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Food Security and Poverty in Asia and the Pacific

Key Challenges and Policy Issues

Asian Development Bank

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Key Challenges and Policy Issues

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Asian Development Bank

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Foreword

Many of the world's fastest growing economies today are located in Asia. Ironically, however, Asia still is home to two-thirds of the world's poor and more than 60% of the world's undernourished population. Across the globe, poverty is the single most common cause of food insecurity. With strong growth, developing countries in Asia and the Pacific have made progress in reducing poverty and hunger. Nevertheless, the progress in food security has been nearly stagnant since the mid 1990s and the absolute number of undernourished people in the region has increased as a result of rapid population growth. Adding to this, the global food and economic crises of 2007–2008 have pushed tens of millions more people into food insecurity. High and volatile food prices persist around the world, including in Asia and the Pacific. While food price spikes and volatility have adverse impacts on all segments of the population, these impacts are more acutely felt by the poor, who spend up to 70% of their income on food items. Moreover, higher and more volatile food prices decrease poor people's ability to move out of poverty in the longer term as higher food bills crowd out expenditures on other basic needs such as health care and education.

This special study explores the web of issues linking food security and poverty, looking into the ways instability in food markets impacts the poor. The study also previews the ongoing research on food security initiated by the Asian Development Bank (ADB) in partnership with the Canadian International Development Agency (CIDA) and the University of British Columbia (UBC). This joint research effort aims to deepen the understanding of food security in Asia and the Pacific and articulate key policy challenges and opportunities.

This study was prepared by ADB's Economics and Research Department (ERD), under the overall guidance of Assistant Chief Economist Cyn-Young Park, Economic Analysis and Operations Support Division (EREA) in ERD, in consultation with Paul Samson of CIDA and Julie Wagemakers of UBC. The study was written by Cyn-Young Park, Hyun Hwa Son, and Emmanuel A. San Andres with significant inputs from EREA staff and staff consultants, including Muhammad Ehsan Khan, Kee-Young Nam, Suphachol Suphachalasai, and Liborio Cabanilla. Special thanks are due to Jill Gale de Villa and Guy Sacerdoti for editorial assistance.



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Highlights

- **Food security should be at the heart of any discussion on poverty.** Food security and poverty reduction are inseparable. Although food security alone does not eradicate poverty, any strategy to fight poverty must be integrated with policies to ensure food security and to offer the best chance of reducing mass poverty and hunger.
- **Around the globe, but mostly in Asia, rising populations and changing consumption patterns are raising global demand for food.** As of 2012, Asia remains the most populous continent, with 4.1 billion people—over 60% of the world’s 7.0 billion total. Moreover, the United Nations estimates show the global population increasing by more than 2 billion people between 2012 and 2050—with Asia accounting for more than half of that increase. Coupled with Asia’s economic growth and increasing affluence, consumption patterns are shifting from cereal grains toward more costly proteins and vegetables.
- **Despite rapid economic growth and poverty reduction, hunger still afflicts many people in Asia.** Between 1990 and 2009, the proportion of people in Asia living on less than \$1.25 a day dropped from 50% to 22%. However, the proportion of undernourished children only declined from 26% in 1990 to 18% in 2009. South Asia continues to be a hotspot for food insecurity and inequity, with undernutrition among children decreasing only slightly, from 64% in 1995 to 60% in 2009 for the poorest 20% of the population; this contrasts with the large decrease from 37% in 1995 to 26% in 2009 among the richest 20%. Hunger is also most dire in South Asia, where nearly 60% of Asia’s hungry, 65% of its extremely poor, and 81% of its underweight children live.
- **Rising food prices disproportionately affect the poor and counteract efforts at poverty reduction.** Although rising food prices affect everyone, the impact is disproportionately large among the poor, who spend a greater proportion of their budgets—up to 60%–70%—on food. Although poverty rates were reduced significantly across Asia in the late 2000s, the pace of poverty reduction was slowed by rising food prices. During this period, an additional 112 million in Asia could have escaped poverty annually had food prices not increased, according to Asian Development Bank estimates.
- **Food prices have been increasingly volatile in recent years, suggesting instability in the global food supply chain.** In 2000–2010, food price inflation has been higher than that of non-food prices, and food prices have also been more volatile. This was

especially true during the 2007–2008 global food crisis, when prices of rice, wheat, and maize spiked to record highs. This volatility reflects an underlying instability in the global food supply chain, with long-term trends (increasing demand and reduced availability of resources) interacting with transitory shocks (extreme weather events and other calamities).

- **Climate change is a major contributing factor in the battle to provide food security in Asia and the Pacific.** Growing pressure on ecosystems to produce food, as well as changing temperature and precipitation patterns, will have unpredictable and deleterious effects on existing food-producing resources. The continued or increased occurrence of extreme weather events will further exacerbate vulnerabilities of communities and natural systems.
- **A vast array of global, regional, and national policies is required to promote food security, and five basic policy strategies can do this while simultaneously reducing poverty.** They are (i) safety nets and social protection programs, (ii) agricultural productivity, (iii) rural development, (iv) agricultural research, and (v) human capital investment.
- **Safety nets and social protection programs can offer immediate relief to the poor during times of crisis.** These programs should be able to act as an automatic stabilizer in the economy to help poor households and farmers cope with food price hikes and price volatility. Rather than subsidies—which can drain budgets and lead to market distortions—well-targeted cash or in-kind transfers, feeding programs, and emergency employment programs can offer effective relief. Public-private food security funds, crop insurance, and futures contracts can also be established to better deal with the impact of natural calamities and price shocks.
- **Improving agricultural productivity is essential for ensuring long-term food security and promoting poverty reduction.** Transferring modern farm technology to increase land efficiency can produce major increases in farm yields. Reducing the amount of food wasted due to poor storage or inefficient processing could also raise global output by 15%–25%. Innovation and adoption of new—and green—technology can enhance agricultural productivity and increase rural incomes, while helping reduce agriculture’s carbon footprint. Governments and development institutions must help provide access to credit, promote farm cooperatives, and train farmers for applying new technologies.
- **Rural development can contribute substantially to food security and poverty reduction.** With the majority of the region’s poor living in rural areas, rural development remains key to reducing poverty. In Asia, the Green Revolution both increased farmers’ incomes and lowered food prices. A new growth paradigm should focus on support for agriculture, increasing income opportunities on par with the urban sector. Rural economic growth and stable food prices, therefore, should be intrinsic components of any food security strategy.

- **As with the Green Revolution of the 1970s, agricultural research is an essential tool for improving food security and reducing poverty.** Advancements in biotechnology could significantly boost farm production and develop plants that are more resilient to weather and less dependent on water. More research and better technologies are also needed in livestock production and fisheries—as people shift dietary preferences from cereal grains to meat and vegetables. Other areas requiring further research and development include the efficient and sustainable use of dwindling arable land and water resources.
- **Investment in health and education, and in basic infrastructure, plays a critical role in providing food security.** Countries that prioritize social development as essential components of poverty reduction—boosting access to basic schooling, health, and nutrition—not only directly enhance individual welfare but also achieve higher average incomes over the long term, contributing to both food security and poverty reduction.

I. Introduction

Food insecurity, or the inability to access food of sufficient quantity and quality to satisfy minimum dietary needs, is the most basic form of human deprivation. Before people can provide for their education, health care, or even clothing and shelter, they need to satisfy their hunger and feel secure that their future meals will indeed be available. Thus, the issue of food security is central to any discussion on poverty.

Food security is defined as the situation when “all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 2002). To achieve food security, food should be available, accessible, and properly utilized at all times.

Availability of food refers to the supply side of the food security issue: whether there is enough food to feed people. Availability is determined by food production and technology, inventory levels, and local and international trade in food. The dimension of availability has been much discussed and, in the 1970s, was the sole definition of food security.

The three other dimensions—access, utilization, and stability—came into the discussion starting in the 1980s. The Green Revolution in Asia had effectively relieved concerns over food supply shortages; however, adequate supplies of food at the national or international level did not

automatically translate into improvements in food security for all people. It became obvious that just producing sufficient food was not enough—the food must also be delivered to the people who need it. Thus, policy focus shifted to the issue of access, which refers to the ability of people to physically obtain and economically procure the food they need. Having food in the town center is meaningless to people who cannot get there. Likewise, having food on market shelves is meaningless to people who cannot afford to purchase it. With the incorporation of access, consideration of food security moved closer to addressing the issue of poverty reduction.

Even when people are able to obtain food, it must be properly utilized—that is, it must be able to satisfy their dietary needs and preferences. The term “utilized” here refers to the use of food for the body’s nutrition and to the utility (i.e., pleasure) attained from food. The first usage, regarding nutrition, is easy to understand—it is not enough for people to just have 2,000 kilocalories per day, which technically can be obtained solely from carbohydrates. But people also need ample amounts of proteins, fruits and vegetables, and micronutrients to maintain physical and mental health. The second aspect—utility or pleasure—is equally important given the centrality of food in determining one’s quality of life. Food is often one of the few pleasures the poor can afford. The food needs to be culturally acceptable and in line with people’s preferences to contribute to their well-being.

Finally, food security also requires that people feel fairly certain about where their next meal is coming from. Uncertainty is a source of anxiety and can discourage individuals, households, and firms from embarking on other economic activities that could provide them with beneficial long-term effects. For example, households may put off investing in education if they feel vulnerable to income or price shocks that threaten their ability to purchase food. Likewise, food-producing firms may defer investing in more efficient technologies if their financial survival could be threatened by highly volatile food prices. Thus, food security requires that people also feel secure about their future food supply, which implies the need for stability in the availability, access, and utilization of food.

This paper discusses the following issues pertinent to food security and poverty in Asia and the Pacific:

- What are the implications of population growth and changes in consumption patterns for food security, given the limited resources for producing and distributing food?
- How does food price inflation and volatility affect food security? What are the impacts of increasing food prices on poverty?
- What are the factors that exacerbate food price volatility and market instability?
- What can policymakers do to improve food security in Asia and the Pacific?

II. The Rising and Changing Global Demand for Food

Strong income growth and rising populations in developing countries have been key drivers behind the rapidly growing global demand for food. Asia, the world's most populous region, is home to over 4.1 billion of the world's 7.0 billion people. The United Nations (UN 2010) projects that the world population will reach 9.3 billion by 2050—2 billion more than in 2012. Asia will account for more than half of that increase. Clearly, the issue of global food security is highly important to evolving socioeconomic conditions in the region.

Rapid income growth and an expanding middle class, particularly in populous Asian economies, are powerful drivers of increased demand for food. During 1980–2010, developing Asia's real gross domestic product (GDP) grew 7.3% annually on average, more than double the world average of 2.9%. If this growth trajectory continues, by 2050 developing Asia will provide just over half of global GDP (ADB 2011a). With Asia's per capita income projected at over \$40,000 (at purchasing power parity [PPP] dollars) by 2050, an additional 3 billion people in the region will be affluent by current standards.

The combined effects of growing population and income will surely have an impact on

aggregate food consumption. The Food and Agriculture Organization (FAO) projects global food consumption per person (expressed as kilocalories/person/day) to rise by an average of 0.29% yearly through 2030 (FAO 2006). As average income levels rise and more people gain access to adequate diets, the growth of food consumption will moderate to 0.15% a year during 2030–2050. However, in food deficient regions such as Sub-Saharan Africa and South Asia, where base levels of food consumption are low, the growth rates will be as high as 0.42% per year (Table 1).

Along with income growth, economic development brings about visible structural transformation, which has implications for the pattern of food consumption. As incomes increase, growth in the world's per capita grain consumption is expected to slow due to the low income elasticity of food, particularly for grains. With rising affluence, people usually shift their diets to a lower share of coarse grains and more meat, fruit, vegetables, and vegetable oils. Rapid urbanization also contributes to the changing diets, as higher value processed food, dairy products, and tropical beverages such as coffee become more readily available.

Table 1: Projected growth in population and food consumption

	Average annual growth rates (%) 1970–2000			Average annual growth rates (%) 2000–2030			Average annual growth rates (%) 2030–2050		
	kcal/person	Popula- tion	Food consump- tion	kcal/ person	Popula- tion	Food consump- tion	kcal/ person	Popula- tion	Food consump- tion
World	0.49	1.70	2.20	0.29	1.03	1.32	0.15	0.48	0.63
Developing countries	0.77	2.05	2.83	0.36	1.20	1.56	0.18	0.57	0.75
Sub-Saharan Africa	0.15	2.80	2.95	0.57	2.23	2.81	0.42	1.48	1.91
North Africa	0.00	2.57	2.57	0.17	1.56	1.74	0.09	0.82	0.92
Latin America and Caribbean	0.74	2.02	2.77	0.32	0.94	1.26	0.13	0.28	0.40
South Asia	0.47	2.23	2.71	0.51	1.29	1.81	0.33	0.53	0.86
East Asia	0.49	1.48	1.97	0.35	0.47	0.82	0.06	-0.17	-0.10
Industrial countries	1.19	0.74	1.94	0.07	0.47	0.54	0.03	0.13	0.16
Transition countries	0.41	0.80	0.49	0.28	-0.64	-0.37	0.19	-0.78	-0.59

kcal = kilocalorie.

Source: Moir and Morris (2011).

Already, in relatively advanced Asian economies (such as Japan; the Republic of Korea; Singapore; and Taipei, China), direct per capita consumption of cereals has declined drastically over the past few decades, while indirect per capita consumption of grains has increased as demand for meat grew. A similar pattern has emerged in Asia's fast growing economies. If strong growth is sustained for the next 2 decades, the changes in dietary patterns in Asia's highly populous economies, such as the People's Republic of China (PRC), India, Indonesia, and

the Philippines, will have a profound impact on global food consumption.

Table 2 illustrates the considerable changes in developing Asia's dietary composition over the last decade. Reflecting its economic prowess, East Asia leads the changes among the subregions with a noticeable drop in the share of cereals while shares of other food products have increased and diets have become more diverse with more protein and fat consumption.

Table 2: Dietary composition (% of total energy consumption)

	Cereals	Starchy roots	Pulses	Meat and fish	Dairy and eggs	Fruits and vegetables	Sugar	Vegetable oils	Others
1990–1992									
Developing Asia	63.52	2.52	0.64	6.76	4.24	2.80	7.08	6.12	10.32
East Asia	53.00	3.00	–	15.33	3.00	3.33	7.00	5.00	10.33
South Asia	64.80	1.60	2.20	2.00	2.60	2.00	8.00	5.40	11.40
Southeast Asia	63.89	2.44	0.22	6.22	1.22	3.22	6.56	5.89	10.33
Central & West Asia	58.89	2.67	0.33	6.33	8.11	2.33	6.33	6.44	8.56
2005–2007									
Developing Asia	57.56	2.64	0.80	7.24	4.80	3.68	7.40	6.72	11.24
East Asia	46.67	3.00	–	14.33	4.33	4.67	6.33	8.33	12.33
South Asia	59.60	2.00	2.20	3.40	4.20	3.00	7.20	6.60	12.20
Southeast Asia	58.67	2.11	0.67	7.56	1.33	3.67	7.78	5.89	12.33
Central & West Asia	52.56	3.11	0.33	5.89	8.22	3.33	6.67	6.33	8.00

– = not available.

Source: FAO (2012).

Changing dietary patterns are an important factor for determining the level and variety of imports of food products including meat, vegetables, edible oil, and oil seeds. Asia's (particularly the PRC's) demand for some food commodities—such as rice, soybeans, meat, fruits, and vegetables—has been very strong in the last decade, reflecting its rapidly changing dietary patterns and rising income levels. Indeed, the surge in global soybean prices is evidence of the PRC's growing indirect consumption of feedstock for livestock, as well as of direct consumption of soybean products and vegetable oil. Sustained high crude oil prices have also increased demand for soybeans and sugar for producing ethanol as a partial substitute for petroleum.

Imports of meat, fish, edible oils, and oil seeds rose sharply in Japan and the Republic of Korea over the last four decades, while the share of cereals and cereal preparations in their total food imports declined steadily. The PRC's imports of meat, fish, vegetable oil, and oil seeds

have also started to take off since the mid-1990s. More recently, India's imports of vegetable oil and oil seeds have also grown rapidly. Given the large populations, growing income levels, and rapid urbanization in the PRC and India, their trends in dietary patterns will clearly have a major impact on global food trade.

A key challenge facing Asian economies is how to meet the evolving demand for non-staple food as their populations are becoming richer and more nutrition-conscious. This evolving demand is likely to have implications for global food trade as the increase in indirect per capita consumption of grains adds pressure on global grain prices. Food imports are crucial for food security in many countries, especially the low-income food-deficit ones. Despite increasing affluence in Asia, large segments of the population remain hungry, and the focus of attention for food security in the region should be on providing these segments with adequate access to food.

III. Poverty and Hunger amid Economic Growth

Food security is indispensable to long-term sustainable growth and development. Well-nourished individuals are likely to have higher productivity and contribute more to economic growth. Food insecurity is often a source of instability in households, communities, and nations, impeding their growth and development. As such, food security has been high on the development agenda of all countries, and poor countries that have many food-insecure people often call urgently for action on the issue. Reducing the number of underweight children and ensuring appropriate levels of dietary energy consumption are integral to achieving the Millennium Development Goals.

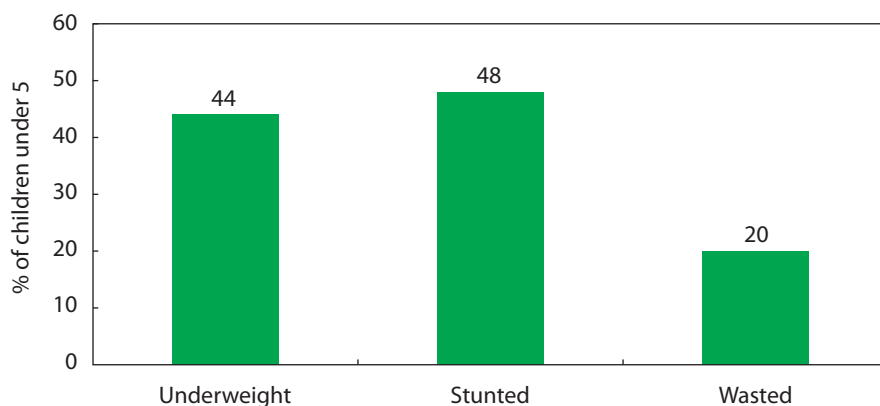
Many developing countries in Asia and the Pacific face food security challenges in both access and utilization. On the issue of access, economic barriers to food are a major concern among poor households. Although most countries uphold the right to adequate food as a basic human right, many poor households are unable to afford their minimum daily food requirements.

Hunger and Nutrition

Pervasive hunger remains a problem in Asia despite the recent declines in the region's poverty incidence. While food insecurity and poverty are closely interrelated, growth alone may not suffice to ensure food security. Between 1990

and 2009, the proportion of people in Asia living on less than \$1.25 a day dropped from 50% to 22%. However, the proportion of undernourished children in Asia only declined from 26% in 1990 to 18% in 2009. And undernourishment in the general population persists in Armenia, Mongolia, Tajikistan, Cambodia, Indonesia, the Lao People's Democratic Republic, the Philippines, Thailand, and Timor-Leste (UN 2011). These findings imply that hunger eradication does not necessarily follow from poverty reduction, suggesting that policies that drive down income poverty alone may not be enough to reduce hunger.

Despite its rapid economic growth in recent years, South Asia continues to be a hotspot for food insecurity and inequity, with the prevalence of child undernutrition decreasing only slightly, from 64% in 1995 to 60% in 2009, for the poorest 20% of the population; this is in contrast to the large decrease, from 37% in 1995 to 26% in 2009, among the richest 20%. Hunger is also most dire in South Asia, where nearly 60% of Asia's hungry, 65% of the extreme poor, and 81% of underweight children are located (World Bank 2009). India, in particular, remains one of the most undernourished countries in the world despite its economic gains. Because of poor nutrition, about 44% of Indian children below the age of 5 years were underweight in 2009, while 48% were stunted and 20% were wasted (Figure 1).

Figure 1: Malnutrition among children under 5 years in India, 2009

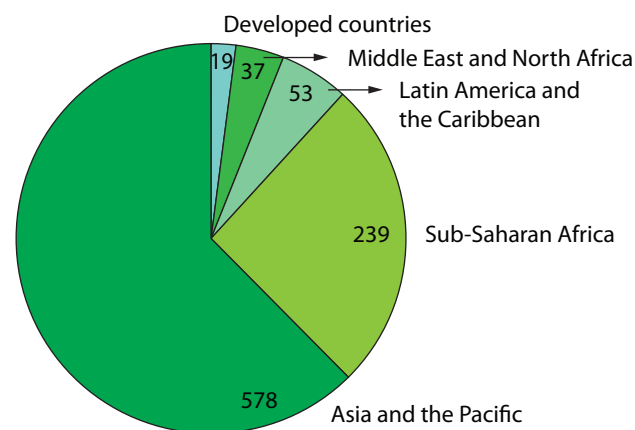
Note: Underweight = below -2 standard deviations from the median weight-for-age of the reference population, stunted = below -2 standard deviations from the median height-for-age of the reference population, and wasted = below -2 standard deviations from the median weight-for-height of the reference population.

Source: FAO (2012).

Simply accessing food does not guarantee attaining food security. To be food secure, people's bodies should be able to use the food effectively so that it contributes to their health and nutrition. This means that food storage and preparation needs to be of sufficient quality to ensure that the food provides good nutritional value.

Nutrition is crucial to improving productivity and economic growth and for combating poverty. Children undernourished during the first 2 years of their lives are expected to have 10%–17% lower income than well-nourished children (World Bank 2009). According to the FAO (2010), the number of undernourished people in Asia reached 578 million in 2010, making the region home to a large majority of the world's undernourished people (Figure 2).

Asia continues to face food security challenges that have not been adequately addressed despite the region's robust economic growth. Policies and programs that directly deal with food security challenges may be needed to help ensure that the region's population, particularly the poor, has access to and utilize adequate quantities of good quality food.

Figure 2: Undernourishment in 2010 by region (million)

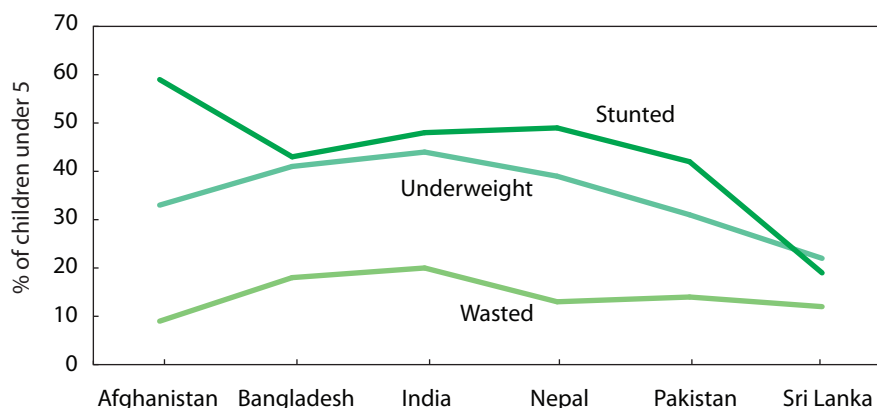
Source: FAO (2010).

Indicators such as child and maternal undernutrition show that Asia is lagging in terms of achieving nutritional security. The region's significant decline in poverty has been matched by only marginal decreases in the number of undernourished people. The poverty headcount decreased from about 1.9 billion in 1990 to about 1.3 billion in 2008, but the number of undernourished people in Asia actually increased by 42 million—from 526 million in 1995–1997 to 568 million in 2006–2008 (FAO 2011).

Of particular concern is South Asia, which has the highest rate, and by far the largest number, of undernourished children in the world. About 40% of the children in South Asia are underweight, and 46% of them are stunted (Figure 3). Children in South Asia also have high levels of micronutrient deficiencies, including

iron, vitamin A, and iodine. Among children under 5 across Bangladesh, Bhutan, India, and Nepal, 55%–81% are iron-deficient, and from 28% to 57% of children under 5 across South Asia suffer from vitamin A deficiency (World Bank 2009).

Figure 3: Malnutrition in children under 5 in South Asia, 2009



Note: Underweight = below -2 standard deviations from the median weight-for-age of the reference population, stunted = below -2 standard deviations from the median height-for-age of the reference population, and wasted = below -2 standard deviations from the median weight-for-height of the reference population.

Source: FAO (2012).

Food Prices and Poverty

Food price inflation is an important barrier to economic access to food. Based on the FAO's index for food prices, real global food prices increased by 14% in just 6 months, from 151 points in June 2009 to 172 points in January 2010 (World Bank 2010). The World Bank attributed the food price spikes to increases in demand due to the use of food crops for biofuels, speculation in agricultural commodity futures markets, and policies such as export restrictions. The Asian Development Bank estimated that in Asia, a 10% increase in domestic food prices could push 64 million more people into poverty (based on the \$1.25 per person per day poverty line at 2005 PPP). Rising food prices in the region since mid-2010 have affected urban consumers as well as rural workers and farmers (ADB 2011b).

Concerns over food prices are mounting because inflation erodes the purchasing power of households, especially those with low incomes, and could undermine the gains in poverty reduction and human development achieved during the last few decades. Many people who were poor before the price increases may now be on the verge of hunger and malnutrition, and those who were barely above the poverty line may slip back below it. In this context, it is important to examine the impact of food prices on poverty.

At the macroeconomic level, higher food prices hurt countries that provide substantial food subsidies. High levels of food subsidies may crowd out public investment in other areas, such as health, education, and infrastructure. At the household level, small-scale farmers and poor consumers are hit hardest by food price hikes.

Many small-scale farmers and poor households produce less food than they consume, and are often net food buyers; thus, they are very vulnerable when food prices increase (FAO 2010). Moreover, volatile food prices often push small-scale farmers and poor consumers into long-term poverty traps. High food prices, by temporarily reducing disposable income, may force households to sell assets, reduce spending on health, or remove children from school in order to maintain food intake. These temporary shocks could have permanent effects on the family's ability to escape from poverty. Volatile food prices also exacerbate the effects of malfunctioning markets, which deter farmers from making productive agricultural investments. Thus, risk-averse farmers may opt for inefficient technologies with low returns rather than risk investing scarce resources in better technology.

The average household in the developing world spends roughly half of its total budget on food. And for households living below the poverty line, food will likely constitute an

even greater portion of expenditures. Indeed, globally, poor households allocate more than 60% of total household consumption to food. Developing countries in Asia and the Pacific are no exception: households with daily per capita consumption of less than \$1.25 at 2005 PPP dollars spend 60%–70% of their total budget on food. Therefore, the poor suffer a disproportionately high adverse effect from food price inflation.

Table 3 presents the percentage of people living below the \$1.25-a-day poverty line for a group of 17 developing economies, accounting for more than 3 billion people in the region. The results show that the poverty rates declined in all the economies considered (except for the Kyrgyz Republic), although the performance of poverty reduction varies across them. The annual reductions in the poverty headcount ratio have been impressive in Armenia (22.61%), Azerbaijan (13.31%), Bhutan (15.26%), urban areas of the PRC (15.98%), Fiji (13.31%), Kazakhstan (24.81%), Sri Lanka (11.01%), and Thailand (21.12%).

Table 3: Change in the percentage of poor based on the \$1.25-a-day poverty line

Country	Survey period		Percentage of poor		Annual growth (%)
	Base	Terminal	Base	Terminal	
Armenia	2005	2008	3.98	1.28	-22.61
Azerbaijan	2001	2008	6.32	0.43	-13.31
Bangladesh	2005	2010	50.47	43.25	-2.86
Bhutan	2003	2007	26.23	10.22	-15.26
China, People's Rep. of-Rural	2005	2008	26.11	22.27	-4.90
China, People's Rep. of-Urban	2005	2008	1.71	0.89	-15.98
Fiji	2002-03	2008-09	29.16	5.88	-13.31
Georgia	2005	2008	15.98	15.27	-1.48
India-Rural	2004-05	2010	43.83	34.28	-3.96
India-Urban	2004-05	2010	36.16	28.93	-3.64
Indonesia-Rural	2005	2010	24.01	17.75	-5.21
Indonesia-Urban	2005	2010	18.67	18.33	-0.36
Kazakhstan	2006	2009	0.43	0.11	-24.81
Kyrgyz Republic	2006	2009	5.94	6.23	1.63
Lao PDR	2002	2008	43.96	33.88	-3.82
Nepal	2003	2010	53.13	24.82	-7.61
Pakistan	2004-05	2007-08	22.59	21.04	-2.29
Philippines	2006	2009	22.62	18.42	-6.19
Sri Lanka	2002	2006-07	13.95	7.04	-11.01
Thailand	2006	2009	1.01	0.37	-21.12

Lao PDR = Lao People's Democratic Republic.

Source: ADB staff calculations based on the latest PovCal database (accessed 3 April 2012).

Without a change in prices, poverty reduction will depend on two factors: average income (or expenditure) and its distribution. An increase in average income without a change in distribution reduces poverty, while an increase in income inequality without a change in average income increases poverty. However, any change in food and non-food prices also alters purchasing power, influencing the percentage of people living below the poverty threshold. Increases in food and non-food prices will reduce people's real income, which in turn increases poverty. Shares of food and non-food consumption vary across income groups—the poor spend a relatively large share of their income on food consumption—thus, a change in food versus non-food prices will also have implications for the distribution of real income. In this context, a change in poverty can be decomposed into three factors: (i) an income effect encompassing changes in average income or expenditure and its distribution, (ii) a food price effect, and (iii) a non-food price effect (see Appendix 1 for a detailed description of the methodology). The pure income effect measures the impact of changes in people's nominal income on poverty, assuming food and non-food prices remain the same. The food and non-food price effects measure the impact of changes in these prices on poverty, assuming nominal incomes do not change. Given this decomposition method, the combined effect of the three components will result in the net impact on poverty reduction.¹

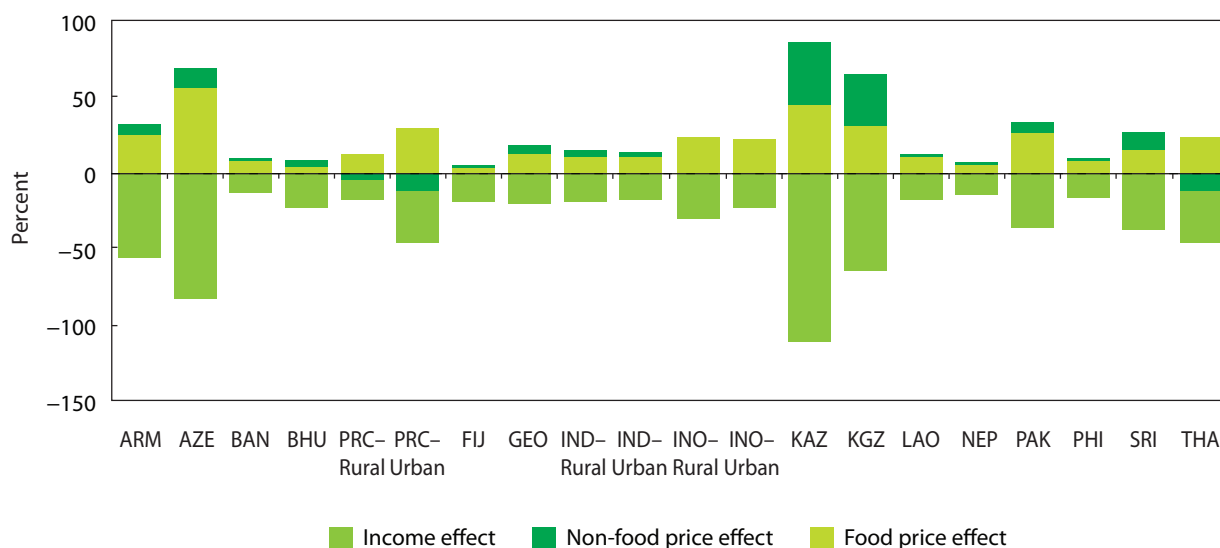
Figure 4 illustrates the change in the proportion of people living below the \$1.25-a-day

poverty line decomposed into the food price, non-food price, and income effects. In all 17 economies considered, mean expenditure increased during the survey periods—mostly during the second half of the 2000s—which resulted in lower poverty rates. However, an increase in food and non-food prices had an offsetting effect on poverty reduction. As observed earlier, food prices increased in all these economies during the period, and most of them also experienced increases in non-food prices, except for the PRC and Thailand where non-food prices decreased.

The income effect seems to dominate the other two price effects, leading to a net reduction in poverty in almost all of the 17 economies (except the Kyrgyz Republic). For example, based on the \$1.25-a-day poverty line, the poverty rate fell by 6.19% per annum during 2006–2009 in the Philippines. The reduction is due to three factors: an increase in mean household expenditure contributed to a 16.08% reduction in poverty rates, but an increase in food prices increased poverty rates by 8.71% and an increase in non-food prices increased it by 1.18%. The net effect of these three factors led to an annual reduction in the poverty rate by 6.19% between 2006 and 2009, with the income effect being the main driver behind poverty reduction. (Appendix 2 presents the detailed results of changes in poverty in the 17 economies due to the three factors.)

A similar decomposition methodology was applied to examine the change in the number of people living below the poverty threshold. For this, the effect of population growth on the change in poverty headcount has been added to the three factors already considered. That is, a change in the number of poor based on the \$1.25-a-day poverty line will now be explained by four factors: (i) the income effect, (ii) the food price effect, (iii) the non-food price effect, and (iv) the population effect. Table 4 presents the results.

¹ This decomposition provides three counterfactuals: (i) the food price component measures the impact of food price increases on poverty when non-food prices and people's incomes had not changed, (ii) the non-food price component measures the impact of non-food price increases when food prices and people's income had not changed, and (iii) the income component measures the impact of an increase in people's incomes on poverty when food and non-food prices had not changed. Therefore, the sum of the three components provides their net impact on poverty.

Figure 4: Change in poverty rates due to food price, non-food price, and income effects

ARM = Armenia, AZE = Azerbaijan, BAN = Bangladesh, BHU = Bhutan, PRC = People's Republic of China, FIJ = Fiji, GEO = Georgia, IND = India, INO = Indonesia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, Lao PDR = Lao People's Democratic Republic, NEP = Nepal, PAK = Pakistan, PHI = Philippines, SRI = Sri Lanka, THA = Thailand.

Note: The estimates of poverty impact have been derived from the price elasticity of poverty, which indicates the percentage increase in poverty when food prices increase by 1%. This elasticity is estimated for the headcount ratio for each of the 17 economies and is presented in Appendix 2 Figure A2.1.

Source: ADB staff calculations.

The estimates show that 30.40 million poor people escaped poverty in developing Asia every year during the survey periods considered in this study. Again, the income effect has been the most significant. Indeed, if prices and populations had stayed the same, the increase in mean household income during the period would have helped 244.10 million poor to escape poverty every year. However, higher food prices in the second half of the 2000s would have pushed 111.74 million into poverty per annum had there been no income, non-food price, or population effects. Likewise, the rise in non-food prices would have amplified the adverse impact on the number of poor by adding 95.46 million poor every year during the same period. Population growth during the second half of the 2000s also added 6.50 million people to the ranks of the poor annually. However, the strength of the income effect ultimately led to a net decrease in the number of people below the \$1.25-a-day poverty line by 30.40 million annually in developing

Asia, offsetting the negative impacts on poverty of price and population effects.

Clearly, the recent food price increases have slowed poverty reduction in the region. While developing Asia still managed to reduce the overall poverty rates in the late 2000s, largely thanks to increases in mean incomes across the region, the food and non-food price inflation effectively hampered the reduction in poverty rates. In the Kyrgyz Republic, where the increase in mean income was modest during the period, losses in purchasing power due to the increase in food and non-food prices were large enough to fully offset the positive income effect, resulting in a net increase in the poverty rate during the same period. All the other economies fared better by reducing their poverty rates following larger increases in mean incomes, although their poverty reduction efforts were also stymied by the increases in domestic food and non-food prices.

Table 4: Explaining the change in the number of poor people (million)

Country	Change in the number of poor people due to				Net effect on poverty
	Population	Food price	Non-food price	Income	
Armenia	0.0000	0.0303	0.0301	-0.09	-0.03
Azerbaijan	0.0004	0.2876	0.3136	-0.67	-0.07
Bangladesh	0.7006	5.5139	5.8902	-13.43	-1.33
Bhutan	0.0018	0.0075	0.0115	-0.04	-0.02
China, People's Rep. of-Rural	-1.7289	24.9164	8.0637	-42.93	-11.67
China, People's Rep. of-Urban	0.1312	2.7213	0.7608	-4.92	-1.31
Fiji	0.0002	0.0113	0.0107	-0.05	-0.03
Georgia	0.0010	0.0911	0.1007	-0.20	-0.01
India-Rural	3.3077	40.3660	45.3774	-99.69	-10.63
India-Urban	2.5543	13.2210	13.4241	-30.85	-1.65
Indonesia-Rural	-0.2453	6.9791	5.5786	-14.03	-1.72
Indonesia-Urban	0.7141	4.6487	3.7168	-8.44	0.64
Kazakhstan	0.0002	0.0296	0.0473	-0.09	-0.02
Kyrgyz Republic	0.0027	0.0979	0.1684	-0.26	0.01
Lao PDR	0.0294	0.2609	0.2702	-0.62	-0.06
Nepal	0.1354	0.8544	0.8843	-2.80	-0.92
Pakistan	0.6024	9.4036	8.7784	-18.99	-0.20
Philippines	0.2812	1.7163	1.3765	-4.31	-0.94
Sri Lanka	0.0145	0.4166	0.6191	-1.33	-0.28
Thailand	0.0018	0.1637	0.0351	-0.34	-0.14
Total	6.5049	111.7372	95.46	-244.10	-30.40

Lao PDR = Lao People's Democratic Republic.

Source: ADB staff calculations.

Overall, the ranks of the poor decreased annually by over 30 million in developing Asia in the late 2000s. If the population had stayed the same during the second half of 2000s, 6.5 million fewer people would have been poor each year in the region. If food prices had not increased during that period, an additional 112 million people would have escaped poverty annually. And if non-food prices had stayed unchanged,

an additional 95 million people per year would have escaped poverty. Although the increase in food prices in the later part of the 2000s did not result in a net increase in poverty rates in Asia, it did slow the region's poverty reduction efforts. In other words, many more people—over 110 million more people—could have been saved from poverty in Asia had food prices not increased during the late 2000s.

IV. Food Price Volatility and Market Instability

Volatility in Recent Food Prices

In recent years, the world has witnessed staggering volatility in food prices. Prior to the global financial crisis, international prices of wheat, rice, and maize reached record highs in 2007–2008. There were many causes for this increase, such as increased demand from emerging economies, competition for resources from biofuel production, and supply disruptions due to droughts and wildfires. Although the global financial crisis and a related fall in demand temporarily dampened the rise in food prices, the eventual recovery and the inflationary effects of financial bail-outs and low interest rates may again put upward pressure on food prices, while ongoing structural transformation associated with the strong economic rise of

large developing countries and climate change suggest a grim outlook for sustaining the food supply in the long run.

The rise in food prices varied significantly among countries in Asia in 2000–2010 (Figure 5). Pakistan experienced the most rapid increase in the inflation rate, from 8.5% in 2005–2006 to 27.5% in 2007–2008. Sri Lanka, which had already faced inflationary pressure from expansionary fiscal and monetary policies before the food price crisis in 2007–2008, experienced a surge in food and fuel prices, which accelerated the pace of inflation. Corresponding figures for the other economies were moderately high, ranging from 10% in India to about 17% in Indonesia.

Figure 5: Inflation trends in selected Asian economies

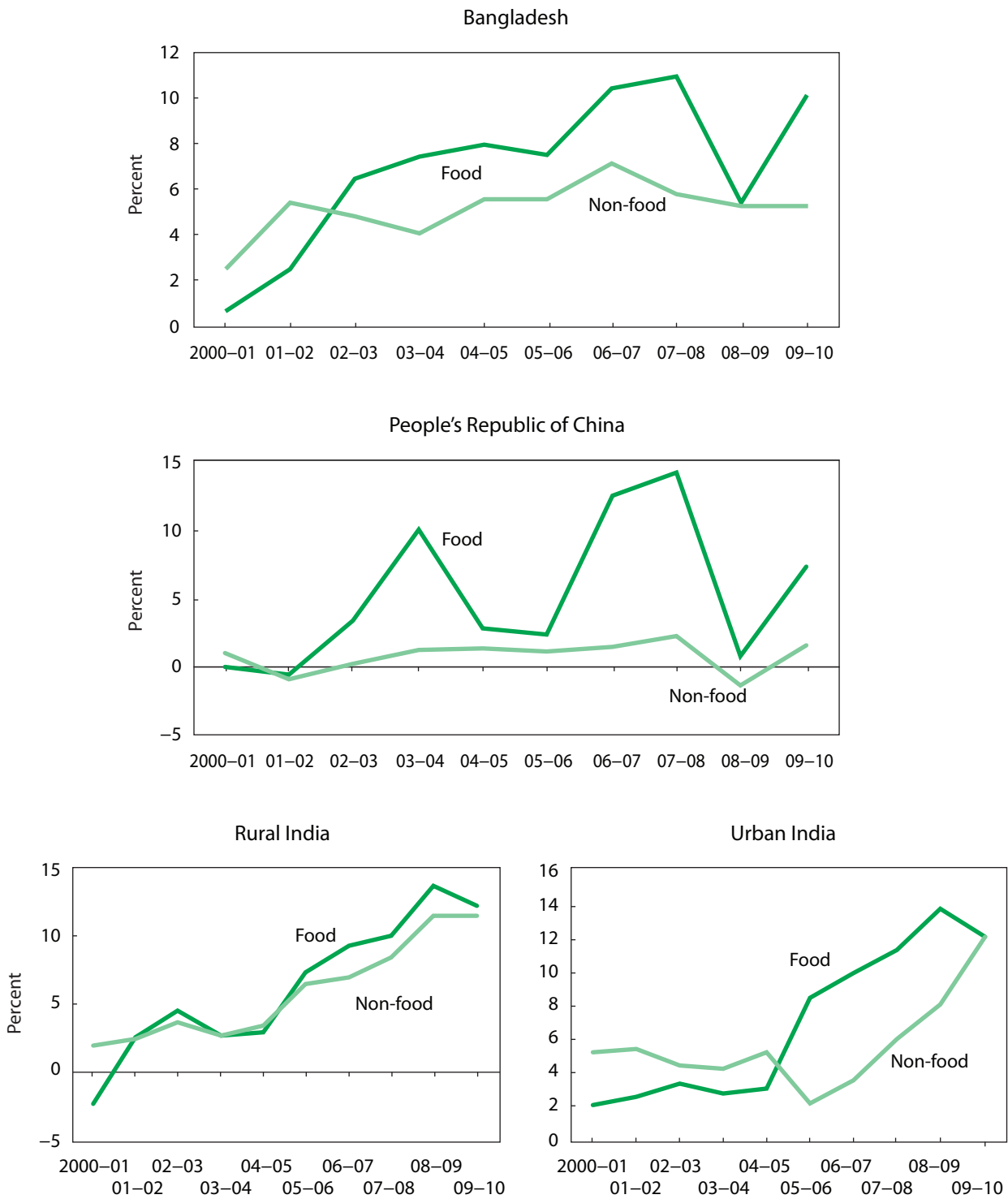


Figure 5: continued.

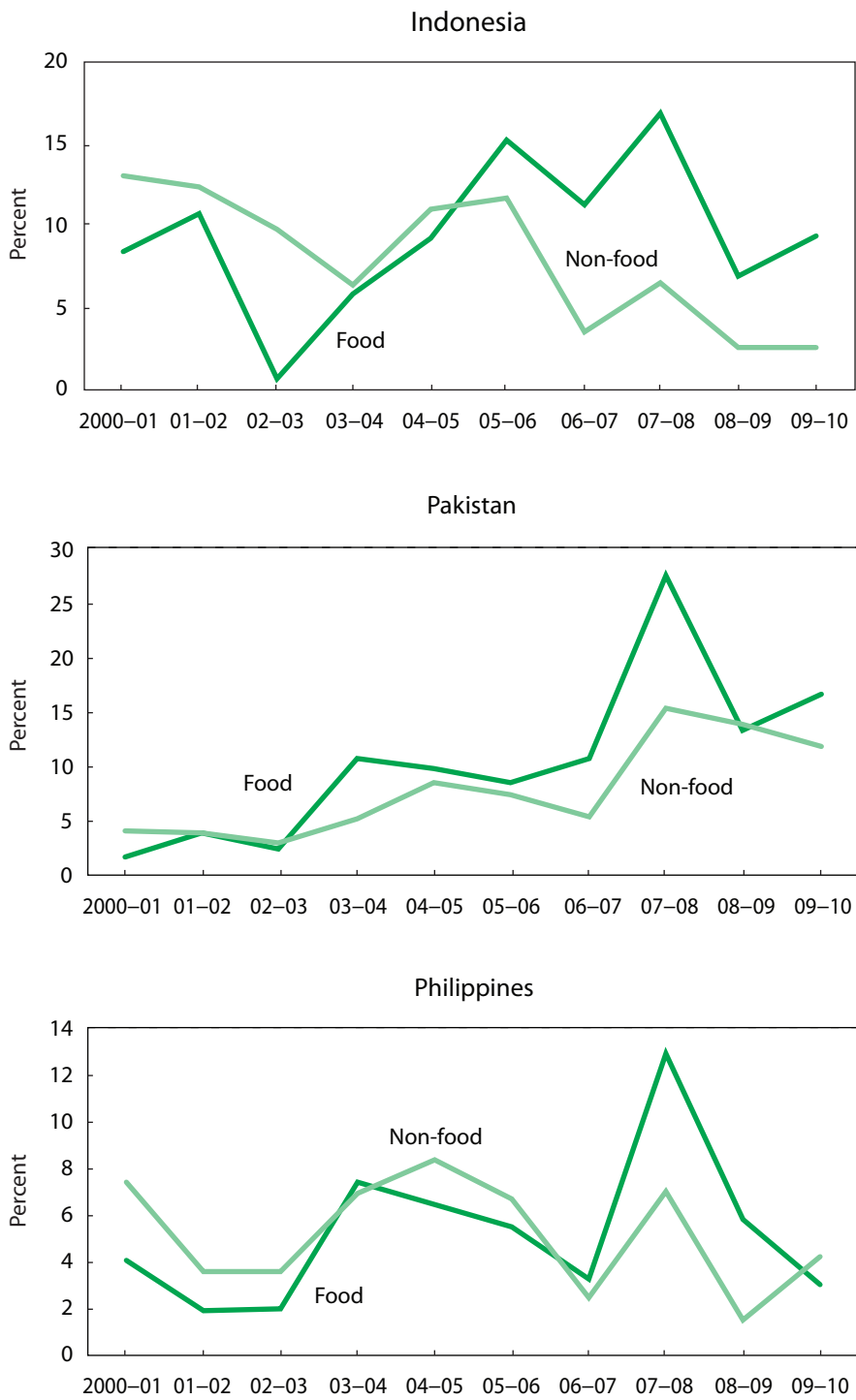
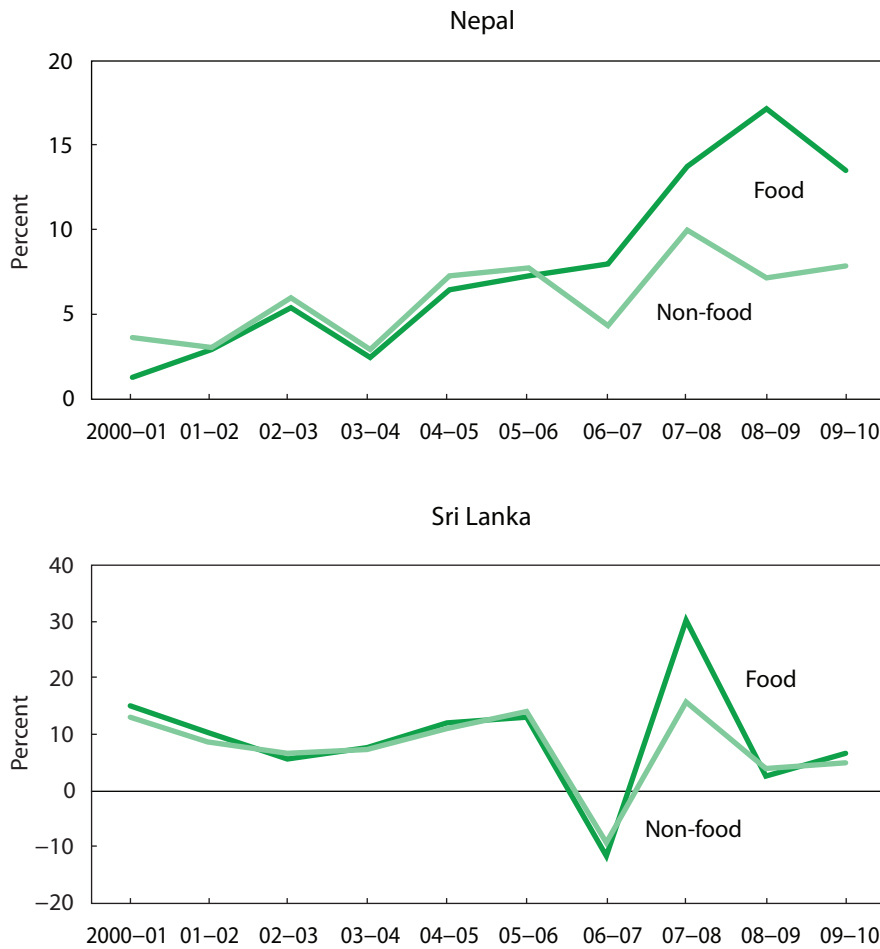


Figure 5: *continued.*



Source: ADB staff calculations.

Inflation of food prices exceeded that of non-food prices in all Asian economies considered in this study. Table 5 and Figure 6 show that food price inflation was the main driver of general inflation in all 17 economies during the sample periods. While the role of food price increases

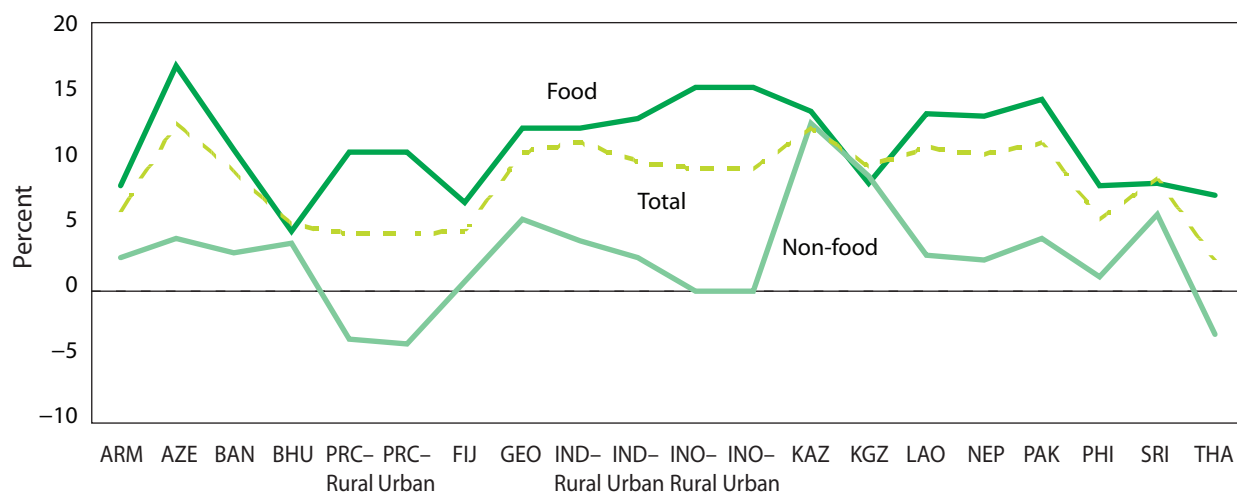
diminished after prices came down in the second half of 2008, in 2010 food prices again became the main factor pushing up general inflation in a number of economies including Bangladesh, India, Nepal, and Pakistan.

Table 5: Food price, non-food price, and general inflation rates in Asia (year-on-year, %)

Economy	Period	Annual inflation rate (%)		
		Food	Non-food	Total
Armenia	2005–2008	7.80	2.56	5.92
Azerbaijan	2001–2008	16.94	3.95	12.52
Bangladesh	2005–2010	10.65	2.86	8.92
Bhutan	2003–2007	4.54	3.52	4.95
China, People's Rep. of–Rural	2005–2008	10.46	–3.59	4.21
China, People's Rep. of–Urban	2005–2008	10.46	–4.05	4.21
Fiji	2002/03–2008/09	6.62	0.73	4.43
Georgia	2005–2008	12.13	5.32	10.40
India–Rural	2004/05–2010	12.21	3.73	11.15
India–Urban	2004/05–2010	12.92	2.55	9.72
Indonesia–Rural	2005–2010	15.20	–0.01	9.12
Indonesia–Urban	2005–2010	15.20	–0.01	9.12
Kazakhstan	2006–2009	13.45	12.52	12.17
Kyrgyz Republic	2006–2009	8.10	8.53	9.31
Lao PDR	2002–2008	13.35	2.70	10.70
Nepal	2003–2010	13.13	2.34	10.30
Pakistan	2004/05–2007/08	14.41	3.85	11.15
Philippines	2006–2009	7.81	1.06	5.34
Sri Lanka	2002–2006/07	8.11	5.74	8.40
Thailand	2006–2009	7.07	–3.20	2.29

Lao PDR = Lao People's Democratic Republic.

Source: ADB staff calculations.

Figure 6: Annual food, non-food, and general inflation rates in Asia

ARM = Armenia, AZE = Azerbaijan, BAN = Bangladesh, BHU = Bhutan, PRC = People's Republic of China, FIJ = Fiji, GEO = Georgia, IND = India, INO = Indonesia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, Lao PDR = Lao People's Democratic Republic, NEP = Nepal, PAK = Pakistan, PHI = Philippines, SRI = Sri Lanka, THA = Thailand.

Source: ADB staff calculations.

Price volatility also has a strong impact on food security because it affects household incomes and purchasing power, increasing the number of people who are poor and hungry.

Price volatility interacts with the level of prices to affect welfare and food security: the higher the price, the stronger the welfare consequences of volatility on consumers. Price volatility can

also generate significant uncertainty along the entire food chain, causing consumers and producers to hold savings in more liquid forms, discouraging longer term investments that can increase productivity and promote human development. Thus, even if food prices are not constantly moving higher, instability in food prices can have long-term impacts on food security (Timmer 1997).

Table 6 presents the volatility in food and non-food prices in selected Asian markets from 2000 to 2010, using standard deviation as a measure of volatility. For all economies shown, volatility of food prices is far higher than that of non-food prices. In particular, the prices of food in Sri Lanka and Pakistan are highly unstable compared to neighboring countries in Asia, while countries such as Bangladesh and the Philippines appear to have less volatile food prices.

Table 6: Price volatility in selected Asian economies, 2000–2010

Economy	Food	Non-food	Total
Bangladesh	3.17	1.13	2.21
China, People's Rep. of	5.08	1.08	2.14
India–Rural	4.76	3.45	4.01
India–Urban	4.28	2.55	2.90
Indonesia	4.36	3.93	3.02
Nepal	5.06	2.27	3.25
Pakistan	7.23	4.16	5.23
Philippines	3.11	2.24	2.23
Sri Lanka	10.03	6.74	8.09

Source: ADB staff calculations.

Given the uncertain environment of the higher level and volatility of food prices witnessed particularly in the second half of 2000s in Asia, comprehensive national food security strategies are called for. Each strategy should take into account its economy's specific circumstances and special characteristics. The strategies should include policies to reduce, manage, and cope with price volatility as well as efforts to increase the incomes of the poor in general. Moreover, the policies need reviewing regularly given the rapidly changing environment.

The recent increase in food prices caused concern in developing countries of Asia and the Pacific. A spike in food prices could tip the poor into even greater hardships and set off social instability. The increase in food prices combined with the uncertainties caused by volatility tends to crowd out spending on other important items such as health care and education. Furthermore, the volatility in food prices increases uncertainty about the future. This can in turn force households and firms to mitigate risks by keeping savings liquid, reducing their propensity to invest in human capital or production.

The Causes of Food Price Instability

Food prices fluctuate due to a combination of short-term shocks and long-term trends. Population growth, economic growth (particularly in economic powerhouses such as the PRC and India), and changing consumption patterns are among the major factors influencing long-term trends on the demand side. However, these demand-side trends are not new. Most recently, these trends were apparent in the 1960s and 1970s, when it seemed that food production may not be able to cope with global population growth and the increasing post-war affluence of Europe, Japan, and the United States. However, in the 1970s, the impending food crisis was averted by the Green Revolution that significantly improved food production around the globe, particularly of staple grains. This eventually led to a decades-long decline in food prices. Indeed, increasing and changing demand may not be an issue if supply can catch up.

The recent food crisis, however, has been characterized by supply-side as well as demand-side constraints. In the last several decades, the rise of large emerging market economies including the PRC and India has been spectacular, and has

brought about rapid structural transformation with significant impacts on agriculture, the environment, and food production. Along with the rush to integrate into the global economy, many countries in Asia have been competing for markets and investments by offering investors favorable wages and building the most attractive and efficient infrastructure. Accompanying this has been a massive structural transformation away from agriculture, with land once used to grow basic food crops being reallocated to expanding cities and factories producing higher value export products. While land available for food production has been threatened by competing needs from population growth and urban expansion, the quality of land already used for production has been deteriorating due to poor management, pollution, and degradation (e.g., erosion and desertification). Reduced attention to agriculture is having serious consequences: it has resulted in endangering food security, degrading the environment, uprooting rural communities, and increasing vulnerability among the poor.

Short-term shocks have also contributed significantly to food price volatility. The 2007–2008 food price crisis was caused by a combination of reduced production due to extreme weather events such as drought in Australia, cyclones in Myanmar, and flooding in India. This was exacerbated by unprecedented increases in petroleum prices, which not only made food production and delivery more expensive but also increased demand for relatively cheaper biofuels, mainly in the form of ethanol sourced from maize (Box).

Trade disruptions also played a key role in increasing the volatility of food prices. In a regime of food production surpluses, trade openness had a positive impact on the global economy, allowing efficient food-producing countries to specialize and increase output while at the same

time encouraging inefficient food producers to diversify into non-food production. Myanmar and Thailand became leading global producers of rice, while the Philippines, which didn't have a comparative advantage in rice production (Dawe, Moya, and Casiwan 2006), went from being a net rice exporter in the 1960s to being among the largest rice importers in the world, instead focusing its energies on electronics and services exports.

However, relying on trade for food can be highly destabilizing in times of supply-side shocks in food exporting countries: it is easy to see how cyclones, floods, and droughts that ruin crops in exporting countries can disrupt food security in importing countries. In addition, food is a unique tradable commodity—food is a highly socially and politically sensitive commodity because it directly affects citizens' well-being. Thus, disruptions in the global food supply chain can lead to policy overreaction: food exporters can impose export bans to secure local food stocks, increasing the sense of insecurity in importing countries, raising their willingness to pay for remaining food sold in the international market, and therefore making food prices even more volatile globally. This is exactly what happened in 2007–2008 when several rice exporters such as India, the PRC, and Viet Nam (ADB 2011b) introduced export bans. This induced the Philippines—already the world's largest rice importer—to increase its imports to ensure local stocks. The debate continues about the role of globalization in ensuring food security. On the one hand, liberalizing international trade would allow inefficient food producers access to more food than they would have under autarky. On the other hand, if global competition reduces domestic food production, importing countries may become even more vulnerable to international supply shocks and price volatilities.

The Food vs. Fuel Dilemma

Global biofuel production has been increasing rapidly in recent years, driven by factors such as oil price hikes, the need for increased energy security, and concern over greenhouse gas emissions from fossil fuels. Biofuels are in general classified as bioethanol, biodiesel, and biogas using conventional technologies. These “first-generation” biofuels are produced primarily from food crops such as grains, sugarcane, and vegetable oils. They include sugar- and starch-based ethanol, oil-crop-based biodiesel, and vegetable oil, as well as biogas derived through anaerobic digestion. Typical feedstocks used in these processes include sugarcane and sugar beet; starch-bearing grains such as corn and wheat; oil crops such as rape (canola), soybean, and oil palm; and (in some cases) animal fat and used cooking oil.

The “food vs. fuel” debate became an emerging issue after the 2007–2008 global food price crises, due to the serious consequences that increased petroleum prices posed for the price of food products at the same time as farmland and crops were diverted to biofuel production. In this regard, the sustainability of biofuel industries has been increasingly questioned due to concerns such as displacement of food crops and effects on the environment and climate change.

The increasing questioning of the sustainability of many first-generation biofuels has raised interest in the potential of “second-generation” biofuels. Depending on the feedstock choice and the cultivation technique, second-generation biofuel production could provide benefits such as consuming waste residues and using abandoned land. Thus, the new fuels could offer considerable potential to promote rural development and improve economic conditions in emerging and developing regions. For example, it is quite sensible to use waste oil and fat from restaurants and food-processing plants to produce biodiesel, to use extra stocks of oil not needed for other purposes, to engage in research on oilseed crops that can be grown on marginal land, and to use non-edible oils from plants already growing in many areas.

However, while second-generation biofuel crops and production technologies are more efficient than first-generation ones, their production could become unsustainable if they compete with food crops for arable land. For this reason research is ongoing into ways to produce biofuels using new feedstocks that are less limited by the availability of land. For example, some types of algae can produce oil and can be used to produce biomass. Algae can be produced without the extensive use of land by cultivating it in ponds. If the ponds are on land that is not suitable for crops, then algae production would not affect food prices.

Advanced biofuel technologies are conversion technologies that are still in the research and development, pilot, or demonstration phase and are commonly referred to as second- or third-generation biofuels. This category includes hydrotreated oil, which is based on animal fat and plant oil, as well as biofuels based on lignocellulosic biomass, such as cellulosic-ethanol, biomass-to-liquids diesel, and bio-synthetic gas. The category also includes novel technologies that are mainly in the research and development and pilot stages, such as algae-based biofuels and the conversion of sugar into diesel-type biofuels using biological or chemical catalysts.

In recent years, biofuel industries have expanded in some Asian economies, particularly in the People’s Republic of China, India, Indonesia, and Thailand. However, sound policy efforts and technology development are vital to ensure the sustainability of a biofuels supply that does not harm food security, biodiversity, or society.

Source: IEA (2011).

The greatest threat to food security, however, is climate change. While trade policies and resource management issues, in principle, can be solved quickly with the right mix of interventions, problems caused by climate change are much more difficult to resolve in the short term and will require long-term and internationally coordinated solutions. Sustainable food security is a key to long-term sustainable development; however, achieving sustainability in food availability, access, stability, and utilization is increasingly challenged by the changing climate and environment. The global climate change has already affected food security in a variety of ways. Rising temperatures tend to reduce crop productivity in the tropics. Climate change alters rainfall and its patterns, thus affecting water supply for farming and livestock. The warming ocean and its acidification, due to greater greenhouse gas concentrations, are reducing fish populations. A hotter climate has caused sea levels to rise. In turn, this is resulting in permanent land loss, coastal inundation, and saltwater intrusion, leading to deteriorating soil quality and suitability. In extreme conditions, which have been evident in recent years, global warming has led to severe droughts, floods, and storms, which destroy crops, pasture lands, livestock, transport and agricultural infrastructure, and household assets.

Without a shift from fossil-fuel-based economic growth, the global mean temperature

is projected to increase by nearly 5°C toward the end of the century relative to pre-industrial levels. Such a magnitude of global warming is expected to have sizeable impacts on agriculture, water resources, coastal zones, infrastructure, energy consumption and production, health and diseases, and ecosystems, with significant implications for long-term food security. Researchers estimate that yield potentials of major crops (rice, wheat, and maize) in the PRC could drop by 15%–25% by 2050 relative to the 2000 baseline (Piao et al. 2010). Yield losses are expected to be even larger in tropical regions such as South and Southeast Asia, and will continue to drop further toward 2100. In Southeast Asia, rice yield is projected to fall by about 50% in 2100 relative to 1990 yields (ADB 2009).

In the future, the climate, under a business-as-usual trajectory, is projected to be characterized by increasingly erratic and severe weather conditions. Looking forward, developing Asia will have to be prepared to cope with unprecedented climate risks. Under such conditions, food security cannot be achieved and sustained unless a concerted effort is made at the global level to mitigate climate change, and the Asian region builds its capacity to shift from the currently vulnerable to a climate-resilient development path.

V. Selected Policy Issues in Tackling Food Security and Reducing Poverty

Food security is an integral part of poverty reduction. Without it, poverty becomes a vicious cycle. Poverty deprives people of access to adequate, good quality food, denying them the nutrition they need to be healthy. Malnutrition undermines productivity, keeps incomes low, and traps people in poverty. The lack of food security is thus both a cause and an effect of poverty. In a region that is home to more than half the world population, building food security—and sustaining it—is imperative for people’s welfare and the economic growth that drives it. Although Asia is economically vibrant and is considered the engine of global economic growth, the number of undernourished people has been rising—from 526 million in 1995–1997 to 567 million in 2006–2008 (FAO 2011).

In developing countries, where many poor people already face difficulties securing their daily food supplies, a spike in prices could catalyze greater hardship and social instability. In developing Asia—home to about two-thirds of the world’s poor—food price inflation in the late 2000s was a significant blow to the region’s progress in poverty reduction. According to Asian Development Bank estimates, if food prices had stayed the same, about 112 million more people could have been saved from poverty every year (based on the \$1.25/day poverty line). Price volatility also helps to push people into the poverty trap. Food prices have been far more volatile than non-food prices in developing Asia during 2000–2010, particularly in Pakistan

and Sri Lanka. This is a major challenge to food security because it affects how poor households and farmers decide where to invest their limited resources. They may resist investing in education, training, health care, and future productivity to provide an immediate safety net—cash or assets—in case food prices rise rapidly.

Food security is a complex, multidimensional issue. The Asian experience clearly shows that economic growth alone does not promote food security. Although rapid growth has helped to reduce the region’s aggregate poverty, the number of undernourished and hungry people has increased. Achieving food security should, therefore, be an integral part of the drive toward poverty reduction.

A combination of short- and long-term; economic and social; macro and structural; and global, regional, and national policies is required to promote food security and reduce both poverty and hunger. While a comprehensive policy framework is needed to ensure food security, some policy measures can deal with food security and poverty simultaneously. There are five basic policy strategies that could be considered: providing food-based safety nets and related social protection programs, enhancing the productivity of agriculture, promoting rural development, supporting agricultural research, and investing in human capital and basic infrastructure.

Providing Food-Based Safety Nets and Related Social Protection Programs

- Safety nets and social protection programs can offer immediate relief to the poor during times of crisis. It is important to build such programs into the system as a part of automatic stabilizers. Food price inflation strongly impacts food security. Governments often provide subsidies to keep the food prices artificially low. However, blanket food subsidies drain budgets and cannot be a viable solution if food price increases are sustained and are caused by supply and demand market fundamentals—subsidies may in fact exacerbate existing problems. The better option when faced with rising food prices may be for the government to provide food-based safety nets and related social protection programs. For example, well-targeted cash transfers are more effective than subsidies because they create less market distortion and are more cost-effective. They allow poor households to increase their consumption and investment levels, which in turn helps bolster rural economies.
- Cash transfer programs should be targeted only to the poor so program costs are more sustainable—even given limited fiscal space. Because cash transfer programs require large amounts of resources, they need to be well targeted to yield maximum results. Transfers to beneficiary households should be based on the minimum cost of a food basket that provides the required calories and nutrition to household members. This will help ensure that available resources are well spent and that cash transfers offer the poor minimum dietary intakes. Such cash transfers could be indexed to increase with rising food prices to mitigate the adverse effects of food price inflation. This will help ensure transfers maintain their real value despite movements in food prices. Cash transfers can also be designed to encourage households to adopt better nutrition practices and invest in their human development—they may be made conditional on household participation in education, health, and nutrition services.
- Governments could consider establishing a “hunger alleviation fund,” in which they set aside a reasonable amount—say, 1% of GDP—as buffer in times of food crisis. Such a fund would provide a safety net for the poor and those most vulnerable to hunger, malnutrition, and starvation. Private corporations could also be offered incentives (such as tax deductions) to contribute to the fund, which could be run by the government in partnership with the private sector.
- Safety nets specific to farmers would include weather-based crop insurance and futures contracts. Weather is a key source of uncertainty for a farmer’s projected incomes, and thus impacts investment and production decisions. Weather-based crop insurance can reduce a large part of this uncertainty, giving farmers the chance to engage in more productive (albeit possibly riskier) activities such as alternative crop selection and use of new technologies.
- Futures contracts, which assure farmers specified prices for output, can also help mitigate risks caused by price fluctuations. Futures help assure farmers a minimum income for their harvest. While crop insurance is meant to encourage greater production, futures contracts can encourage poverty reduction. One important consequence of income uncertainty is that children are forced into paid labor in order to diversify a household’s income portfolio. However, if

farmers are assured a certain level of income, they will be more likely to invest in their children's health and education, increasing the likelihood that their household will escape poverty.

Enhancing Agricultural Productivity

- Improving agricultural productivity is essential for ensuring long-term food security and promoting poverty reduction. Adequate food supply is a fundamental prerequisite for food security, especially as the global population is projected to reach 9 billion by 2050. Bolstering farm productivity through better technology and efficiency can help increase food production. Historically, agricultural productivity has played an important role in poverty reduction. As poverty in Asia remains a predominantly rural phenomenon, boosting agricultural productivity will have an increasingly large impact on economic development and poverty reduction.
- Transferring modern farm technology to increase the efficiency with which land is used can produce major increases in farm yields. Although Asia's industrial farms are highly efficient, many smaller farms still use centuries-old technology. There remains much room to increase yields of smaller and less efficient farms. Reducing the amount of food wasted due to poor storage or inefficient processing could significantly boost the global food supply. According to the International Fund for Agricultural Development, reducing such losses could be equivalent to raising output by 15%–25% (*Economist* 2011). In many cases, the technologies required to improve productivity in developing countries exist,

but may remain too costly for poor farmers to adopt—and farmers may lack adequate knowledge to apply the technologies. In this case, governments and development institutions have a critical role to play in providing access to credit, promoting farm cooperatives, and educating farmers about applying new technologies.

- Innovation and adoption of new technology can help improve agricultural productivity and rural incomes. For example, waste-to-energy technologies (i.e., converting agri-biomass to energy) are slowly gaining ground, especially in the face of rising fuel prices. These green technologies help reduce agriculture's carbon footprint and they enhance agricultural productivity and rural income. Energy can be sold or used separately and organic fertilizer generated in the process of converting biomass into energy can be used for agricultural production. Similarly, animal manure combined with biomass (e.g. rice straw, corn stover, sugarcane leaves) can be also used for biogas production.

Promoting Rural Development

- Promoting rural development can contribute substantially to poverty reduction and food security. A majority of the region's poor live in rural areas and this often poses a dilemma for national policymakers when choosing policies to stabilize food prices and/or protect the agricultural sector. For example, protectionism to sustain high food prices is a popular tool to support farm income. But such policies do not always yield the desired result if farmers are themselves poor. Sustained low agricultural productivity brought about by limited global competition reduces food production and small-scale farmers may end up not being

able to produce enough food for their own demand, let alone the market's. High food prices can also reduce the farmer's own purchasing power, crowding out spending on seeds and fertilizers, thus further reducing food production. Rural economic growth and stable food prices, therefore, should be intrinsic components of any food security strategy.

- The most effective approach in tackling both poverty and food insecurity is through a rural-based growth strategy. In Asia, the Green Revolution provided a dual-track route for successful poverty reduction and food security by directly increasing farmer incomes and lowering food prices. Asia's experience shows conclusively that rural development and growth can help reduce poverty most effectively. A new growth paradigm should focus on support for agriculture, increasing rural income opportunities on par with the urban sector. Doing so will stem the excess labor migration from rural to urban centers that accompanies structural transformation. Rural incomes should also be diversified to improve stability, while urban-rural integration needs to be scaled up. The rural economic base can be diversified by introducing new value-adding activities, including the transformation of agricultural wastes into energy sources.

Supporting Agricultural Research

- Now, as during the Green Revolution of the 1970s, agricultural research is an essential factor in improving agriculture's productivity. For example, advancements in food technology could significantly boost farm production. Advances in biotechnology can allow the production of crops that are not only more resistant to pests and weather events,

but also have higher nutritional content. More research and better technologies are also needed in livestock production and fisheries—as people shift dietary preferences from cereal grains to meat and vegetables. Current methods of animal husbandry have a high carbon footprint and are thus environmentally unsustainable in the long term. Likewise, better technologies for fish farming are needed to improve sustainability and prevent depletion of fish populations in the open seas.

- Other areas requiring further research and development include the efficient and sustainable use of dwindling land and water resources. Higher yields are mandatory as available land for agriculture contracts. Although some virgin land areas are still available for cultivation (equivalent to about 10%–30% of land currently being cultivated), the potential land use for food production is offset by urban sprawl and by soil erosion and degradation. Further, competition for water use by rising populations and more frequent droughts calls for the development of crop varieties that use water more efficiently or are tolerant to water interruptions. Farmers are expected to need 45% more water by 2030, but are in competition with rapidly increasing urban needs.

Investing in Human Capital and Basic Infrastructure

- Human capital investments, such as in health and education, and investments in basic infrastructure, such as water and sanitation, play a critical role in food security—as they are essential components of poverty reduction. While sustained income growth leads to poverty reduction and food security, the link between economic growth and food

security may be weakened by the poor's limited access to human capital formation and basic infrastructure. Countries that prioritize social development—boosting access to basic schooling, health, and nutrition—not only directly enhance individual welfare but also achieve higher average incomes over the long term. Prioritizing development of human capital improves food security by providing much-needed education on health and nutrition, understanding the

importance of food security itself, and enabling farmers to better adopt modern and more productive farming technologies—for example, by improving processing and storage. Likewise, employing more efficient water management and sanitation will help prevent soil degradation due to pollution, and maintain a healthier, more productive population by preventing the spread of disease.

Appendix 1

Measuring the Impact of Food and Non-Food Price Changes on Poverty

Food and Non-Food Price Elasticity of Individual Money Metric Utility

People's real incomes decline when prices increase, all else being equal. The fall in real incomes varies from person to person, so price increases affect both the level and the distribution of income. In this section we present a methodology that measures the extent to which increases in food and non-food prices affect aggregate poverty.

Suppose that there are only two commodities—food and non-food—and let p_f and p_n be the prices of food and non-food, respectively, in the base year, which change to p_f^* and p_n^* in the terminal year. First, we need to know how changes in prices of food and non-food will affect an individual's real income (or expenditure).¹ Our methodology is based on the expenditure function $e(u, p_f, p_n)$, which is the minimum expenditure required to obtain u level of utility when the price of food is p_f and non-food is p_n .² Using Hick's (1946) compensation variation, the change in the real income of the individual with income x is given by³

$$\Delta x = -[e(u, \mathbf{p}^*) - e(u, \mathbf{p})]. \quad (\text{A.1})$$

Using Taylor's expansion and ignoring the terms of higher order of smallness gives

$$\Delta x = -(p_f^* - p_f)q_f(x) - (p_n^* - p_n)q_n(x), \quad (\text{A.2})$$

where $q_f(x)$ and $q_n(x)$ are the demand for food and non-food by the individual with income x . From (A.2) we derive the proportional change in the real income due to changes in food and non-food prices as

$$\left[\frac{\Delta x}{x} \right]_{price} = -w_f(x)r_f - w_n(x)r_n, \quad (\text{A.3})$$

where $w_f(x)$ and $w_n(x)$ are the shares of food and non-food in the total expenditure by an individual with income x , and r_f and r_n are the food and non-food inflation rates. This equation shows that the real income of an individual with income x will always decrease when food and non-food prices increase.

Along with price increases, suppose the nominal income also changes between the base and terminal periods. Suppose $g(x) = \frac{\Delta x}{x}$ is the proportional change in the nominal income between the two periods, then the change in the real income of the individual with income x in the base period is given by

¹ Expenditure and income are used interchangeably as a welfare measure. Although we use the term "income" throughout the paper, it is meant to be a welfare measure based on expenditure. Using income as a measure of welfare creates many complex issues relating to savings. Moreover, there is a widely held view that expenditure is a better measure of long-term standard of living than income.

² This function is also referred to as the cost function in the literature. See Deaton and Muelbauer (1980).

³ One can also use Hick's (1946) equivalent variation to

measure the change in real income. However, a more commonly used measure of the change in real income is Hick's compensation variation.

$$\left[\frac{\Delta x}{x}\right]_{real} = -w_f(x)r_f - w_n(x)r_n + g(x). \quad (A.4)$$

Thus, the change in the real income is the sum of the three components: (i) the food price effect, (ii) the non-food price effect, and (iii) the income effect. Each component of equation (A.4) will have impacts on changes in poverty. Equation (A.4) is derived under the assumption that consumers do not substitute food for non-food items, or vice versa. This is a reasonable assumption because individuals rarely substitute food for non-food items even if the prices of food increase at a faster rate than those of non-food items.⁴

Food and Non-Food Price Elasticity of Poverty

If the income or expenditure x of an individual is a random variable with a density function $f(x)$, and z is the poverty line, then a general class of additively decomposable poverty measures can be written as

$$\theta = \int_0^z P(z, x) f(x) dx, \quad (A.5)$$

where $P(z, x)$ is a homogenous function of degree zero in z and x such that⁵

$$P(z, z) = 0, \quad \frac{\partial P(z, x)}{\partial x} < 0, \quad \text{and} \quad \frac{\partial^2 P(z, x)}{\partial x^2} > 0.$$

Using (A.4) in the total differentiation of (A.5) gives poverty decomposition

$$\frac{d\theta}{\theta} = \epsilon_f r_f + \epsilon_n r_n + \frac{1}{\theta} \int_0^z \frac{\partial P}{\partial x} x g(x) f(x) dx, \quad (A.6)$$

where ϵ_f and ϵ_n are the food and non-food price elasticities of poverty. This equation shows that the total proportional change in poverty can be decomposed into three components: the first term in the right hand side of (A.6) is the impact of food inflation on poverty, the second term is the impact of non-food inflation on poverty, and the third term is the income effect. An increase in food and non-food prices (measured by their inflation rates) thus increases poverty. Along with the food and non-food inflation, people's nominal incomes may also be increasing. The third term in the right side of (A.6) is always negative when the growth rate $g(x)$ of nominal income is positive, which implies that an increase in nominal income always reduces poverty. The income effect can be further decomposed as the sum of the two components, (i) the growth effect, and (ii) the distribution effect.

Kakwani and Son (2008) discuss the decomposition of change in poverty into growth and distribution effects at length. Since our focus in this study is on measuring the impact of food and non-food price increases on poverty, we will not provide further decomposition of the income effect. Our empirical study of 17 economies will analyze the relative contribution of three effects—food price, non-food price, and income—on poverty. We have calculated these relative contributions for three poverty measures: (i) the head-count ratio, (ii) the poverty gap ratio, and (iii) the severity of poverty.

Shapley Decomposition

The decomposition given in (A.6) could be estimated by using household-level data from surveys, but this is not possible because we do not have complete survey datasets for all the economies. Therefore, we used the World Bank's

⁴ Substitution is more prevalent between items within food and non-food categories.

⁵ Foster, Greer, and Thorbecke (1984) poverty measures are obtained when we substitute $P(z, x) = \left(\frac{z-x}{z}\right)^\alpha$ in

equation (A.5), where α is the parameter of inequality aversion. When $\alpha = 0, 1,$ and $2,$ the poverty measure θ corresponds to the head-count ratio, the poverty gap ratio, and the severity of poverty index, respectively.

interactive program, PovCal,⁶ which allowed us to calculate the poverty incidence for different survey years using any given poverty line. Given this constraint, the best option was to estimate the decomposition in (A.6) using the Shapley decomposition technique. This is a powerful technique for estimating the contributions of different factors to an outcome, and has recently become popular.

A general class of poverty measure given in (A.5) is fully characterized by the poverty line z , which is the sum of food and non-food poverty lines (i.e., $z = z_f + z_n$), and the vector of income distribution \tilde{x} :

$$\theta = \theta(z_f + z_n, \tilde{x}), \quad (\text{A.7})$$

where θ is the poverty estimate in the base year. The poverty estimate in the terminal year is given by

$$\theta^* = \theta(z_f^* + z_n^*, \tilde{x}^*), \quad (\text{A.8})$$

where $z_f^* = (1 + r_f)z_f$ is the food poverty line, $z_n^* = (1 + r_n)z_n$ is the non-food poverty line, and \tilde{x}^* is the vector of income distribution in the terminal year. The percentage change in poverty between base and terminal years is given by

$$\frac{\Delta\theta}{\theta} = \Delta \ln(\theta) = \ln[\theta(z_f^* + z_n^*, \tilde{x}^*)] - \ln[\theta(z_f + z_n, \tilde{x})], \quad (\text{A.9})$$

which, on using Shapley decomposition, can be expressed as the sum of three factors: the food price effect, non-food price effect, and income effect. The food price effect is captured by estimating the change in poverty when the food poverty line changes from z_f to z_f^* while the non-food poverty line and the vector of income distribution does not change. This gives an estimate of the food price effect on poverty as

$$r_f \hat{\epsilon}_f = \frac{1}{3} [\ln\{\theta(z_f^* + z_n, \tilde{x})\} - \ln\{\theta(z_f + z_n, \tilde{x})\} + \ln\{\theta(z_f^* + z_n^*, \tilde{x}^*)\} - \ln\{\theta(z_f + z_n^*, \tilde{x}^*)\}] + \frac{1}{6} [\ln\{\theta(z_f^* + z_n^*, \tilde{x})\} - \ln\{\theta(z_f + z_n^*, \tilde{x})\} + \ln\{\theta(z_f^* + z_n, \tilde{x}^*)\} - \ln\{\theta(z_f + z_n, \tilde{x}^*)\}],$$

where $\hat{\epsilon}_f$ is the estimated price elasticity of poverty for food.

Similarly, an estimate of the non-food price effect on poverty is given by

$$r_n \hat{\epsilon}_n = \frac{1}{3} [\ln\{\theta(z_f + z_n^*, \tilde{x})\} - \ln\{\theta(z_f + z_n, \tilde{x})\} + \ln\{\theta(z_f^* + z_n^*, \tilde{x}^*)\} - \ln\{\theta(z_f^* + z_n, \tilde{x}^*)\}] + \frac{1}{6} [\ln\{\theta(z_f + z_n^*, \tilde{x}^*)\} - \ln\{\theta(z_f + z_n, \tilde{x}^*)\} + \ln\{\theta(z_f^* + z_n^*, \tilde{x})\} - \ln\{\theta(z_f^* + z_n, \tilde{x})\}],$$

where $\hat{\epsilon}_n$ is the estimated price elasticity of poverty for non-food.

The income effect is calculated by keeping both food and non-food poverty lines the same but the vector of income distribution changes from \tilde{x} to \tilde{x}^* :

$$g \hat{\delta} = \frac{1}{3} [\ln\{\theta(z_f + z_n, \tilde{x}^*)\} - \ln\{\theta(z_f + z_n, \tilde{x})\} + \ln\{\theta(z_f^* + z_n^*, \tilde{x}^*)\} - \ln\{\theta(z_f^* + z_n^*, \tilde{x})\}] + \frac{1}{6} [\ln\{\theta(z_f + z_n^*, \tilde{x}^*)\} - \ln\{\theta(z_f + z_n^*, \tilde{x})\} + \ln\{\theta(z_f^* + z_n, \tilde{x}^*)\} - \ln\{\theta(z_f^* + z_n, \tilde{x})\}],$$

where g is the growth rate of the average nominal income and $\hat{\delta}$ is the estimated growth elasticity of poverty. This elasticity implies that if the food and non-food prices did not change, then a 1% increase in the average nominal income will lead to $\hat{\delta}$ % reduction in poverty.

⁶ Available at <http://iresearch.worldbank.org/PovcalNet/index.htm>

It can be easily verified that

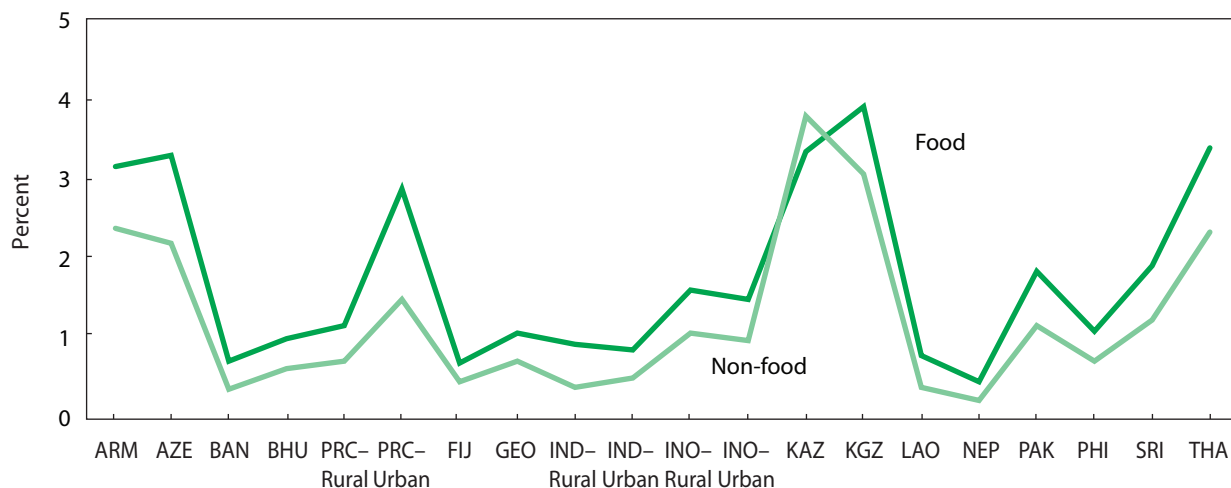
$$\frac{\Delta\theta}{\theta} = r_f \hat{\epsilon}_f + r_n \hat{\epsilon}_n + g \hat{\delta}, \quad (\text{A.10})$$

which is our proposed decomposition of change in poverty in terms of the food price effect, non-food price effect, and income effect. In this study, we have only presented the empirical results for the decomposition of the head-count ratio.

Appendix 2

Price Elasticity and Percentage Change in Poverty

Figure A.2: Price elasticity of food and non-food for the percentage of poor based on \$1.25-a-day poverty line



ARM = Armenia, AZE = Azerbaijan, BAN = Bangladesh, BHU = Bhutan, PRC = People's Republic of China, FIJ = Fiji, GEO = Georgia, IND = India, INO = Indonesia, KAZ = Kazakhstan, KGZ = Kyrgyz Republic, Lao PDR = Lao People's Democratic Republic, NEP = Nepal, PAK = Pakistan, PHI = Philippines, SRI = Sri Lanka, THA = Thailand.

Source: ADB staff calculations.

Table A.2: Annual percentage change in poverty due to the income effect, food price effect, and non-food price effect

Country	Change in percentage of poor due to			Net effect on poverty
	Food prices	Non-food prices	Income	
Armenia	24.79	8.12	-55.53	-22.61
Azerbaijan	56.10	13.09	-82.50	-13.31
Bangladesh	7.77	2.08	-12.72	-2.86
Bhutan	4.62	3.58	-23.47	-15.26
China, People's Rep. of-Rural	12.28	-4.21	-12.97	-4.90
China, People's Rep. of-Urban	30.21	-11.70	-34.50	-15.98
Fiji	4.73	0.52	-18.56	-13.31
Georgia	13.08	5.74	-20.30	-1.48
India-Rural	11.47	3.51	-18.94	-3.96
India-Urban	11.42	2.25	-17.31	-3.64
Indonesia-Rural	24.64	-0.02	-29.84	-5.21
Indonesia-Urban	22.77	-0.01	-23.13	-0.36
Kazakhstan	44.96	41.86	-111.63	-24.81
Kyrgyz Republic	31.76	33.45	-63.58	1.63
Lao PDR	10.79	2.18	-16.80	-3.82
Nepal	6.15	1.09	-14.86	-7.61
Pakistan	26.71	7.13	-36.12	-2.29
Philippines	8.71	1.18	-16.08	-6.19
Sri Lanka	15.61	11.06	-37.67	-11.01
Thailand	24.09	-10.89	-34.32	-21.12

Lao PDR = Lao People's Democratic Republic.

Source: ADB staff calculations.

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Food Security and Poverty in Asia and the Pacific

Key Challenges and Policy Issues

Ensuring a secure supply of food is essential, given the world's (and especially Asia's) growing population, high and volatile food prices, increasingly scarce resources, and changing environment. This paper discusses the drivers behind food insecurity in Asia and points to ways to mitigate it.

The world's population has now reached 7 billion, and is projected to increase by more than 2 billion between now and 2050. Asia will account for majority of the increase. And Asia's growing affluence is shifting food demand away from cereal grains toward meat, vegetables, and fruits, which require more water, land, and other inputs than do cereals.

Asia, which is home to most of the world's poor and undernourished populations, is finding increasing difficulty feeding its people as demand for food expands rapidly just as water and land resources decline. Because of these pressures, food prices have been rising since the 2000s. High and volatile food prices are eroding the purchasing power of households—especially of poor ones, which spend up to 70% of their budgets on food—and are thus undermining recent gains in poverty reduction. The impact of higher food prices is severe—an additional 112 million people could have escaped poverty in Asia during the late 2000s if food prices had not increased during the period. Thus, long- and short-term strategies are needed to ensure food security and bolster efforts at poverty reduction. Policies to enhance food security that are discussed in this paper include safety net and social protection programs, and policies that promote agricultural productivity, rural development, agricultural research, and human capital investment.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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