during the wet season. These effects are likely to become more acute in a changing climate.[25]

22 | IPCC, 2007, 21.

23 | Cf. Dan Smith and Janani Vivekananda, "A Climate of Conflict: The links between climate change, peace and war", *International Alert*, Nov 2007; Global Humanitarian Forum (ed.), "Human Impact Report – The Anatomy of a Silent Crisis. Geneva", *Global Humanitarian Forum,* 2009.

24 | Cf. B. Rerkasem, "Climate Change and GMS Agriculture", in: Kobkun Rayanakorn (ed.), *Climate Change Challenges in the Mekong Region*, Chiang Mai Press, Chiang Mai, 2011; N.T.H. Thuan, "Adaptation to Climate Change in Rice Production in Vietnam Mekong River Delta", in: Kobkun Rayanakorn (ed.), *Climate Change Challenges in the Mekong Region*, Chiang Mai Press, Chiang Mai, 2011.

25 | Cf. IPCC, 2007, n. 20, 21.

Degrading agricultural lands through drought, flooding or erosion, or rendering of entire lands unviable by an encroaching sea, atmospheric changes create risks for the region.

The physical manifestations of atmospheric change that are threatening Asia can act in conjunction to create multiple stresses that are greater than the sum of their parts.[26] Whether by affecting water quality or availability, degrading agricultural lands through drought, flooding or erosion, or rendering of entire lands unviable by an encroaching sea, atmospheric changes create risks for the region, and there is reason to expect that these risks will make the challenge of feeding Asia more formidable.

CONCLUSION: POLICY IMPLICATIONS AND RECOMMENDATIONS

In response to the significant challenges and trends of urbanisation and environmental stresses, and in order to achieve sustainable food security in the region more generally, policies and strategies need to achieve several key goals. These include improving small-holder productivity; protecting vulnerable people; supporting transparent, fair and open trade; establishing regional strategic grain reserves; and creating regional frameworks for knowledge sharing and better coordination. Such multi-pronged approaches are needed to meet Asia's contemporary and future food security challenges. Several more specific policy suggestions that address the region's food security challenges must follow.

Enhance investment in agriculture and food sector and prioritise R&D

There is a need to regain investment momentum in the agriculture and food sector, and reenergise efforts in the R&D sectors. Evidence has demonstrated that agriculture is capable of generating high economic returns on investments. Food sector investments allowed food production to meet many of the demands that have accompanied factors such as economic growth, population expansion, demographic changes, and shifts in food preferences.

26 | Cf. Martin L. Parry et al., "Technical Summary", in: Martin L. Parry et al. (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, 2007.

These investments have waned over the past decade and contributed to the slowdown in food production growth. Investments in R&D in particular have reduced over time in most developing Asian countries, affecting yields of agricultural commodities including fish and other marine products. Investment momentum in the agriculture sector must be rejuvenated to support yield-enhancing infrastructure and activities. These include R&D, agricultural extension, insurance and credit, and assistance to enable small-, medium- and large-scale farmers to overcome the emerging threats posed by climate change, fuel and food price volatility, and other uncertainties of the globalised food system.

Public and private sectors, including companies, farming and non-governmental organisations, philanthropic organisations, and government actors must contribute to these investments. There is also an incentive for food security stakeholders to pursue enhanced scientific and policy innovation. Future R&D efforts should shift in such a way that the most appropriate combination of sciences and techniques are employed with due consideration to the circumstances of smallholder farmers. Attention must be given to their ability to access new technologies, as well as the applicability of new technologies in their production environment, and the capacity of stakeholders to adopt and use technical improvement being deployed.

Technologies should also be pursued to lower the environmental impacts of farming and encourage the development of urban and peripheral agriculture.

Focus should increasingly shift towards the development of technologies made to improve the production of commodities that are projected to undergo rapid demand increases because of the evolving economic and demographic circumstances. Technologies should also be pursued to lower the environmental impacts of farming and encourage the development of urban and peripheral agriculture.

Improve conditions for Asia's small-holder farmers and the poor

The plight of the region's chronically poor should be addressed as a priority. These people are often isolated from mainstream economic growth, lack market access and opportunities, have comparatively low skills and

capabilities, and encounter linguistic and cultural difficulties. They require policies targeted at supporting their specific conditions. Such support could be provided in the form of social safety nets or cash transfers, employment generation, universal healthcare, or skills training and capacity development. These actions are important for bringing the region's poor to a level of sufficient productivity and food security. The most beneficial of these safety nets are those that would help the chronically poor eventually develop, so they are able to benefit from market expansion and overall economic growth.

Capacities must be enhanced to sustain increases in farm production and to diversify livelihood activities to increase incomes. Agriculture remains the economic backbone of most Asian countries but the value added per unit of production input has not improved to the extent necessary to effect broad-based progress in living conditions, especially for small-holder farmers. Incomes in the agriculture sector could improve through diversification, not only to high-value crops but also to value-adding activities that would facilitate the transformation of the agricultural sector into more commercial scales.

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Enhance linkages to modernising markets and trading systems

A significant transformation is taking place in the food supply chain; Asian consumers now obtain 40 per cent of agricultural products from supermarkets and corporate retail outlets. Private sector investments are critical in the modernisation of this supply chain, particularly in the off-farm segments that involve wholesalers, processors and supermarkets to improve efficiency, ensure delivery of trusted quality products, reduce transaction costs, and ultimately result in lower food prices. Governments would do well in many cases to lower entry barriers for private businesses and put in place more stringent food safety measures. Small-holder farmers should be better integrated into the overall modernisation process.

While much of the food consumed in Asia is produced domestically, the role of international trade is accelerating in importance especially with the rapid expansion of urban populations that are partly dependent on imports for their food requirements. In this regard, more liberalised trade should be explored and trade partnerships expanded. Additionally, export curbs and other policies that may distort trade should be reconsidered where possible to avert food shortages and episodes of price volatility. The establishment of effective food supply and demand monitoring and early warning systems can help prepare for market fluctuation. Likewise, the establishment of emergency food reserves can prevent countries from being exposed to food supply unreliability. Measures such as robust and deep grain futures markets that have not yet been applied to agricultural commodities should be studied in terms of their effectiveness in promoting transparency of price formation, supply stability and market confidence.

The establishment of emergency food reserves can prevent countries from being exposed to food insecurities. Measures such as robust and deep grain futures markets should be studied in terms of their effectiveness.

Improve linkages between rural and urban food security stakeholders

As urbanisation increasingly shapes environment and demographics in Southeast Asia, existing foundations must be extended to create positive symbiotic relationships between producing and consuming actors. It is clear that food-importing countries can impact conditions in producing states and regions in fundamental ways. These relationships need to be managed in order to add resilience and reduce vulnerabilities for importing states while providing economic opportunities for producing countries. While potentially symbiotic, such relationships between producer and consumer states are often difficult to manage. They may require policy interventions that cooperatively address the different circumstances and interests of urban food consumers and rural food producers.

The importance of agriculture for rural employment and development could be better recognised, and policies that help rural actors face the challenges that exist in changing Asian food systems should be pursued. Millions of rural stakeholders in Asia look to the food sector for their

sustenance and livelihood, and ensuring that needs are met in both areas is crucial for food security in both rural and urban settings. The instances of poverty and hunger should therefore be reprioritised throughout Asia, and the key role played by small-holder farmers, many of them women, should be reflected in future policy directions. Specifically, improvements in land tenure legislation and regulation, supply-chain and storage infrastructure, access to modern agricultural inputs, sharing of best practices, and food price management are all attainable and vital for the future of rural Asia.

Finally, resources available in urban contexts must be utilised to promote sustainable agricultural advancement in rural settings. Investments in agricultural production are needed from urban economic, political and social centres. Investors and recipients should pursue policies that protect local communities and contribute to national strategies that recognise the necessity of environmentally and socially sustainable policies for future growth and prosperity. Combining the financial, economic, logistical and research capacities of urban areas with the land and natural resource endowments of Asia's hinterlands is essential for the region to effectively respond to the significant food security challenges of the 21st century.