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The State of
Food and Agriculture in Asia and the Pacific

2006

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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Preface

I am pleased to announce the first issue of *The State of Food and Agriculture in Asia and the Pacific*. This publication is being launched to meet the need for a forward-looking regional analysis of the many issues facing food and agriculture in this very dynamic part of the world. I hope that it will catalyze informed discussion of appropriate policies to improve the competitiveness of agricultural producers and increase the affordability of food for the hundreds of millions of poor in the region. Its focus on the regional dimensions of food and agriculture makes it a complement to *The State of Food and Agriculture* published at FAO headquarters in Rome, which focuses on specific issues (e.g. biotechnology, international trade) at a more global level.

The first part of the publication is an analysis of medium to long-term trends in poverty and the role of agriculture, production and natural resources, consumption, and marketing and trade. Underlying all parts of this analysis is a concern for the food security of both producers and consumers. The second part of the publication focuses in more detail on two specific issues confronting Asian agriculture: reducing vulnerability to natural hazards and the effects of trade liberalization on food security. These topics are two of the six priority themes contained in the Regional Strategic Framework of FAO's Regional Office for Asia and the Pacific, the document that guides FAO's work throughout the region.

The State of Food and Agriculture in Asia and the Pacific is the result of a collaborative, multi-disciplinary effort by staff of the FAO regional office in Bangkok led by David Dawe, Senior Food Systems Economist. The feature "Trade liberalization, poverty and food security" was prepared jointly with Randy Stringer, Chief of the Comparative Agricultural Development Service (ESAC) in the Agricultural and Development Economics Division (ESA). The box "Can contracts help small farmers participate in more globalized food chains?" was contributed by Ellen McCullough of the Agricultural Sector in Economic Development Service (ESAE), also part of ESA. Extremely helpful comments from a large number of staff at FAO headquarters and several experts outside FAO are very gratefully acknowledged.

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The State of Food and Agriculture in Asia and the Pacific

Poverty and the role of agriculture

Member countries in Asia and the Pacific[1] have made great strides at reducing poverty and food insecurity and improving human development. From 1962 to 2003, life expectancy at birth increased by 17 years in East Asia and the Pacific and by 18 years in South Asia (World Bank, 2006).[2] Mortality rates for children under five have declined dramatically. The Human Development Index is higher today than it was in 1975 for all countries in the region for which there are data (UNDP, 2005). From 1981 to 2001, the proportion of people living on less than $1 per day[3] declined from 57.7 to 14.9 percent in East Asia and the Pacific and from 51.5 to 31.3 percent in South Asia. In South Asia, progress was more rapid in the 1990s than in the 1980s. In East Asia and the Pacific, poverty rates were cut in half from 1981 to 1990 and cut in half again from 1990 to 2001 (World Bank, 2006). From 1990–1992 to 2000–2002, the proportion of undernourished in developing and transition countries in Asia and the Pacific declined from 20 to 16 percent (FAO, 2004a). Access to improved water supplies in rural areas increased in nearly all countries from 1990 to 2002 (UNDP, 2005). While not all countries have shared in these gains, progress has been widespread across the region.

Despite the substantial progress, many remain mired in poverty. None of the developing countries in Asia and the Pacific are on track to meet all of the Millennium Development Goals by 2015 (UNESCAP, 2005). In 2001, more than 700 million Asians still lived on less than $1 a day, more than the entire population of sub-Saharan Africa at that time. As of 2000–2002, there were still 548 million undernourished people in the developing and transition economies of Asia and the Pacific. Many farmers, fishers and foresters are exceedingly vulnerable to floods, droughts and cyclones as well as less frequent events such as earthquakes and tsunamis (see feature on "Development, science and markets for disaster risk reduction"). Absolute income gaps between the richest and poorest quintiles are widening, and it is politically difficult to manage these disparities.

Although the agricultural sector (including forestry and fisheries unless otherwise specified) continues to grow, it is declining in relative importance in Asia, both in terms of its contribution to GDP and its share of the labour force. Farm households are diversifying their sources of income toward services and industry, or leaving the agricultural sector altogether. For example, the share of agriculture in GDP in Thailand decreased from 36 percent in 1960 to 10 percent in 2003 (World Bank, 2006). This relative decline of agriculture is inevitable in countries that experience economic growth, which has been widespread in the region. Since the Industrial Revolution, no country has managed to become wealthy without a major reorientation of the economy away from agriculture.

Urbanization is proceeding rapidly in East Asia (E Asia[4]) and Southeast Asia (SE Asia[5]). In 2004, the ratio of urban to total population was 42 percent in both these subregions,

[1] In this publication, Asia and the Pacific includes all 46 members of the Regional Office for Asia and the Pacific, excluding France and the United States of America as the bulk of their population is outside the region. Other FAO publications and databases may include different countries for the Asia and Pacific region. For the purposes of this document, these 44 countries are divided into six mutually exclusive subregions defined in later footnotes: East Asia, Southeast Asia, South and Southwest Asia, Central Asia, the Pacific Islands and the developed economies.

[2] The designations "East Asia and the Pacific" and "South Asia" are those used by the World Bank. They include only developing countries.

[3] All instances of $ refer to US$.

[4] E Asia is comprised of China, Democratic People's Republic of Korea, Mongolia and Republic of Korea.

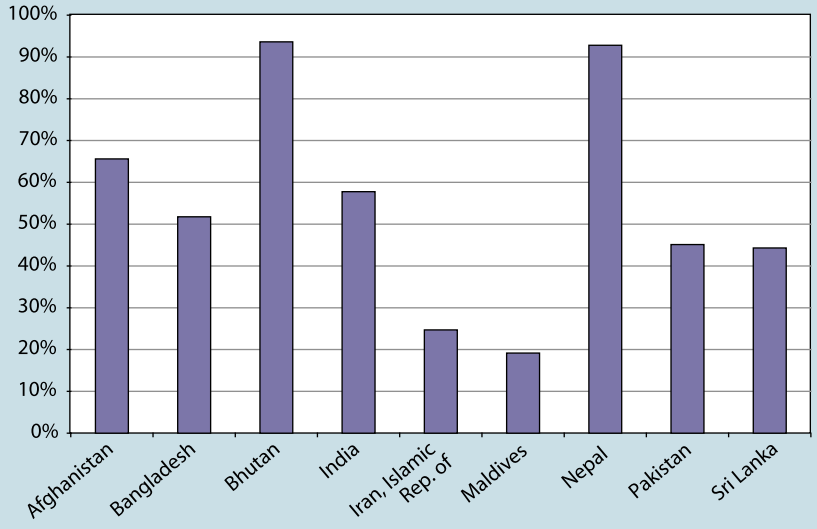
[5] SE Asia is comprised of Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Thailand, Timor-Leste and Viet Nam.

up from 33 and 34 percent, respectively, ten years earlier (FAO, 2006a).[6] These levels are still well below that in the developed economies (where it was 70 percent in 2004).[7] Urbanization has been much slower in South and Southwest Asia (SSW Asia[8]) and the Pacific Islands,[9] where the ratios currently stand at 30 and 20 percent, respectively. In Central Asia,[10] the rural share of the population is increasing, with urbanization rates falling from 44 to 41 percent from 1994 to 2004.

Despite the trends in urbanization, the absolute size of the agricultural labour force is still increasing in all subregions except for E Asia and the developed economies. More than half of the economically active population is still involved in agriculture in E Asia, SE Asia, SSW Asia and the Pacific Islands, and agricultural employment is especially important for the livelihoods of the poor (see Figures 1a to 1e). In addition, agriculture remains a major sector of all developing Asian economies. In India, it accounts for 22 percent of GDP (2003), and 58 percent of the economically active population engages in agricultural activities. These figures are even larger if the value generated through downstream processing is included. Thus, the health of the agricultural sector is crucial for increasing economy-wide productivity, especially in areas with a comparative advantage in agriculture. Agriculture also serves as a buffer and safety net by providing employment in the face of large economic shocks, such as the financial crisis in 1997–1998.

The importance of agriculture to the macro economy, the labour force and the poor suggests that investment in agriculture should continue. Indeed, studies in India and China have shown that, dollar for dollar, agricultural research has historically been one of the most effective means for government spending to reduce poverty (Fan, 2002; Fan, Hazell and Thorat, 2000; Fan, Zhang and Zhang, 2000). Other research has shown that agricultural growth in Asia is typically more "pro-poor" than growth in other sectors (FAO, 2005a; Timmer, 2005). Unfortunately, public funding for agriculture is declining

Figure 1a. Percentage of labour force in agriculture, South and Southwest Asia, 2004



Source of data: FAO (2006a)

[6] Unless otherwise noted, most data cited in this report are from FAO (2006a).

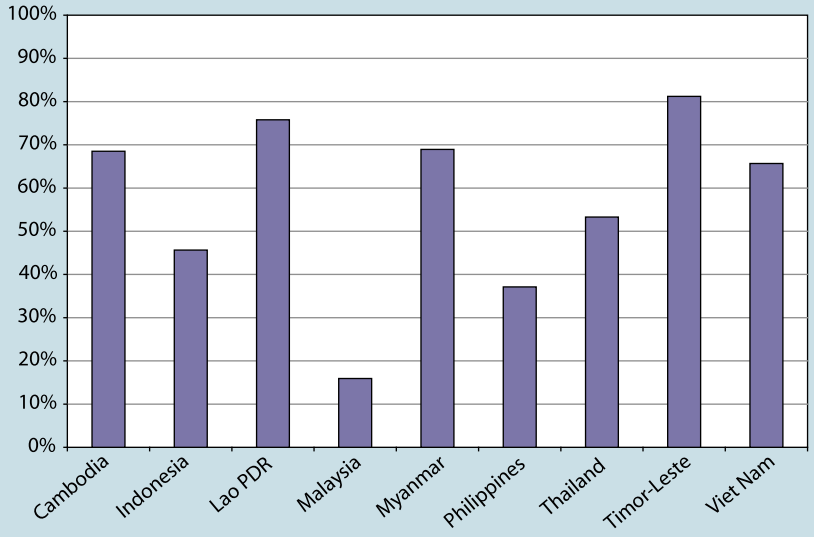
[7] The developed economies include Australia, Japan and New Zealand.

[8] SSW Asia is comprised of Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan and Sri Lanka.

[9] The Pacific Islands include Cook Islands, Fiji Islands, Kiribati, Marshall Islands, Micronesia (Federated States of), Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

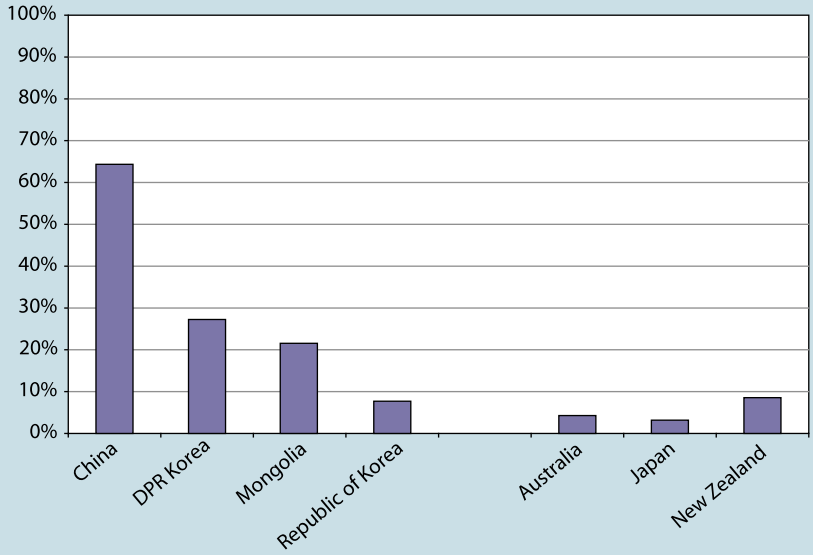
[10] Central Asia includes Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Figure 1b. Percentage of labour force in agriculture, Southeast Asia, 2004



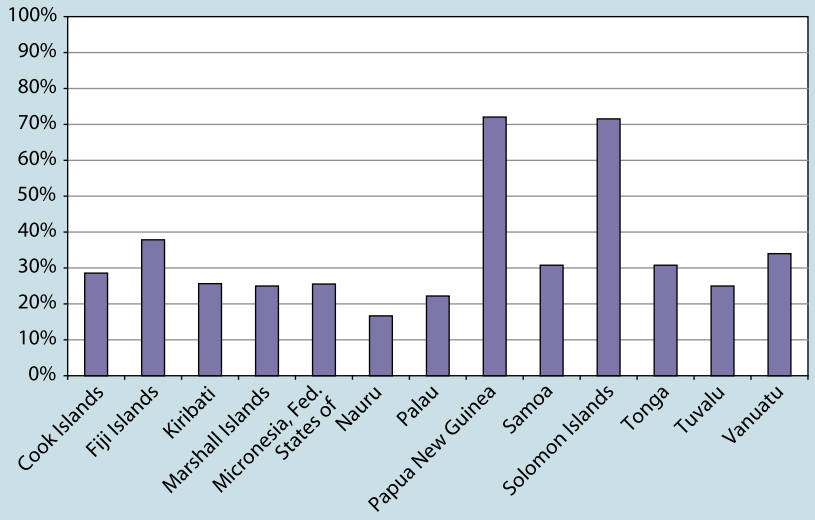
Source of data: FAO (2006a)

Figure 1c. Percentage of labour force in agriculture, East Asia and the developed economies, 2004



Source of data: FAO (2006a)

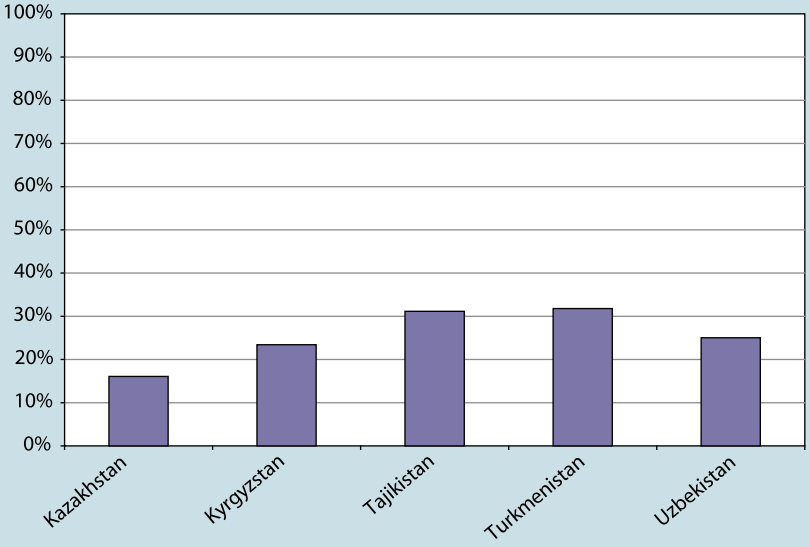
Figure 1d. Percentage of labour force in agriculture, Pacific Islands, 2004



Source of data: FAO (2006a)

Note: FAO (2006a) reports data for the size of the labour force only to the nearest thousand. Thus, the calculations for Pacific Island countries may be subject to large rounding errors because of their small populations.

Figure 1e. Percentage of labour force in agriculture, Central Asia, 2004



Source of data: FAO (2006a)

in many countries, although there are notable exceptions such as China. Furthermore, much of the funding for agriculture often goes to subsidies that are not targeted to the poor, instead of being allocated to activities that increase productivity. Private funding of agricultural research may be able to compensate to some extent, but it has so far been limited in developing countries because of difficulties in reaching small farmers.

Ideally, the rural to urban transition (of jobs and the economy) should result from people being pulled into urban areas with new jobs, as opposed to being pushed out of rural areas. Such an outcome will require rapid growth in both industry and agriculture. Rapid growth in agriculture will also tend to dampen some of the tensions and disparities that arise in the wake of rapid urban and industrial growth, and make it easier to manage the rapid growth of cities. Of course, poverty in many parts of Asia is concentrated in backward regions and among disadvantaged families that will not be

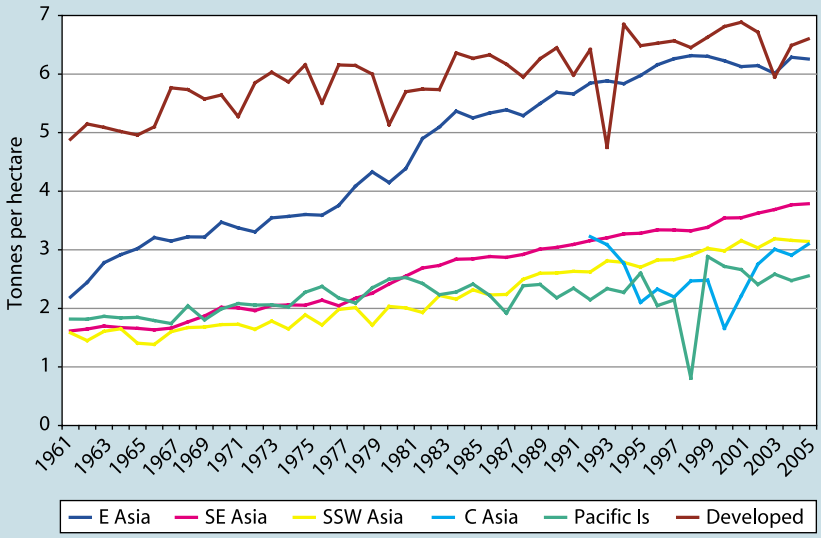
lifted out of poverty by agricultural growth alone. This poverty will need to be specifically targeted with more education and improved infrastructure, and good governance will be needed to implement these programs. But even for these people, it is likely that agricultural growth is an essential complement to education and infrastructure in the process of poverty reduction.

Production, the environment and natural resources

Rice, wheat and maize

Rice is the most widely planted crop and the most important source of calories in Asia and the Pacific. Per capita rice production in the developing countries of the region increased from 117 kilograms of paddy in 1961 to an all-time peak of 166 kilograms in 1999. Since then, however, production has failed to keep pace with population growth, and per capita production declined to 154 kilograms in 2004. The decline in per capita production is because of small declines in area harvested and continued population growth, as yields per hectare are still increasing (although growth has slowed). On a subregional basis, rice yields have largely stagnated in E Asia and SSW Asia during the past five years, but they remain on an upward trend in SE Asia (see Figure 2).

Figure 2. Rice yields by subregion, 1961–2005



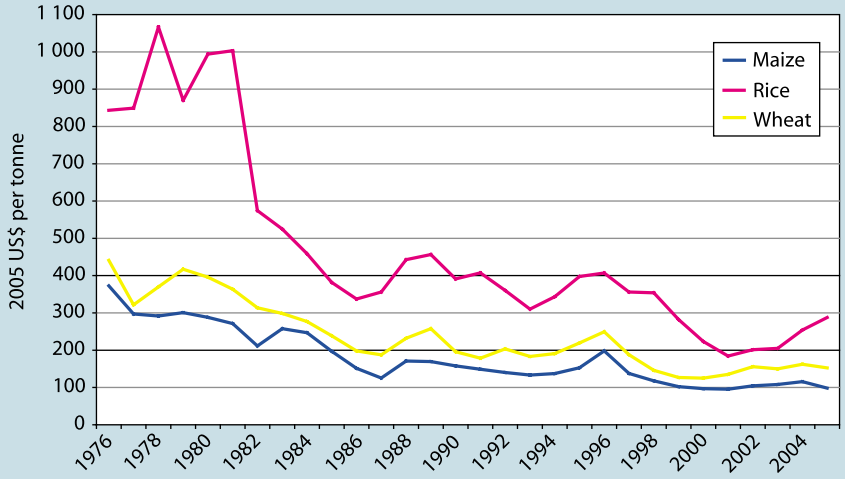
Source of data: FAO (2006a)

Per capita wheat production is also below its peak in both E Asia and SSW Asia, the two main producing subregions. As is the case for rice, Asian wheat area is below its peak in the late 1990s. Yields grew a cumulative 10.5 percent during the past ten years (from 1992–1994 to 2002–2004).

These declines in per capita production should be considered in the context of demand and trade, as economic growth allows Asians to diversify their diets away from staple foods. Rice prices on the world market in 2005, adjusted for inflation, were still well below the level during the 1990s, even after China's recent exit as a major net exporter (see Figure 3).[11] These low prices are responsible to some extent for the recent decline in area and the low prices suggest there is no large-scale crisis in rice production, at least at present. Well managed intensive irrigated rice systems growing two or three rice crops per year seem to be remarkably sustainable over long periods of time, although climate change may put this to the test. Wheat prices in the first half of this decade, adjusted for inflation, were also at historic lows (see Figure 3). Regional net

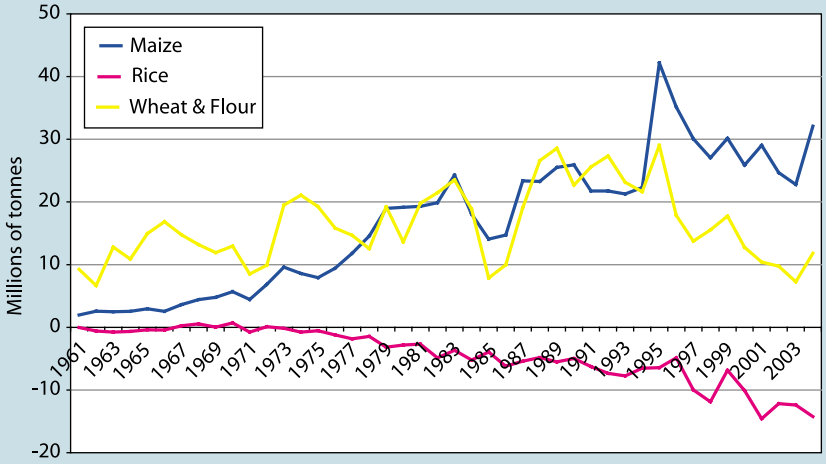
[11] All statements in this paper about trends in world market prices use raw data from IMF (2006).

Figure 3. Inflation-adjusted world market grain prices, 1976–2005



Source of data: IMF (2006)

Figure 4. Net grain imports, Asia and the Pacific, 1961–2004



Source of data: FAO (2006a)

Note: Negative numbers indicate net exports.

imports of wheat and wheat flour for 2001–2004 averaged 9.8 million tonnes, their lowest level for a four year period in at least the past forty years.[12] Regional net exports of rice also reached historic highs from 2001–2004 (see Figure 4).

Despite the long-term declines in world grain prices and costs of production per tonne, yield stagnation in many grain producing areas, continued population growth and possible increased demand for bioenergy give cause for concern that prices will increase substantially in the future. While higher prices would benefit some farmers, they would also increase hunger. It is possible that this scenario is overly pessimistic, and that even a relatively small rise in prices will give farmers the incentives to intensify production, thus increasing supply again and ensuring prices do not rise by more than a small amount. But such a positive outcome is not certain, and the risk of increased hunger means that action must be taken to avoid substantially higher food prices.

In general, trends in prices, wages and profits are more important indicators than trends in agricultural production. For example, the world's supply of food is already adequate

[12] Central Asia is excluded from this calculation for lack of long time-series data.

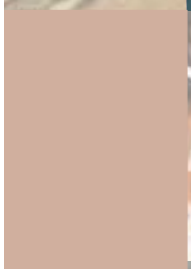













to feed everyone if distributed evenly, but this fact is not relevant in market economies where access to food depends on incomes and prices. Low retail prices for food are important because most of the poor's money is spent on food. High profits for farmers are also important, because many farmers are poor and farming is an important source of income.

Unfortunately, simultaneously achieving low prices for consumers and high profits for farmers through government subsidies is not sustainable in poor countries. The large number of poor consumers and farmers means that subsidies will divert too many scarce resources away from important productivity enhancing investments such as infrastructure, education and health that are essential for long-term development. The best way to achieve low prices and high profits is through public goods such as scientific agricultural research that lower production costs per tonne and reduce the risk of higher prices in the future. Lower production costs per tonne are the only sustainable way to keep farming profitable and deliver low prices to poor consumers.

In contrast to rice and wheat, production of maize continues to outpace population growth in the region. Driven by rising demand for animal feed and increased adoption of hybrid seeds, yields and area both increased about 12 percent from 1992–1994 to 2002–2004, and maize area harvested reached a peak for the region in 2004. Despite the increased production, the region is still a net importer of maize (see Figure 4). Although demand is growing, world maize prices in the first half of this decade were at historic lows (see Figure 3).

Oilseeds, fruits and vegetables, industrial and beverage crops

Production of a wide range of other crops, including edible oilseeds, fruits and vegetables, rubber and coffee, is also much higher today than it was in the early 1990s. Prices of these commodities adjusted for inflation are generally lower, showing that growth in supply outstripped growth in demand.

Production of edible oilseed crops increased substantially during the past ten years (from 1992–1994 to 2002–2004) in Asia and the Pacific, led by oil palm, whose production more than doubled. Essentially all of the increased production of oil palm was because of an increase in area harvested of 3.4 million hectares in Malaysia and Indonesia, as average yields remained approximately constant. Asia and the Pacific accounted for 89 percent of world production in 2004, up from just 11 percent in 1961. Unfortunately, some of the growth in production has come at the expense of the environment. Burning of forests to clear new area for plantations has caused air pollution that has adversely affected human health, and possibly also the production of other crops in the region.

Production of rapeseed, sunflower seed, sesame seed and groundnut also increased substantially, with cumulative increases ranging from 27 to 41 percent during the past decade (2002–2004 compared with 1992–1994). Production of soybeans, the most widely planted edible oil crop in Asia and the Pacific, grew 15 percent. Much of these increases were because of higher yields, but the area harvested to these crops also increased by 3.9 million hectares in E Asia. During the same period, the area harvested to these edible oils declined by 0.7 million hectares in SSW Asia, although soybean area in this subregion increased by 2.4 million hectares (55 percent). In SE Asia, soybean area fell by nearly half (most of the decline was in Indonesia). Thus, there have been dramatic shifts in oilseed area between and within countries during the past decade because of increased demand and changes in policies.

Several fruits and vegetables registered large production increases between 1992–1994 and 2002–2004. In E Asia, there were large increases in production of watermelons, pears, plums, asparagus, cucumbers and cabbages, and this subregion accounted for nearly all of the increased production in the region. Production growth rates of these commodities in China averaged more than 10 percent annually during the past decade.

Production increases for tomatoes (111 percent) and onions (86 percent) were also large, and were more widespread across the region. Among tropical fruits, bananas (62 percent) and mangoes (37 percent) also showed rapid growth. India accounted for the largest share of increased production, but China, the Philippines, Indonesia and Thailand (for mangoes) also showed large increases.

Large increases in production also took place for rubber and coffee. Coffee production in the region jumped 92 percent from 1992–1994 to 2002–2004, led by increases in Viet Nam (where production more than quintupled) and to a lesser extent, Indonesia (56 percent) and India (55 percent). This increased production led to a large decline in coffee prices on the world market. Rubber production increased by 46 percent during the past decade, with the largest gains coming from Indonesia and Thailand. Although Asia and the Pacific accounted for 92 percent of world natural rubber production in 2004, the increased production did not lead to a decline in world rubber prices. Prices (adjusted for inflation) in 2004 were at a similar level to that prevailing ten years earlier, because recent increases in petroleum prices led to increased prices for synthetic rubber (natural rubber's main potential substitute).

Production of sugar cane, tea and cotton in the region increased during the past decade by 22, 25 and 16 percent respectively. Most of the increase in sugar cane production was because of greater area harvested, while for cotton all of the increase was because of higher yields. Tea benefited from both larger area and higher yields. Tobacco production fell 18 percent, with most of the decline coming from a 31 percent decrease in area harvested in China.

Diversification of cropping systems

As it has for millennia, rice remains the most important crop in the region. Rice is especially dominant in mainland SE Asia, where there are extensive flood plains that are well suited for rice cultivation. In this part of the region, rice accounts for more than half of total crop area harvested in most countries. However, the importance of rice is declining. While it occupied 26 percent of total crop area harvested in the region in 1980, its relative importance declined to 23 percent in 2004.

Relative declines also occurred for most other cereal crops, with the exception of maize. Wheat's share of total crop area harvested was 14 percent in 2004, down from 18 percent in 1980. The share of area devoted to coarse grains (excluding maize) declined from 13 percent in 1980 to 6 percent by 2004, although maize's share of total crop area has been approximately constant at 7 percent since 1980. Roots and tubers declined from 4 percent of area in 1980 to 3 percent by 2004. As cereals have become less dominant, oilcrops and fruits and vegetables have assumed rising importance. Oilseeds increased their share of area from 13 to 17 percent between 1980 and 2004, while fruits and vegetables increased their share from 4 to 10 percent.

Diversification is likely to continue, encouraged by the substantial shift in relative world market prices among agricultural and food products during the past 25 years. While prices of most agricultural commodities (adjusted for inflation) declined during this time, prices of fruits and livestock products decreased much less than rice prices, due partially to shifts in consumer demand (see Table 1). For example, the ratio of world market prices of oranges and bananas relative to rice in 2003–2005 were more than triple and double (respectively) the ratio in 1979–1981. A similar trend is noticeable for most meat, poultry and fish products. The price ratios of beef and shrimp to rice have increased 43 and 63 percent, respectively, and the ratio has nearly quadrupled for poultry. Relative to rice, the prices of field crops such as soybeans, wheat and maize have also increased, but the increases have generally been smaller than for high value products.

Because changing consumer demand will continue to drive diversification, government influence is best confined to macrolevel guidance as opposed to microlevel planning.

Table 1. Inflation-adjusted agricultural commodity prices on world markets

Commodity	Price (2005 US currency)		Units	% change 1979–1981 to 2003–2005	% change in price ratio to rice
	1979–1981	2003–2005			
Rice	956	249	$/tonne	-74%	0%
Wheat	392	155	$/tonne	-61%	52%
Maize	287	107	$/tonne	-63%	44%
Soybeans	634	252	$/tonne	-60%	53%
Shrimp	26	11	$/lb	-58%	63%
Poultry	75	74	cents/lb	-2%	278%
Swine	211	66	cents/lb	-69%	20%
Beef	297	111	cents/lb	-63%	43%
Soybean Oil	1 285	546	$/tonne	-58%	63%
Sunflower Oil	1 442	865	$/tonne	-40%	130%
Palm oil	1 203	418	$/tonne	-65%	33%
Oranges	964	817	$/tonne	-15%	225%
Bananas	876	506	$/tonne	-42%	122%
Sugar	43	8	cents/lb	-81%	-26%
Tea	514	209	cents/kg	-59%	56%
Coffee	458	76	cents/lb	-84%	-37%
Cotton	203	62	cents/lb	-69%	17%
Rubber	139	60	cents/lb	-56%	67%

Source of raw data: IMF (2006)

Note: cents refer to one-hundredth of a US dollar. lb refers to a US pound, equal to approximately 0.45 kg.

At the macrolevel, governments should be aware that policies to artificially raise grain prices hinder diversification, especially if such policies are sustained over long periods of time. It is also important to enable the participation of private sector retailers and agribusiness firms in marketing by removing excessive regulations and providing a stable policy environment. These firms can provide the capital, markets and knowledge that farmers need in order to diversify. Governments should allocate adequate funds for agricultural research on crops other than cereals, build dense networks of rural roads that allow farmers to effectively market perishable products and establish, monitor and enforce quality standards.

Microlevel planning is less necessary and may often be counterproductive, especially because market signals provide guidance to farmers as to what specific crops or products are most in demand. For example, there are many reports of diversification plans that have failed, often because of marketing problems. Given an enabling macroenvironment as described above, relatively higher prices (and profits) for non-staple foods will naturally encourage farmers to switch crops, at least in some areas. In areas that have a strong comparative advantage for growing rice, such as the extensive floodplains in mainland SE Asia, most farmers will continue to grow rice. There are many such areas in all Asian countries, so despite the trend toward crop diversification, rice will remain a major crop (if not the dominant one) in most Asian countries for many years to come. For example, wheat still occupies more than a quarter of annual harvested area in Australia and about a fifth of annual harvested area in the United States of America.

Livestock, fisheries and forestry

An FAO index of livestock production grew rapidly from 1992–1994 to 2002–2004, with the most rapid growth occurring in China (93 percent), Viet Nam (93 percent) and the Philippines (79 percent). For the region as a whole, all subcategories of livestock products grew rapidly. The most rapid production growth was in poultry (a cumulative 83 percent) and eggs (78 percent). Rapid growth in poultry and egg production was widespread throughout the region, with the exception of Central Asia (where growth was negative in these and most other major livestock product categories) and

the developed economies. Production of milk exhibited strong growth in East Asia (136 percent), SE Asia (65 percent), SSW Asia (52 percent) and the developed economies (33 percent). Pigmeat production grew 50 percent for the region, with strong growth in SE Asia (55 percent), E Asia (53 percent) and the Pacific Islands (44 percent).

Approximately 80 percent of the total increase in Asian livestock production since 1990 has come from large-scale industrial operations located in urban areas, often with thousands of animals packed closely together. The advantages of locating in urban areas are easier access to both feed supplies and markets for meat and eggs. However, such large concentrations of animals and animal wastes close to dense human population often cause considerable pollution problems such as algal blooms in offshore fisheries, leaching of nitrates and pathogens into drinking water supplies and contamination of soil resources with excess nutrients, pathogens and heavy metals. In order to reduce this pollution, livestock producers can be encouraged to locate further from cities and closer to croplands, where manure can be better utilized by crop farmers and human population densities are lower. Shifts in location can be achieved through a combination of zoning and land use regulations reinforced by taxes, incentives and infrastructure development. For example, in Thailand, high taxes were levied on poultry production within a 100 kilometre radius of Bangkok, and in less than a decade, the concentration of poultry production on the outskirts of Bangkok dropped substantially. Thailand's relatively well developed infrastructure no doubt contributed to this outcome (discussion in this paragraph is based on FAO, 2006b).

Another key problem facing the livestock industry is highly pathogenic avian influenza (HPAI). Farmers have lost production, and the negative effects were often compounded when consumer fears reduced demand and caused prices to decline. Because control of HPAI is a public good, governments need to take an active role in instituting early warning systems that provide for surveillance, diagnosis and control. Crucial components of these systems include sharing data, cooperating with other governments and international organizations and disseminating information, especially among small producers. It is also important to design appropriate compensation schemes that reduce the impact on small producers, while ensuring that culled birds are disposed of properly and that funds are not leaked to other uses. Compensation schemes can benefit those in need and provide incentives for farmers to help control HPAI.

Relative to other high value products such as livestock, poultry and dairy, production from capture fisheries (which account for slightly more than half of regional fish production) has grown relatively slowly in recent years. Production growth during the past ten years (1992–1994 to 2002–2004) was just 23 percent for the region, and in the developed economies, production declined 33 percent. Production also declined in E Asia during the past few years, as production in 2004 was 4 percent below its peak in 1999.

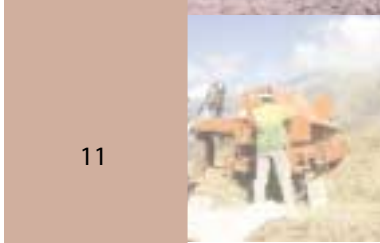
There are many concerns regarding the depletion of capture fisheries. The rise of industrial fishing has substantially increased fishing effort, and in many areas there has been "fishing down the food chain" as the proportion of larger, more valuable species (e.g. groupers, snappers, sharks) has declined in favour of an increased share of smaller, less valuable species (e.g. triggerfish, squids, octopus). These trends have often created a negative impact on small fishers that depend on the vitality of marine resources for an important part of their livelihood. An analysis of fishing effort, catch levels and profits in the Gulf of Thailand showed that reductions in effort would lead to recovery of fish stocks and increased production and profits. Because access to marine resources is difficult to regulate, both within and between countries, improved cooperation will be necessary to achieve such desirable outcomes. The experience in Europe's North Sea after two world wars shows that heavily exploited fish stocks can recover when released from heavy fishing pressure (for more discussion of these issues, see FAO, 2004b).











Slowing growth of capture production and high prices for fish have made diversification into and intensification of aquaculture attractive options for farmers in Asia and the Pacific, which is home to about 90 percent of the world's aquaculture production. In fact, production from aquaculture, including aquatic plants, more than doubled in the region between 1994 and 2004. Production nearly doubled in SSW Asia, and more than doubled in E and SE Asia. As a result, aquaculture accounted for 45 percent of total fish production in the region in 2002–2004, up from 30 percent in 1992–1994. The total value of the international fish trade exceeds that for any other agricultural commodity, but there are increasing demands on the quality and safety of traded seafood products. The region will have to greatly improve the quality of its exports in order to meet these demands.

Production of fuel wood, which accounts for 75 percent of wood use in the region, declined by a cumulative 1.7 percent between 1992–1994 and 2002–2004. Declines occurred in most subregions, although production increased slightly (by a cumulative 4.6 percent) in SSW Asia. Production of industrial roundwood declined by a cumulative 10.1 percent between the same two periods, with an especially large drop of 24.7 percent in SE Asia. Furthermore, the relative importance of natural forests as a source of industrial roundwood has declined, and the majority of official industrial wood production now comes from plantation forests. This shift is because large volumes of plantation wood have reached maturity in recent years in some countries, in addition to the fact that much of the highest value, easiest to log and most profitable natural forests have already been destroyed. Policies such as logging bans in natural forests in, *inter alia*, China, India, the Philippines and Thailand have also contributed to this shift. But illegal logging is widespread, and it is believed that actual harvests from natural forests are substantially higher than recorded in the statistics of several countries (for more discussion of these and other forestry issues, see FAO, 2003 and FAO, 2005b).

Among all regions of the world, Asia and the Pacific has the lowest level of forest cover, with forest area equal to about 19 percent of total land area. Between 1990 and 2000, there was a cumulative loss of forest cover in Asia and the Pacific of about 1.1 percent. This rate of loss was less rapid than in Africa or South America, and similar to that in North and Central America. Within the region, the highest rate of loss was in insular SE Asia, where a significant factor is clearance of land for agricultural purposes (often oil palm plantations). Loss of forest cover was higher for natural forests, with some compensation being provided by increases in plantation area. As a whole, the region is very close to meeting the World Conservation Union (IUCN) target of 10 percent of forests under conservation status, although there are still challenges in managing those conservation forests properly.

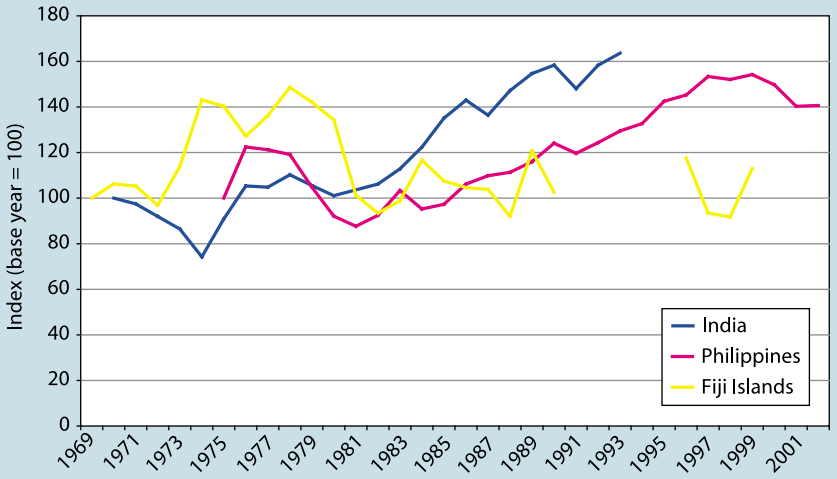
There have been some improvements in forest management in the region because of broadened realization of the consequences of deforestation, concerted national and international pressure, greater attention to social and land tenure issues and a range of specific policy measures to regulate and encourage better management. However, a range of challenges remain: areas under certification are small, the quality of governance is falling in many countries, plantation growth rates are low and devolution has often not had the desired effects. These challenges will need to be addressed in order to improve the livelihoods of those who depend on forests and ensure the sustainability of the resource base on which they depend.

Inputs to production

Labour, mechanization and land

Economic growth and improved infrastructure are allowing many rural dwellers to obtain better paying jobs outside agriculture, in turn leading to increases in agricultural wages. Agricultural wages, adjusted for inflation, increased in India by 63 percent from 1970 to 1993, while a similar increase was observed in the Philippines

Figure 5. Indices of trends in inflation-adjusted agricultural wages, selected countries



Sources of data: India (Fan, Hazell and Thorat, 1999), Philippines (BAS, 2004), Fiji Islands (Fiji Islands Bureau of Statistics, 2005)

Note: Data for India are rural wages. The first year of data for each country is set to 100. No comparisons of wage levels between countries are possible with this graph.

from 1981 to 2002. Such trends are taking place in many countries in the region, but not all. For example, agricultural wages were largely stagnant in the Fiji Islands from 1980 to 1999 (see Figure 5).

Because labour is the most important input in many production systems, rising wages (and reduced availability of labour) in many Asian countries are forcing farmers to mechanize operations, adjust cropping patterns and/or resort to migrant labour. In some cases, these changes can be extraordinarily rapid. In the Central Plain of Thailand, the quantity of labour used in irrigated rice cultivation declined from 57.5 person days per hectare in 1987 to just 8 person days per hectare by 1998, a decline of 86 percent in little more than a decade (Isvilanonda, Ahmad and Hossain, 2000). The reduced labour use was because of mechanization of harvesting operations and a switch from transplanting to direct seeding. Similarly rapid changes are occurring in southern China, where many farmers have changed from triple cropping (rice-rice-winter crop) to growing a single crop of rice in order to save labour.

Farmers often cannot afford agricultural machinery, so well functioning rental markets are crucial for the adoption of mechanical technologies. For example, while combine harvesting is widespread in the Central Plain of Thailand, only a small percentage of farmers actually own a combine harvester. Use by owners, plus rental through cooperatives or government agencies, collectively account for just 6 percent of use, with the remainder occurring in private rental markets (Dawe, 2005a). These rental markets tend to arise naturally in the absence of government restrictions.

Because many of the migrants to cities are young and male, the average age of farmers is increasing. Farmers are getting older not only in Japan and the Republic of Korea, but also in countries such as Thailand. Farm households are also becoming more likely to be headed by females. For example, in Thailand, the percentage of female-headed agricultural households increased from 12 to 27 percent between 1978 and 2003 (Dawe, 2005a). The increasing importance of women in farm management has also been documented in parts of India and other countries. The changing profile of farmers has important implications for irrigation managers and extension agents (among others), who must devise new strategies to communicate effectively with their new clientele.

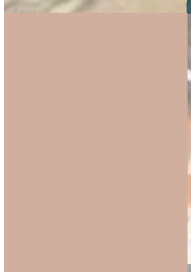













In wealthier countries such as Japan and the Republic of Korea, average farm size is increasing, but at a slow pace. For example, between 1956 and 2003, average farm size in Japan increased by just 0.60 hectares. The increase in the Republic of Korea from 1969 to 2002 was 0.58 hectares (Fan and Chan-Kang, 2003). In contrast, national average farm size is still decreasing in most Asian developing countries. For example, average farm size in Nepal decreased from 0.95 hectares in 1992 to 0.79 hectares in 2002, and similar trends occurred in Pakistan and the Philippines, among others, during the decade of the 1990s (FAO, 2006c). But farms are becoming larger in dynamic agricultural areas close to large cities, such as Suphan Buri province near Bangkok. From 1993 to 2003, total agricultural land area in Suphan Buri declined, but the number of agricultural households declined even more rapidly, as families migrated to Bangkok or assumed non-agricultural jobs in rural areas. Active land rental markets have played an important role in the land consolidation process in Suphan Buri (Dawe, 2005a).

Land loss to urbanization is increasing the pressure to raise crop yields, although the magnitude of this loss is not as large as commonly supposed. Much of the "loss" in cultivated land in China in recent years is for ecological purposes such as conversion of marginal sloping lands to forests, or because of shifting cropping patterns in favour of horticulture. Nevertheless, non-agricultural construction claimed a cumulative 1.1 million hectares between 1997 and 2002, equal to about 0.8 percent of cultivated land at the beginning of the period (Lu et al., 2005). In Indonesia, land devoted to house compounds and surroundings increased by 0.3 million hectares between 1996 and 2004, equal to about 0.65 percent of agricultural land in 1996 (raw data from BPS, 2002; BPS, 2006). Total farm area declined by 3 percent from 1991 to 2002 in the Philippines (raw data from NSO, 2006).

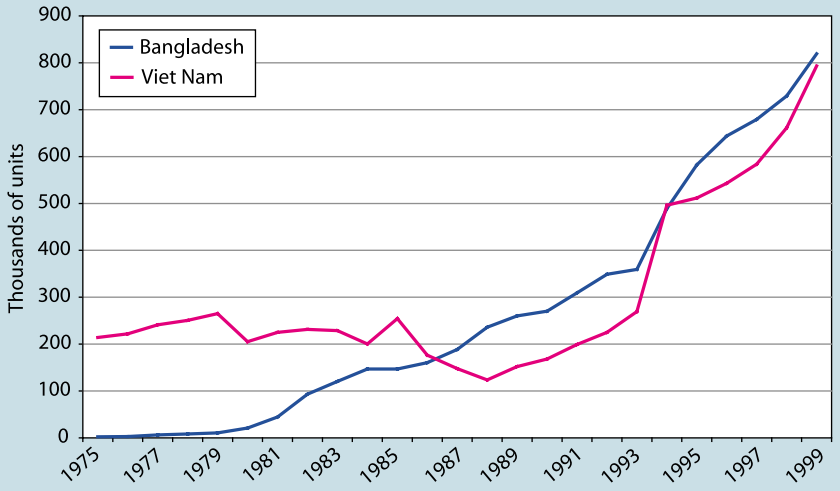
Water

Agriculture is the largest user of water in Asia and the Pacific, accounting for nearly 90 percent of consumptive use. But economic growth has created growing competition for that water, and use by households and industry will increase rapidly in the future. Non-irrigation water use may account for nearly a quarter of total use in the region by 2025. Projected growth in consumptive use by agriculture in the region to 2025 is essentially zero, while growth in cereal demand is expected to be more than 50 percent (Rosegrant, Cai and Cline, 2002). Thus, it will be crucial to improve water productivity.

Despite increasing competition for water, irrigated area in the region increased from 1993 to 2003 by 15 million hectares. As a result, many marginal production systems have declined in importance. For rice, harvested area under the deepwater and upland ecosystems (where yields are low) declined by 25 percent from the late 1970s to the early 1990s. During the same period, the share of rice area that is irrigated in Asia (excluding China, where nearly all rice is irrigated) increased from 35 to 44 percent (Huke and Huke, 1997). The increased prevalence of irrigation appears to have contributed to stabilizing aggregate rice production in Asia and helping to make the world rice market more stable than it was in the 1970s (Dawe, 2002). Nevertheless, the rate of increase in irrigated area was slower in recent years than in earlier decades.

The continued increases in irrigated area do not mean that large dams continue to be constructed at the same rates as in the past. Instead, much of the new irrigation uses pumps to extract water from subsoil reservoirs, drainage canals or creeks and streams. For example, in Pakistan, tubewells and other wells accounted for more than half of growth in total irrigated area from 1961 to 1981. From 1982 to 1995, all of the growth in irrigated area came from tubewells, with the area irrigated by other sources actually declining in absolute terms. Rapid growth in pump irrigation has also occurred in Bangladesh, India, Sri Lanka and Viet Nam, among other countries (Dawe, 2005b; see Figure 6).

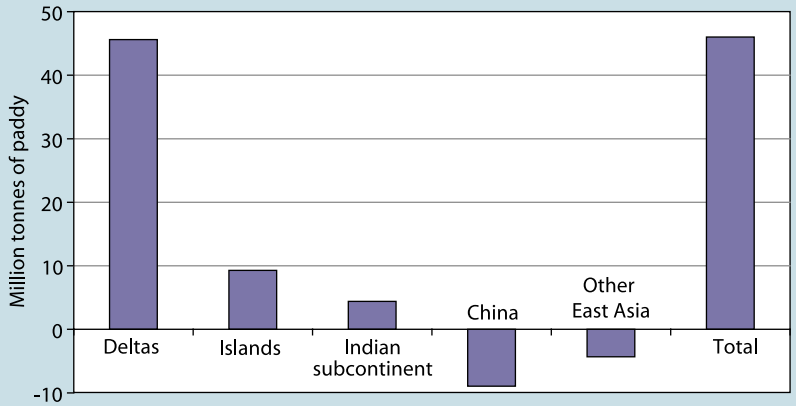
Figure 6. Number of operating tubewells (Bangladesh) or agricultural pumps (Viet Nam), 1975–1999



Sources of data: Bangladesh (Ministry of Agriculture, 2001), Viet Nam (General Statistical Office, 2001)

The rapid spread of pump technology that allows greater control over water resources has shifted the comparative advantage of rice production within the region. Nearly all the increases in Asian rice production during the past decade came from the delta areas of mainland SE Asia, Bangladesh and eastern India, all of which are well endowed with water (see Figure 7). Greater control over water can increase cropping intensity, as in the Central Plain of Thailand, and spur adoption of modern varieties, as in Bangladesh and eastern India. This shift in comparative advantage suggests that the delta countries, in particular those in mainland SE Asia where population densities are relatively low, will be an important future source of rice supplies for the world market.

Figure 7. Change in rice production, 1992–1994 to 2002–2004



Sources of data: FAO (2006a), FAORAP-RDES (2006)

Note: Deltas includes Bangladesh, Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam and the Indian states of Assam, Bihar, Jharkand, Orissa, and West Bengal. Islands includes Indonesia, Malaysia, Philippines, Sri Lanka and Timor-Leste. Indian sub-continent includes all of India except the five states mentioned above. Other East Asia includes Democratic People's Republic of Korea, Japan and Republic of Korea.

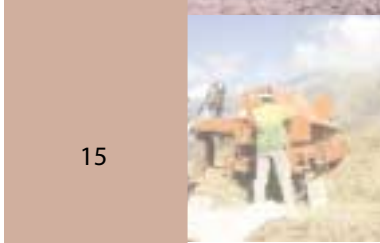
Pump irrigation creates natural incentives for farmers to be more careful in water management because they face a positive marginal cost for energy every time they irrigate, even if the water itself is free. However, government policies to subsidize electricity for pumping can reduce or eliminate this incentive. The money spent on such subsidies could usefully be redirected to public goods such as agricultural research,











education, rural roads, clean drinking water or immunizations. Lack of incentives to manage water carefully can also lead to resource overexploitation. Draw down of water tables that exceeds natural recharge is not necessarily a negative outcome (there are not many who would argue that oil or mineral resources should never be exploited), but it can create problems when it is so rapid that the change becomes difficult to manage, forcing farmers to abandon agricultural land because of deteriorating water quality and land salinisation when they do not have alternative sources of income.

While increased groundwater pumping has improved farmers' control over water and access to safe drinking water, groundwater resources in parts of Bangladesh, Cambodia, China, India and Nepal contain high levels of arsenic affecting drinking water quality. Irrigation with arsenic contaminated water can also result in accumulation of arsenic in the rice grain and the soil, but more research is needed in order to quantify the severity of these effects on food safety and food security.

Incentives for careful water management are less prevalent in gravity flow surface irrigation systems, as Asian farmers do not usually pay for such water, or pay a flat fee that is not dependent on the quantity of water used. These irrigation systems also typically fail to provide water in a reliable and flexible manner that can support farmers who are facing shortages because of competition from industry or who want to diversify cropping patterns, and conjunctive management of surface and groundwater is rare. Nevertheless, even in the absence of prices, some farmers living near urban areas are being forced to manage gravity flow water more carefully, as water is reallocated by administrative fiat away from agriculture and toward the industrial and household sectors. Farmers in the upstream ends of irrigation systems often impose a similar discipline on downstream farmers. However, in the absence of property rights or marginal water pricing, such reallocation can be arbitrary, and it often fails to maximize equity, economic efficiency or the productivity of scarce water (Rosegrant and Binswanger, 1994).

While surface water pricing for individual farms is not likely to be cost-effective given the small farm sizes prevailing in Asia, China has developed a system of pricing water volumetrically to groups of farmers. For large groups of farmers, this system may not provide proper incentives because of free-rider problems. As a possible solution, some irrigation systems in China temporarily assign property rights over water to individual water managers. They are allowed to collect water fees from farmers based on historical quantities used, but have to pay only for water actually withdrawn, which gives financial incentives to the manager to reduce water inputs (Wang et al., 2005).

Improved planning of water resource use, including incentives for surface water management, improved water control structures and capacity building for irrigation system managers, will be important given rising agricultural wages and the greater importance of non-farm income in household livelihoods. These two trends are reducing the desire of many farmers to participate in water management, as has happened in the famous *subaks* of Bali and many other irrigation systems. More attention to individual financial incentives that combine property rights and marginal water pricing, such as those being tested in parts of China, may lead to greater water productivity than does the standard approach to participatory irrigation management, where the financial incentives are more muted.

Fertilizer and pesticides

Over the longer term, consumption of nitrogen (N) fertilizer per hectare of crop area harvested has steadily increased in most of Asia. In E Asia, growth has been especially rapid, from 69 kg nitrogen (N) per hectare in 1978 to 155 kg N per hectare in 2002. Growth has also been rapid in SE Asia and SSW Asia, but much less than in E Asia. As a result, current levels of N use are much higher in E Asia than in SE Asia and SSW Asia. Consumption of phosphate (P) and potash (K) fertilizer has also grown rapidly, sometimes at rates exceeding the growth in N consumption. However, there are many

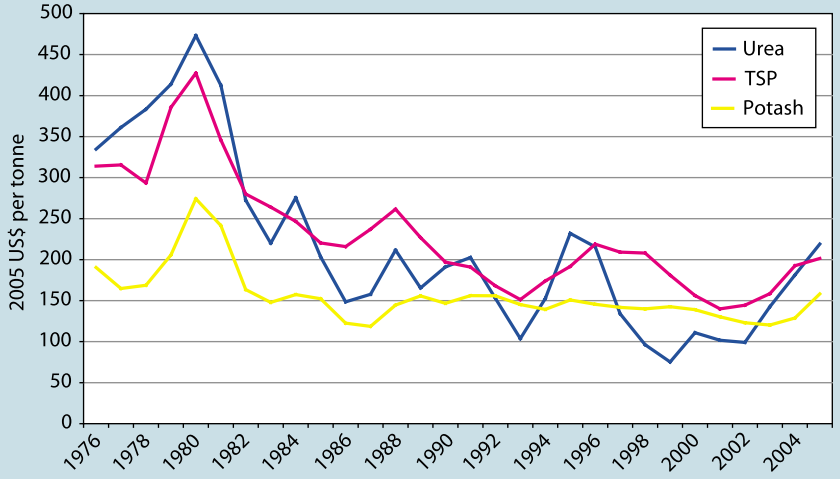
areas where soil nutrients are being mined, e.g. many intensive rice systems are exhibiting negative K balances (Dobermann, Witt and Dawe, 2004). In some cases, reversing these imbalances will lead to higher profits for farmers.

Inorganic fertilizers make a major contribution to lowering per tonne production costs of food. In turn, affordable prices for food increase caloric intake of the poor and reduce the prevalence of being underweight, which the World Health Organization recently cited as the most dangerous health problem in the world. Thus, fertilizer makes important contributions to improving human health. On the other hand, fertilizer runoff from agricultural production, especially N, contaminates water supplies. For example, Chinese rice farmers often use inappropriate types (ammonium bicarbonate instead of urea) and excessive quantities of N (180 kg per hectare or more), leading to low recovery efficiencies of 35 percent or less. In addition to reducing farmer profits, the lost N from crop (and livestock) production also contributes to the creation of "dead zones" in the East China Sea at the mouth of the Yangtze River (Li and Daler, 2004). Such dead zones can devastate fishing grounds and the livelihoods of those who depend on them for sustenance and income. Improving recovery efficiencies will require investments in human capital, both for extension agents and for farmers. In other parts of Asia (e.g. Cambodia, parts of the Philippines), it is probably beneficial to increase N use, but higher recovery efficiency will also be important in these areas.

In the wake of rising prices for petroleum and natural gas, urea fertilizer prices on the world market more than doubled from 2002 to 2005. World market prices for triple superphosphate (TSP) and potash also increased, but to a much smaller extent. Fertilizer subsidies are less common in Asia than they were twenty years ago, so rising prices have often been passed on to farmers, putting downward pressure on profits. The effects are smaller than commonly supposed, however, because costs of labour, land and management account for most of the gross value of production. For example, nitrogen fertilizer typically accounts for less than 10 percent of the gross value of rice production in intensively managed systems. Thus, a doubling of urea prices has the same effect on rice farmers' income as a 10 percent decline in the price of paddy.

Despite the recent surge, world market fertilizer prices in 2005 (after adjusting for inflation) for urea, TSP and potash were at similar levels as in 1995 (see Figure 8), and, in the case of urea and TSP, were much lower than in the early 1960s, on the eve of the Green Revolution. Compared with 1963–1965, prices for TSP in 2005 were 28 percent lower. In 2005 US dollars, urea prices were about $500 per tonne in the early 1960s, compared with $219 per tonne in 2005. It is not clear how future prices for petroleum,

Figure 8. Inflation-adjusted world market fertilizer prices, 1976–2005



Source of data: IMF (2006)

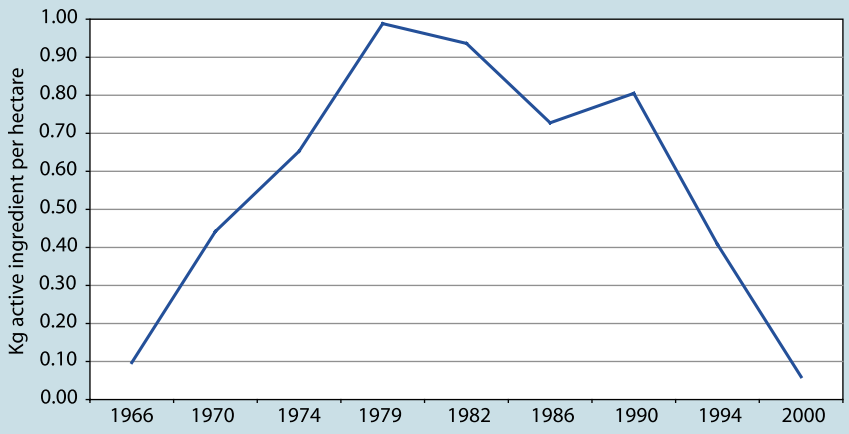
natural gas and urea will evolve. For example, after the second oil shock in 1980, urea prices declined 69 percent in real terms in just six years. Of course, that may not happen this time.

The recent rise in fertilizer prices may encourage some farmers to adopt organic agriculture. But the magnitude of this shift will likely be small because of inorganic fertilizer's small contribution to production costs. While organic agriculture occupies an important market niche, that niche is small. Adoption rates are less than one-tenth of one percent of arable and permanent agricultural land in nearly all developing economies in Asia and the Pacific (FAO, 2005c), suggesting that most farmers do not believe that organic agriculture can produce food at competitive costs. While production costs per hectare in organic agriculture are sometimes lower than in conventional agriculture, production costs per tonne of output are typically higher, which means that organic farming is profitable only if the output can be sold at higher prices. Indeed, prices for organic output are higher, but in developing countries, this higher price consigns such produce to niche markets. Furthermore, organic farming is ecologically sustainable only in a limited set of environments.

Because of problems with data availability, it is difficult to paint a general picture of trends in pesticide use. However, the perceptions of many farmers, extension service providers and even policy-makers regarding the magnitude of crop losses caused by insect pests are often greatly exaggerated (Heong and Escalada, 1997). Thus, it is important to minimize the negative health effects that pesticide (especially insecticide) applications can have on farmers, who often spray with little or no protection. This can be done by educating farmers in integrated pest management (IPM) as promoted by FAO, through innovative media campaigns and by strengthening regulatory enforcement. Plant breeding can also offer improved pest and disease resistance in new varieties.

One positive example is the steady reduction in insecticide use on rice in the Central Luzon rice bowl of the Philippines during the past twenty years. Application rates are now lower than before the Green Revolution (see Figure 9). During the same time, rice yields in this area increased. Another potential means of reducing insecticide use is Bt cotton, a genetically modified crop that is now being widely adopted in China and India, where collectively more than 70 percent of the region's cotton is produced. Reports appear to indicate that insecticide use with Bt cotton has fallen dramatically and that farmers' health has improved (Pray et al., 2002).

Figure 9. Insecticide use by rice farmers in Central Luzon, Philippines, 1966–2000



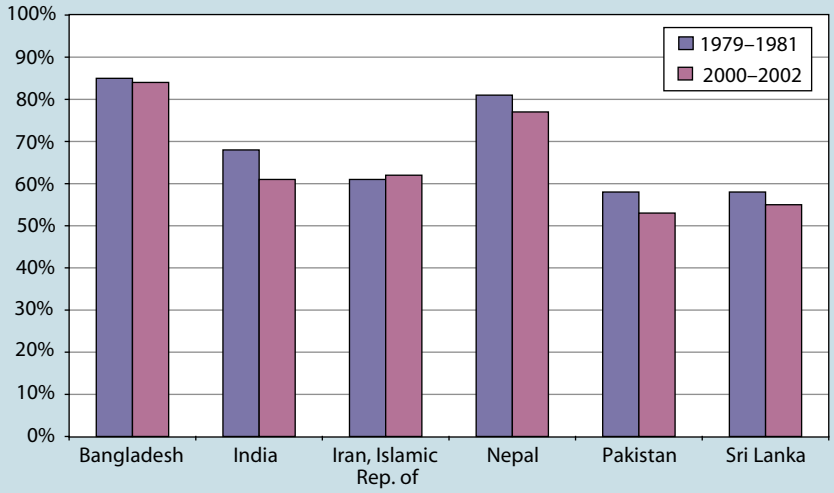
Source of data: IRRI (2002)

Food consumption and nutrition

Income growth leads to many changes in diets. Bennett's Law, a well-known regularity in the development process, states that the proportion of calories from starchy staple foods (grains, roots and tubers) in total calories declines as income increases. Because of the widespread economic growth in the region, such a decline has occurred in nearly all developing countries in Asia and the Pacific during the past 20 years (see Figures 10a to 10c).

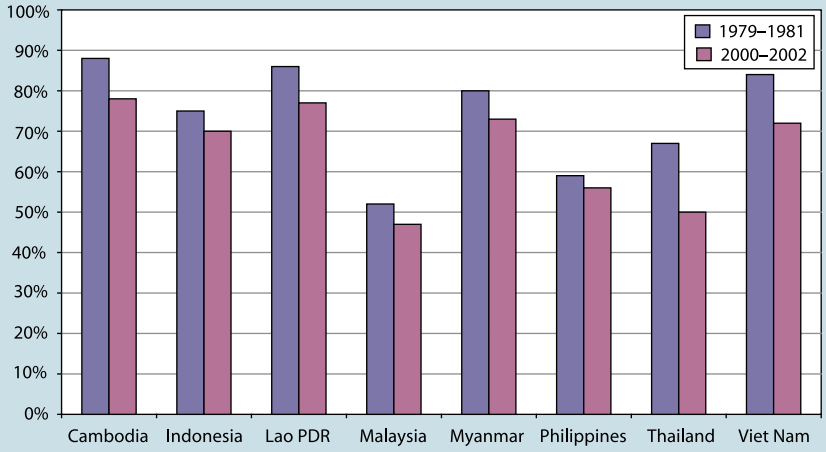
As caloric intake has increased and diets have diversified, anthropometric indicators (e.g. weight for age) have improved substantially for children under five in nearly all countries in the region since 1990. Data collected by the World Bank (2006) show that the prevalence of stunting declined from 32 percent in 1992 to 17 percent in 2000 in East Asia and the Pacific, while South Asia showed a decline from 62 percent in 1990 to 46 percent in 1999. The prevalence of underweight also registered declines in both of those two regions during the 1990s (18 to 14 percent in East Asia and the Pacific, 62 to 48 percent in South Asia). Although these indicators of nutritional status have

Figure 10a. Percentage of calories from starchy staple foods, South and Southwest Asia, 1979–1981 and 2000–2002



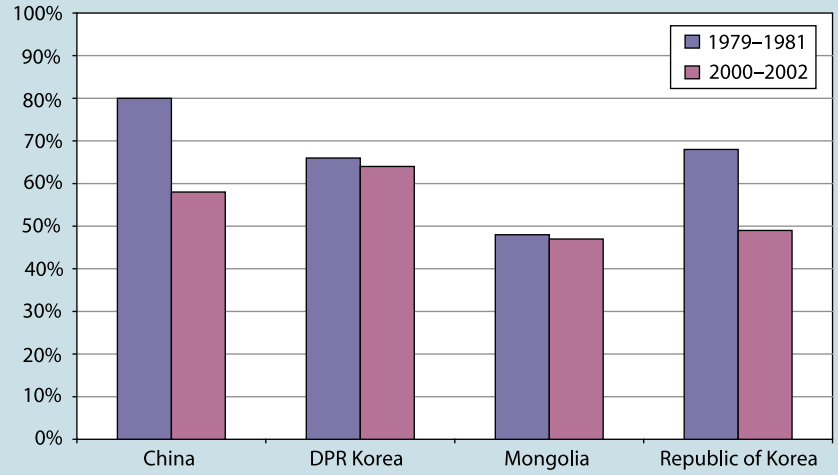
Source of data: FAO (2004a)

Figure 10b. Percentage of calories from starchy staple foods, Southeast Asia, 1979–1981 and 2000–2002



Source of data: FAO (2004a)

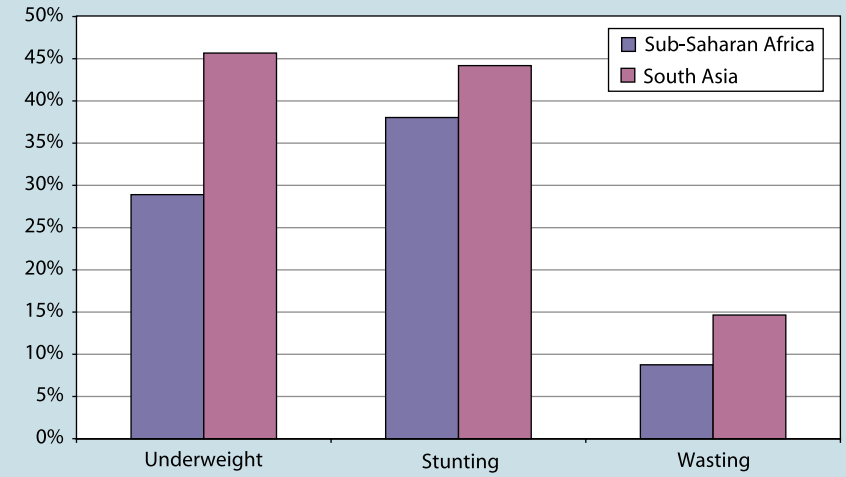
Figure 10c. Percentage of calories from starchy staple foods, East Asia, 1979–1981 and 2000–2002



Source of data: FAO (2004a)

improved in South Asia, the incidence of underweight, stunting and wasting in South Asia is much higher than anywhere else in the world, including sub-Saharan Africa (see Figure 11). For example, the most recent data from the United Nations Childrens Fund (UNICEF, 2006) indicate that underweight prevalence is 46 percent in South Asia compared with 29 percent in sub-Saharan Africa. In South Asia, females are also slightly more likely to be underweight (47 percent) than are males (44 percent). In addition to increased availability of food, both the education and status of women have been shown to make large contributions to the reduction of child malnutrition (Smith and Haddad, 2001).

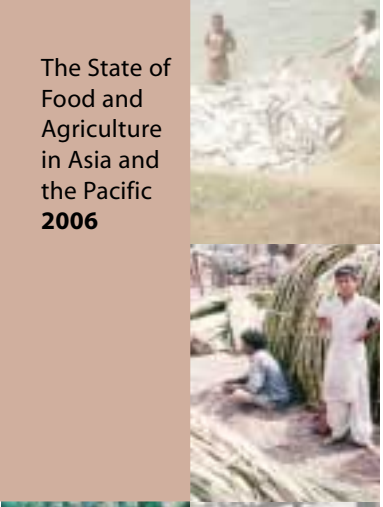
Figure 11. Incidence of underweight, stunting and wasting in children under 5, sub-Saharan Africa and South Asia



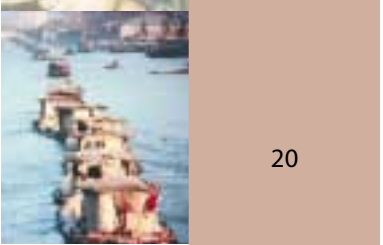
Source of data: UNICEF (2006)

Staple foods

As diets in the region are diversifying away from staple foods, diversification is also taking place within the category of starchy staples. For example, in southern India, the importance of rice is declining as consumption shifts toward wheat. But in northern India, where wheat is the traditional staple, demand is shifting from wheat to rice (Pingali and Khwaja, 2004). Similar trends are taking place in northern and southern China. In SE Asia, where rice is the staple food and wheat is not grown, a shift from rice







to wheat has been taking place in several countries. The process is well underway in Malaysia, the Philippines, Thailand and Indonesia, is just starting in Viet Nam, but has not yet begun in Cambodia, Lao PDR and Myanmar. Some of the shift from rice to wheat products is also because of increased convenience in terms of less preparation time, which is important as populations become more urbanized. Starchy roots are an important staple food in many Pacific Island nations, in addition to cereals. Per capita consumption of starchy roots has declined in several of these countries in favour of cereals since 1980, e.g. Samoa, Solomon Islands and Tuvalu.

Despite a shift towards rice in specific parts of India and China, per capita demand for rice is now stagnant at best in most countries of the region, and is declining in others. Per capita consumption in Japan was just 58 kilograms in 2002, compared with 111 kilograms in 1961. Sharp declines have also been experienced in Malaysia, the Republic of Korea and Thailand. Per capita rice consumption in China is well below its peak, and in India it has been essentially stagnant for a decade. These trends do not imply that Asian diets will become westernized in the sense that wheat replaces rice as the major source of calories. Even in Japan where per capita income is very high, rice still provides considerably more calories than wheat, and there is no doubt that the Asian preference for rice will remain for many years to come. On the other hand, the only factor now sustaining growth in rice demand in Asia is population growth, but this is slowing in most of the region. It is difficult to know how much longer aggregate regional rice demand will continue to increase, but at a minimum it is clear that it will not be a dynamic source of demand growth for farmers.

While the importance of rice is declining, especially for middle-class households, it is important for development efforts not to become overly focused on agricultural products with high value-added potential. Rice often provides two-thirds of calories for the poor and can account for 20 to 40 percent of total household expenditures (Dawe, 2000). Furthermore, in most countries in SSW Asia and SE Asia, the poorest of the poor are more often rice consumers than rice farmers. Because so much of the poor's income is spent on rice, it is important to reduce that burden by lowering the retail price. One study in rural Central Java in Indonesia (Block et al., 2004) found that when rice prices increased in the late 1990s, mothers in poor families responded by reducing their caloric intake in order to better feed their children, leading to an increase in maternal wasting. Furthermore, purchases of more nutritious foods were reduced in order to afford the more expensive rice. This led to a measurable decline in blood haemoglobin levels in young children (and in their mothers), increasing the probability of developmental damage. A negative correlation between rice prices and nutritional status has also been observed in Bangladesh.

Lower rice prices will be more sustainable if they come about through improvements in productivity that lower production costs per tonne and allow rice farmers to increase profits at the same time that consumers benefit from lower prices. Scientific research is critical to this process of increasing productivity and thus needs to be widely supported by the public sector. While agriculture in general needs public support, it is particularly important for rice because it is the most important commodity for the Asian poor. In addition to this socio-economic dimension, there is also a technical reason for public support: rice is a self-pollinating crop. Such crops tend to have a homozygous genome, which means farmers can save their own seeds without a substantial loss in yield for subsequent crops. This reduces the financial incentives for the private sector to breed new seeds and suggests a stronger role for the public sector. Hybrid rice, which is heterozygous, may change this equation in the future and allow for more private sector participation, but for the moment inbred rice still dominates the Asian landscape.

Dietary transitions

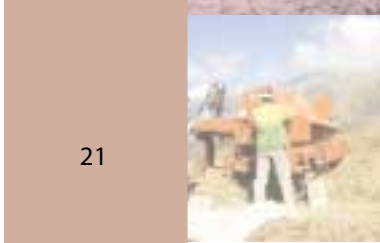
For most developing countries in Asia and the Pacific, daily per capita fat consumption has increased substantially since the early 1960s, and it continued increasing during the











1990s. Led by rapid growth in China, the largest increase from 1990–1992 to 2000–2002 among subregions was in E Asia. Gains were more moderate in SE Asia, SSW Asia and the developed economies, while per capita intake of fat actually declined in Central Asia and the Pacific Islands. It should be noted, however, that the level of fat intake in these latter two subregions, even after the decline, is still greater than in SE Asia and SSW Asia. Much of the increased fat consumption since 1990 has come from animal products, but a large proportion has also come from vegetable oils.

The percentage of calories in the diet coming from fat has increased substantially since 1980 in most countries in the region. It is an open question how far this trend will continue. For example, it reached a peak of 32 percent in Malaysia in 1990, but has declined since then to 25 percent. Even in developed Japan, it is 27 percent, much below levels in Australia, New Zealand and the United States of America (38, 32 and 37 percent, respectively). Thus, Asian diets may not become as fatty as those in Western countries. However, fat intake will probably continue to rise in SE Asia and SSW Asia, as the current percentage of calories coming from fat for most countries in these two subregions is less than 20 percent.

Protein consumption per capita increased substantially among developing countries in E Asia, SE Asia and the Pacific Islands since 1990. Gains in SSW Asia were small, however, and Central Asia experienced declines. Growth in protein consumption was generally slower than growth in consumption of fats. The percentage of protein that comes from animal sources increased from 1990–1992 to 2000–2002 in E, SE and SSW Asia, while it was essentially constant in Central Asia and the developed economies. In the Pacific Island nations, this percentage declined during that period. In the developed economies of the region, animal protein accounted for 58 percent of total protein in 2002, while it was less than half in all other subregions. The lowest percentage occurred in SSW Asia (20 percent), where poverty is particularly widespread and vegetarianism is practiced by many.

While the gap in protein consumption between the developing countries of Asia and the Pacific and developed nations is narrowing, this does not imply that diets are becoming homogeneous, as fish and seafood account for a much larger proportion of protein (relative to meat and poultry products) in Asia and the Pacific than in the rest of the world. Even in Japan, which is as wealthy as the major Western economies, fish and seafood supply 50 percent more protein than meat, while in Australia and the United States of America meat supplies eight or nine times as much protein as fish and seafood. Thus, while growth and globalization are causing profound transformations in diets, there is still tremendous heterogeneity across countries and it appears these differences will remain for many years to come.

With increased agricultural trade, it is more common today to find temperate zone fruits in tropical developing countries. While these fruits may be easy to find on supermarket shelves, they have not substantially affected the consumption patterns of most Asians in developing countries. In Malaysia (the wealthiest tropical member state in the region), bananas and pineapples contribute more than six times as many calories as do apples and grapes, and in the Philippines the ratio is about 80 to 1. On the other hand, tropical fruits have had more success in temperate countries. In Japan, imported bananas contribute almost as many calories as do apples, and in the United States of America they contribute more.

Marketing, trade and food security

During the past twenty years, several developments have combined to increase trade in agricultural products. Transportation and communication infrastructure has improved substantially in the region. For example, in India, there were 3.3 million kilometres of roads in 2002, up from 2.0 million in 1990. The cellular telephone network is expanding rapidly, allowing farmers and traders to communicate more easily about current trends in prices. In the Philippines in 2003, there were 270 cellphones per

thousand people, up from essentially zero a decade earlier. In Bangladesh, there were only 10 per thousand people, but many more have access through rental markets (all data in this paragraph come from World Bank, 2006). Rapid economic growth and urbanization, as discussed earlier, have increased the demand for more diversified diets that rely on specialized production from other localities. Tariffs and non-tariff barriers (NTB) on international trade are lower.

Domestic marketing

While international trade is important, most food production in Asia is directed to domestic markets, and most consumption comes from domestic food production (Japan and the Republic of Korea are exceptions to the latter generalization). Large changes are taking place in these domestic marketing systems, many of them associated with the rise of supermarkets. In Asia supermarkets are expanding into poorer neighbourhoods, smaller towns and rural areas, targeting low and middle-class consumers. The purchasing practices of the supermarkets are transforming agri-food markets in Asia with important implications for small farmers and rural communities. In Thailand, for example, about 10 percent of all farmers in 2003 were operating as contract farmers, compared with a negligible percentage a decade earlier (see the box "Can contracts help small farmers participate in more globalized food chains?" for more discussion of this increasingly common institutional arrangement). Reardon et al. (2003) estimates that supermarkets accounted for 30 percent of retail food sales in SE Asia in 2002, up from just 10 percent a decade earlier. Food procurement and distribution systems are becoming more centralized, although it is important to remember that most Asian farms remain small.

Can contracts help small farmers participate in more globalized food chains?

Contracts usually involve advance agreement between producers and purchasers on some or all of four parameters: price, quality, quantity (or area) and time of delivery (Singh, 2002). Specific contract terms and arrangements determine how the parties involved share the benefits, costs and risks of coordination. These may deal with timing of payment; mechanisms for setting price; provision of services and inputs; documentation requirements; quality and quantity of production; arrangements for assessing quality; and mechanisms for settling disputes and enforcing the contract.

Contractual arrangements vary widely in degree of formality and in structure. In Punjab, India there exist direct contracts between small farmers and companies as well as indirect contracts that also involve a state agency charged with coordinating and promoting contracts. The direct contract relationship was more beneficial for small farmers in Punjab because it resulted in better delivery of extension services and more reliable purchase of commodities (Kumar, 2005).

Contracts have many potential benefits for small farmers. For example, contracts can facilitate market access by lowering marketing risks and reducing transaction costs (Pingali, Khwaja and Meijer, 2005). One specific instance involves citrus exports to India from Bhutan. The model relies on intermediaries who receive advance funding from exporters to procure oranges from small farmers (Tobgay, 2005). As soon as citrus trees blossom, collectors provide advance credit to their producers in exchange for assured access to their orange harvests at a fixed price, based on the blossoms. The collector oversees the harvest, transport and marketing of the products and bears all associated risks. In the absence of such arrangements, small farmers would be deterred from citrus marketing by the labour costs of harvest and the dangers of spoilage caused by poor road and market infrastructure.

When contracts fix output prices in advance, they may allow farmers to produce risky high-value crops that they otherwise would avoid becuase of large price fluctuations. These arrangements can also help to ensure a reliable supply for companies that have made

investments in these crops (Simmons, Winters and Patrick, 2005). About two-thirds of contract farmers in Suphan Buri, Thailand have a fixed output price, so it is a relatively common practice, at least in this locale (Dawe, 2005).

Contracts can also help small farmers access inputs, credit and other services that often constrain production. Companies often provide inputs to farmers with whom they are contracting at below-market prices or at cost. Chambal Agritech in Punjab, India does this for its potato farmers. Contracts can help farmers receive technical support and extension services, often of better quality than state offered extension services (Kumar, 2005). Contracts can also facilitate access to credit. In Kazakhstan, credit was the primary reason for small cotton farmers to enter contractual arrangements (Swinnen, 2005).

Contracting can lead to increased farm productivity and quality of output, as has been the case throughout the former Soviet Union (Swinnen, 2005). In Punjab, farmers who signed contracts with Pepsi produced potatoes with lower production costs, fewer pesticides and less fertilizer (Kumar, 2005). Benefits arising from contract farming often spill over to participants' non-contract fields and to neighbouring farmers. Farm assistance programs created for contract farmers have been replicated by other companies and by state agencies because of their success (Swinnen, 2005).

Corporations often prefer to deal with larger farmers because of the fixed costs of transacting with each supplier (Pingali, Khwaja and Meijer, 2005). There is abundant evidence that small farmers are less likely to enter formal contracting arrangements and are less likely to receive favourable terms (e.g. a fixed output price) (Singh, 2002). In Punjab, India, the average farm size under contract farming exceeds the average operational farm size by a factor of three (Kumar, 2005). Although contract farming has risen to the point of including 9 percent of farmers in Suphan Buri, Thailand, very small farmers are slightly less likely to enter contracts (Dawe, 2005).

However, there are also many reasons for and evidence of corporations contracting with small farmers. Small farmers may be able to provide better quality assurance at a lower cost of enforcement. Thai Fresh United relies on many small producers, who use labour-intensive techniques, to supply high quality herbs, spices, vegetables and fruits that meet the company's strict requirements (Boselie, Henson and Weatherspoon, 2003). Purchasers can also diversify their supply base and stabilize their supply stream by contracting with small farmers (Swinnen, 2005).

It is often difficult for small farmers to meet quality, safety and delivery standards mandated by purchasers. In Viet Nam, modern food distribution outlets have introduced the practice of rejecting produce from suppliers on the basis of its appearance and safety (Cadilhon et al., 2006). Compliance with purchaser requirements can require investments in technology, which may serve as a barrier for small, cash poor farmers (Dolan, Humphrey and Harris-Pascal, 2001; Reardon and Berdegué, 2002). Although supermarkets are usually reliable in paying farmers, they typically delay payment for several weeks. Some small farmers may have difficulty bridging this gap.

It is important that quality assessment and contract enforcement processes are fair to small farmers. In Kazakhstan, cotton farmers complained that their produce was assessed unfairly by purchasers, who both judged quality and set prices (Swinnen, 2005). Simple solutions, such as provision of rural marketplaces, can facilitate more effective third party monitoring. For example, many rice farmers complain not of price setting but that the weighing practices of purchasers are unfair. The government in Thailand responded by constructing rural wholesale markets for paddy rice. Private investors have followed the government's lead and also constructed these wholesale markets; to protect farmers, their weighing scales are subject to unannounced inspection at any time.

One possible method for small farmers to overcome some of the disadvantages noted above is to form production and/or marketing cooperatives. Cooperation can increase bargaining power, allow for economies of scale and lower marketing and negotiation costs. However, farmer cooperatives are not a panacea, as such horizontal coordination introduces

a new set of transaction costs associated with group decision-making. In some cases, their success is unduly dependent on the charisma, intelligence and altruism of one leader. Other possibilities for horizontal coordination also exist. For example, farmers may voluntarily cede operational control over their land to large operators, while maintaining ownership and collecting land rent, as has happened in Muda, Malaysia. Large farmers can also serve as intermediaries between small farmers and supermarkets by subcontracting for some of their production needs.

While small farmers have some disadvantages that hinder participation in these new more centralized supply chains, it is important to realize that small farms still dominate Asian agriculture, in contrast to the large farms in Latin America. Farm sizes continue to get smaller in the developing countries of the region, and governments often impose restrictions on maximum farm sizes that are not likely to be eliminated anytime soon. Thus, if supermarkets hope to achieve large market shares in Asian food retailing, they will need to learn how to deal with small farmers, either directly or indirectly.

The ultimate policy goal in helping small farmers should be to sustain human livelihoods, not farm livelihoods per se. Investment in human capital in rural areas can allow small farmers (and their children) to take better advantage of emerging opportunities, and improved infrastructure can lower marketing constraints. Setting and enforcing official standards for quality and safety assessment will improve the fairness of market participation for small farmers. In general, interventions to help small farmers are likely to be most effective if they create a good business environment, as opposed to providing specific services via parastatal institutions.

Large firms can bring needed investment capital, working capital and knowledge, but they may be reluctant to deal with small producers because of high transactions costs. The development of suitable marketing intermediaries that can utilize the comparative advantages of small farms (e.g. in crops that require labour-intensive production) will be important to bridge this gap. Fundamental changes in small farms need to occur in order for them to provide what supermarkets demand in terms of quantity and quality. They often have to comply with certification requirements that are more stringent than official food safety standards. Meeting the demands of procurement officers requires skills and technology that small farmers often do not have. They may have to invest – individually or collectively – in irrigation, greenhouses, trucks, cooling sheds and packing technologies. Farmers need to be able to sort and grade their produce, meet timing and delivery requirements and document their farming practices. In addition, they should be able to bridge the gap between delivery and payment, which presupposes access to credit.

Downstream, the changes have potential benefits for consumers in terms of achieving greater variety, reduced seasonality and lower prices of food products. In terms of food safety, tracing the source of food contamination has become easier, but there is also a risk that the entry of unsafe food into the food chain is rapidly distributed. Supermarkets are raising food quality standards, but there is still an important regulatory and oversight role for governments.

International trade

As regards international trade, many countries have lowered agricultural tariffs and non-tariff barriers, and applied tariffs in most countries are well below the maximum allowed under World Trade Organization (WTO) agreements. Many tariff reductions have been unilateral, and bilateral/subregional agreements have further lowered tariffs for selected trading partners. Dowlah (2003) found that the unweighted average tariff in Bangladesh for agricultural products declined from 76 percent in 1991–1992 to 34 percent in 1998–1999, with similar trends in import weighted tariffs and the effective rate of protection. China lowered its most favoured nation (MFN) tariffs on agricultural products from 46 percent in 1992 to 19 percent in 2001, while India lowered its MFN

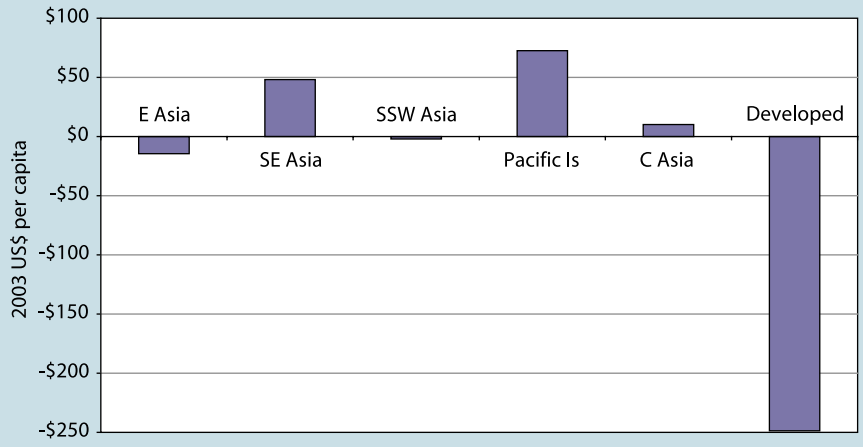
tariffs from 66 percent in 1990 to 42 percent in 2001 (FAO, 2005a). Non-tariff barriers have also been lowered in many countries. Despite the increased openness to trade, some sensitive commodities remain subject to substantial protection.

One prominent subregional agreement is the Association of Southeast Asian Nations (ASEAN) Free Trade Agreement (AFTA). The first six members of ASEAN have already cut intra-ASEAN tariffs to 5 percent or less on nearly all items (rice being a prominent exception), and the other four members are due to follow by 2010 or sooner. Most non-tariff barriers are also being eliminated. AFTA is further expanding to include China, Japan and the Republic of Korea (AFTA plus 3). Other subregional agreements include the South Asia Free Trade Agreement (SAFTA) and the Pacific Island Countries Trade Agreement (PICTA), and there are many bilateral trade agreements as well (e.g. between Thailand and China for fruits and vegetables; see Bilaterals.org, 2006). Generally speaking, freer trade is beneficial, but changes in trade policy create both winners and losers. It is important that the interests of the poor be fully considered in designing and implementing agreements (see the feature on "Trade liberalization, poverty and food security").

Because of improved infrastructure, changes in demand and more open trade policy, international agricultural trade today is substantially more important throughout Asia and the Pacific than it was in the early 1960s. During the past ten years (from 1994 to 2004), trade volumes (both imports and exports) have continued to grow in nearly all member states. Given the rapid growth of Asia–Pacific economies, much of the increased agricultural trade has been within the region. In 1987, 38 percent of agricultural exports from Asia–Pacific economies had destinations elsewhere in the region, but by 2003 this percentage had increased to 48 percent. The increase for agricultural imports has been slower. In 2003, 41 percent of all agricultural imports by regional economies came from within the region, compared with 38 percent in 1987 (data from WITS, 2005).

The Asia-Pacific region is a net importer of agricultural products (including forestry and fisheries), as it has been since the middle of the 1960s. SE Asia is the main surplus producing subregion, with a trade surplus in 2003 of about $26 billion. The Pacific Islands and Central Asia are also surplus producers, while East Asia, SSW Asia and the developed economies are net deficit subregions (see Figure 12). The largest net importer is Japan, with a deficit in 2003 of nearly $57 billion. In fact, excluding Japan, the Asia-Pacific region is a net surplus region (data from WITS, 2005).

Figure 12. Agricultural trade surplus or deficit per capita by subregion, 2003

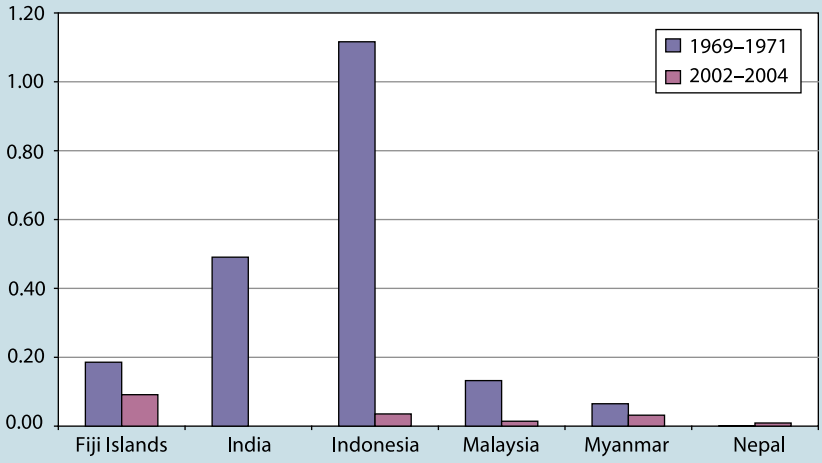


Source of data: WITS (2005)

Note: Agricultural trade as defined here includes trade in forestry and fisheries.

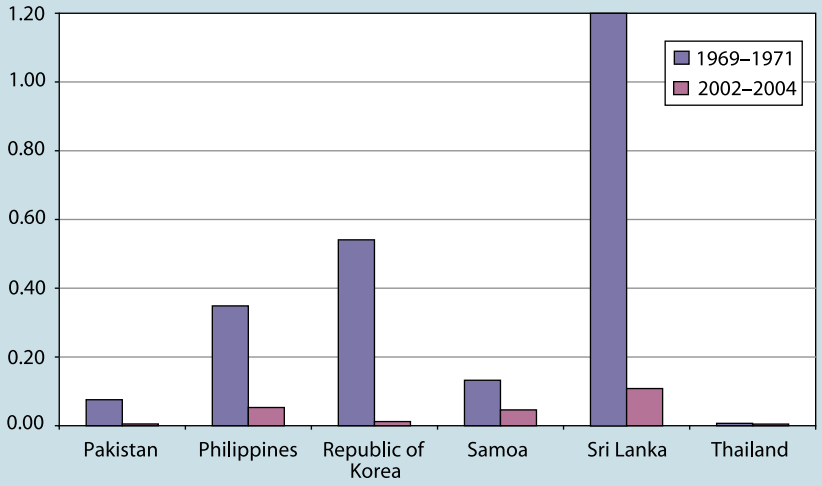
Despite the deficit status of some countries, cereal imports are now less than 10 percent of foreign exchange reserves in most Asian countries, suggesting foreign exchange constraints are not a serious problem in most circumstances (see Figures 13a to 13b; ratios exceeding 100 percent in some particular years were not uncommon 35 years ago). Per capita availability of calories exceeds the minimum dietary energy supply in all member countries for which reliable food balance sheet data are available, with only one exception. Thus, most Asian countries have achieved food security at the national level.

Figure 13a. Ratio of the value of cereal imports to foreign exchange reserves, various countries, 1969–1971 and 2002–2004



Sources of raw data: FAO (2006a), IMF (2006)

Figure 13b. Ratio of the value of cereal imports to foreign exchange reserves, various countries, 1969–1971 and 2002–2004



Sources of raw data: FAO (2006a), IMF (2006)

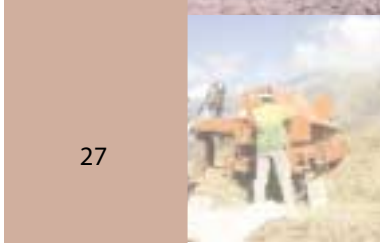
Note: Ratio for Sri Lanka was 2.02 in 1969–1971. The scale was modified in order to show changes in other countries more clearly. All developing countries in the region for which data are available are included in either Figure 13a or 13b.











Despite the impressive progress in national food security, many households in the region are still food insecure. Household food security depends on access to food, in particular incomes and food prices. On both of these fronts, the situation has improved considerably during the past twenty years. The income of the poorest quintile of the population has increased in most Asian countries (Timmer, 2004; absolute income gaps between rich and poor have widened considerably at the same time) and international prices of cereal crops have declined, while increased productivity has allowed farmers to reap gains that offset the fall in prices.

Because rice is by far the most important source of calories for those Asians who are still food insecure, rice prices are a critical determinant of household food security. Fortunately, prices on the world rice market in 2003–2005 were 74 percent lower, in inflation-adjusted US dollar terms, than they were in 1979–1981. This improvement is because of lower unit costs of production, as supply has increased faster than demand. For individual countries, world prices are also much lower in domestic currency terms (adjusted for inflation), because real currency depreciation against the US dollar has been much less than the fall in dollar denominated rice prices. Given appropriate policies, the decline in world prices gives the poor increased opportunities to access cheap food.

The world rice market is also more stable today than it was in the past, making it a more reliable source of supplies. The increased stability of prices is because of more stable production and the re-emergence of market oriented exporting nations (e.g. Thailand, Viet Nam) that must be reliable suppliers to the world market in order to ensure the health of their domestic rice economies (Dawe, 2002). As an example of this improved stability, world market prices did not increase in the aftermath of the 1998 El Niño, which led to large production shortfalls in Indonesia and the Philippines and coincided with further losses caused by the "flood of the century" in Bangladesh. World prices did increase about $80 per tonne from 2003 to 2005, but this was a small increase compared with increases in previous decades. In addition, this increase to some extent was simply a recovery from the very low prices prevailing in 2001 to 2002, not just a decline in China's net exports. Prices are still well below the level of ten years ago. While world market instability does not threaten the availability of supplies, it is probably not desirable for all world price fluctuations to be passed on to domestic consumers and producers. Thus, there is still a need for cost-effective national policies to stabilize domestic prices. Such policies should aim to stabilize rice prices but not increase the long-term average, because the poorest of the poor are often rice consumers.

The effects of agricultural subsidies in developed countries on household food security are conflicting. Because subsidies encourage production, they lower market prices, hurting farmers. On the other hand, those lower prices help poor consumers. Thus, any reduction of subsidies will have mixed effects on the poor in the short term, depending on the specific commodity and country. In the longer term, it is even more difficult to ascertain the effects, as removal of subsidies might spur innovation and further productivity gains, as seems to have happened in New Zealand (Federated Farmers of New Zealand, 2002). Such innovation will put downward pressure on prices and hurt farmers that do not increase productivity or add value through downstream processing.

Development, science and markets for disaster risk reduction

Natural disasters that occur when vulnerable communities are affected by droughts, floods, cyclones, forest fires, landslides, earthquakes or tsunamis are accompanied by tremendous suffering around the world. The Asia–Pacific region is especially vulnerable; nearly 90 percent of the people affected by natural disasters since 1970 live in this region. On average each year about 100,000 people are injured or killed in Asia by natural disasters, and over four million people lose their homes (data in this paragraph come from OFDA-CRED, 2006). Especially in poor rural areas, these disasters aggravate food insecurity and retard or even reverse the development process. People living on the margin cannot easily cope when disaster strikes, and they must often go into debt after selling or losing family assets. Once assets are stripped, food consumption declines. Mothers and children are usually the most severely affected, leading to malnutrition, disruption of cognitive development and increased child mortality. One-time events can thus create permanent problems.

Focus on the long-term fundamentals

A large number of committed government and non-government organizations, individuals and international agencies are involved in relief efforts when disaster strikes, contributing money, goods and/or time. However, it is important to remember that the first lines of defence against all types of natural disasters should be long-term poverty alleviation, improved infrastructure and investment in human capital. Wealthier people who are in better health and have financial reserves and more durable houses are obviously better able to withstand the effects of natural hazards, so reducing poverty is the most important step for reducing vulnerability to disasters.

Besides poverty reduction, adequate and durable infrastructure is also critical, both in terms of allowing relief supplies to arrive in disaster areas and in terms of accelerating the development process in order to reduce food insecurity and poverty. For example, an Oxfam report noted that the price of timber had tripled in Aceh a year after the tsunami, making it more difficult to build new houses to replace those destroyed by the tidal surges. This outcome could have been avoided with good infrastructure (possibly accompanied by temporary changes in trade policy) that allowed integration with other timber markets.

Furthermore, because agriculture is dependent on the climate and thus risky, it is also important that farmers diversify into non-farm activities that can provide income when households are adversely affected by droughts or floods. Studies have shown that farmers' ability to diversify their income sources is at least in part affected by educational levels (e.g. van de Walle and Cratty, 2004), so more and higher quality education is important for reducing vulnerability to natural disasters.

While it is difficult to overstate the importance of poverty reduction, infrastructure, education and diversification in the battle to reduce vulnerability to disasters, it will take many years to achieve these goals even under the most optimistic of scenarios. During this interim, many other short and medium-term measures are also critical in order to reduce the suffering associated with disasters. Emergency relief will always be needed to some degree, but there are many solutions that will reduce the need for emergency relief response.

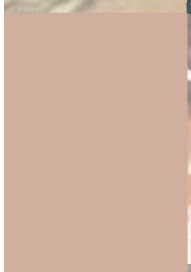













Be prepared

One rupee of prevention is worth three rupees of cure

Preparation for the next tsunami, both technically and socially, is undoubtedly important. Nevertheless, it may be difficult to sustainably train local communities in disaster preparedness if the next tsunami is not experienced for several generations. Being prepared for droughts or floods, however, could be more successful (and more valuable) because these events recur with a much higher frequency.

Compared with geological (e.g. earthquakes, tsunamis) and biological (e.g. insect infestations) disasters, hydro-meteorological disasters (e.g. floods, droughts, windstorms) are by far the most frequent disasters in Asia, as in the rest of the world, and they account for most of the damage to the food and agricultural sector. Hydro-meteorological disasters also affect a larger percentage of the population in Asia than other types of disasters (UNISDR, 2006). For example, the 2002 drought in India caused a 19 percent drop in foodgrain production, compared with what was expected based on trends. More than 300 million people across 18 states felt its impact (IRRI, 2005). The June to August floods in Bangladesh in 2004 caused an estimated $7 billion in damages (OFDA-CRED, 2006).

Bihar, India's poorest state, contains eight river basins that cause major flooding every year in the monsoon season. Because of these rivers, Bihar contains more than half of the Indian population affected by floods. In Dharbanga District, the flooding has become worse during the past 30 years because of the construction of embankments to protect nearby towns. A project initiated by Tearfund and the Discipleship Centre, non-governmental organizations from the United Kingdom and India, respectively, has helped to reduce vulnerability by implementing a range of measures (Venton and Venton, 2004). Raised hand pumps were installed that stay above flood levels so as to safeguard water supplies and reduce repair costs after the floods recede. Boats were purchased for use in evacuations, and embankments that serve as evacuation routes were raised. Human capacity building was also enhanced by establishing disaster management teams, in addition to the creation of a village development fund. These simple measures were not able to reduce crop losses caused by the floods, but they were able to reduce livestock losses, in addition to many other benefits. Most important, even though some benefits were omitted because of difficulties in attaching monetary values to them, the benefit to cost ratio for the project exceeded 3 across a range of sensitivity analyses. This finding suggests that communities, governments and donors could usefully spend more money on disaster prevention.

Drought forecasting

Many have rightly recognized that a better tsunami warning system in the Indian Ocean could have saved tens of thousands of lives in December 2004. But recent scientific advances mean that better warning systems are also possible for other natural hazards, such as drought events caused by the El Niño-Southern Oscillation (ENSO) phenomenon. ENSO is a major cause of interannual climatic variability in much of Asia, and various studies have shown it to have large effects on food production in India, Indonesia, the Philippines and Sri Lanka, especially rice (Selvaraju, 2003; Naylor et al., 2001; Falcon et al., 2004; Zubair, 2002). Reasonably reliable forecasts of major events can now be made in advance of farmers' planting decisions, affording the opportunity for farmers to change cropping patterns, use varieties more tolerant of drought or purchase pumps to tap alternative water supplies such as groundwater. Water resources managers could use the forecasts to improve water allocation across competing sectors, for instance by defining better allocation rules that are contingent upon climate forecasts. Forecasts can also used to better plan for any necessary food imports. But for these coping mechanisms to improve people's lives, it is necessary to develop a national planning process that explicitly incorporates such forecasts (including their uncertainties) and effectively communicates the results to local decision-makers.

Utilize scientific knowledge in designing interventions

Land salinity and the tsunami

A solid understanding of scientific principles and facts is often important for designing effective disaster relief or prevention programs. For example, when the tidal surges of the tsunami brought seawater washing over the land, there were widespread alarmist reports regarding the impact of saltwater on the soil and how reclaiming the land would take many years. While it is true that reclaiming soils in arid countries that have become salinised because of irrigation practices or natural accumulation can take years, the situation is very different in the case of sea flash floods, where the nature and duration of flooding are very different. Further, in the tropical humid conditions prevailing in tsunami-affected areas, there was more opportunity for leaching of the salt by monsoon rains and/or irrigation with fresh water. Indeed, just a few months after the tsunami, FAO surveys showed that more than two-thirds of the affected arable land throughout the region had been cleaned of salt through precipitation and irrigation (FAO, 2005d). Such knowledge is clearly important for making sure that the massive funds generously provided by donors are used to help the tsunami victims in a cost-efficient manner. For example, better use of such knowledge would have directed money to areas where leaching and irrigation was less likely to be effective, with the funds being used for the development or repair of needed drainage systems.

Deforestation and large-scale flooding

As another example, many government decision-makers, international aid groups and media are often quick to blame large scale flooding on deforestation caused by small farmers and loggers. However, there is no scientific evidence linking such flooding to deforestation (FAO-CIFOR, 2005).[1] Such misguided views from well intentioned organizations have on occasions prompted governments to make life harder for poor farmers by driving them off their lands and away from the forests, or down the slopes into the plains, while doing nothing to prevent future flooding. For example, catastrophic floods in China, Thailand and the Philippines prompted logging bans that put many people out of work. While planting trees and protecting forests can have many environmental benefits (including minimizing runoff that causes localized flooding), preventing large scale floods is not one of them. Even at the local level, the flood-reducing effects of forests are heavily dependent on soil depth, structure and saturation levels, not exclusively on the presence of trees.

If deforestation was causing floods, the large amount of deforestation during the past century would be expected to create an increased frequency of major flood events, but the frequency of such floods has remained the same over the last 120 years, going back to the days when lush forests were abundant. The sharp increase in the economic and human losses attributed to flooding is caused not by deforestation but mainly by the simple fact that more people are living, working and generating more wealth in flood plains. Thus, many floods that previously would have been only minor events are now major disasters.

Policy-makers and development agencies have a responsibility to pursue solutions that are rooted in the best available science, and it is important to acknowledge that objective scientific research does not provide easy answers when it comes to understanding flooding. We need to stop blaming people who live and work in and around forests for floods that affect entire river basins and instead consider the effect of a wide variety of land-use issues, which can in some instances include poor logging techniques. For example, draining and developing wetlands and damming and altering stream flows can make floods worse. However, this is not to say that development of wetlands and dams are major causes of all floods, either. Every situation is different, and

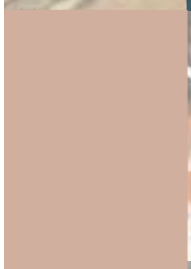
[1] As with large-scale flooding, the causes of localized flooding are complex. Localized flooding is not discussed here.










solid scientific theory and evidence must be considered in order to find efficient solutions that take due account of the multiple uses of river basins in specific contexts. An integrated approach to watershed and floodplain management combines land-use management in the uplands with land-use planning, engineering measures, flood preparedness and emergency management in the lowlands. Crucially, it considers the social and economic needs of communities living in both the mountainous watersheds and the river basins.

Breeding and improved crop management for abiotic stress

When Robert Chandler, the first Director-General of the International Rice Research Institute (IRRI), was asked about 40 years ago what was the best technology available for rainfed rice, he replied simply, "irrigation." While that statement is still true today, scientific and technological advancements now provide another potential set of answers as well, ranging from breeding better varieties to improved crop management.

Contrary to common perception, many advances in biotechnology are possible without transferring genes across species. New tools of biotechnology (e.g. marker-assisted selection, molecular breeding, deletion mutants) and new breeding strategies are allowing for the selection of varieties with improved drought tolerance that also give high yields under well watered conditions (many popular varieties are unable to perform well under both conditions). Rice breeders are also developing a new type of rice, aerobic rice, that combines the ability of some traditional but low-yielding varieties to grow in dry soils with the fertilizer responsiveness and yield potential of modern high-yielding varieties. Improved crop management can also help farmers to use water more efficiently. To give just one example, dry direct seeding, whereby the seeds are planted into non-flooded fields, can help farmers to avoid late season drought and also accelerate the cropping calendar, allowing for multiple cropping.

Problems of excess water are also amenable to solution using the tools of biotechnology. Scientists have recently used molecular markers to incorporate a gene for submergence tolerance into a popular Indian rice variety *(Swarna)*. This new approach allowed the creation of a variety that is identical in all respects to the pre-existing variety, with the exception of one gene. This task would have proved difficult, if not impossible, using only conventional breeding approaches. Scientific research to develop techniques and products that turn unfavourable production environments into more favourable ones needs to be given more financial support.

Use markets when appropriate

Increased use of world food markets to stabilize food prices

While world commodity markets are subject to price fluctuations, they can also provide badly needed supplies in times of need. Increased use of world food markets can also save money by reducing the need for stockpiling large quantities of supplies that, if they are not needed to respond to a natural disaster, often deteriorate after prolonged periods of storage. Rice is the staple food of most Asians, and the world rice market, once the most volatile of world grain markets, is now much more stable than it was between the mid-1960s and early 1980s, primarily because of more stable production and an increased commercial orientation of major rice exporters (Dawe, 2002).

Against this backdrop, Bangladesh liberalized rice imports in April 1994 by removing non-tariff barriers and allowing the private sector to import subject only to a tariff. India also liberalized its rice trade in late 1994, relaxing its ban on exports of ordinary rice and allowing more private sector participation (Del Ninno and Dorosh, 2001). This pair of liberalizations paved the way for a surge of imports (about 2.25 million tonnes) by Bangladesh in 1998 in response to the "flood of the century." Most of these imports came in small shipments from India and were carried out by the private sector on both ends. The timely imports served to stabilize domestic prices; absent these imports, it has been estimated that rice prices in Bangladesh would have risen by 40 to 60 percent,

which would have resulted in serious hardship and food insecurity for millions of poor people (Dorosh, 2001).

Many are sceptical that poor countries can rely on world markets for food, but the ratio of cereal imports to foreign exchange reserves is now typically 10 percent or less in Asia, much less than it was 40 years ago (when it often exceeded 100 percent). Thus, even in times of exceptional need, world market instability or lack of foreign exchange is unlikely to threaten the availability of supplies. International trade mediated by the private sector should today be a more prominent component of an effective policy to stabilize domestic staple food prices in the face of disasters.

Lower tariffs to promote irrigation

Bangladesh also provides an example of using good policies to stimulate the expansion of irrigation, which buffers farmers against the vagaries of the weather and can prevent a natural hazard (in this case, drought) from becoming a natural disaster. Before 1978, the Bangladesh Agricultural Development Corporation (BADC) monopolized all procurement, maintenance and installation of tubewells. By late 1988 however, after a process of gradual changes, the private sector could import and trade in pump sets for shallow tubewells (STW) at low import duties and without having to adhere to standardization requirements. As a result of these reforms, installation costs for STW fell substantially and the area irrigated by tubewells increased from 0.27 million hectares in 1981/82 to 1.98 million hectares in 1991/92 (62 percent of irrigated land), an increase by a factor of 7 in a decade. The rate of increase was particularly rapid in the latter half of the 1980s after the elimination of standardization requirements. Further, irrigation water prices declined substantially after liberalization for small and large farmers alike (for more discussion of these reforms, see Hossain, 1996).

It should be noted that irrigation has also had an important downside in Bangladesh (and other countries), *viz.* contamination of water supplies with arsenic. While this is a serious problem, it is not an argument against irrigation *per se*. It is an extremely unfortunate side effect that requires more research and action in order to eliminate threats to human health, as well as possible long-term threats to the productivity of the soil.

Weather insurance

Crop insurance programs have had a long and difficult history. Insurance is viewed as necessary to protect farmers from the inherent risks present in agricultural production, but there have been many problems in implementing effective programs. These problems include high transactions costs, moral hazard and adverse selection. Transactions costs are high because of the need to evaluate the losses suffered by farmers on an individual, case-by-case basis. Moral hazard is a problem because once insured, farmers have less motivation to manage the crop in a way that avoids losses. Adverse selection arises because risk levels vary from one farm to another and only the farmers most prone to risk want to buy the insurance, thus raising premiums to unaffordable levels. Or, if premiums are not raised to an actuarially fair level, then the program is often fiscally unsustainable. These problems typically lead to large financial losses; even in developed countries, crop insurance programs cost several dollars to deliver each dollar of insurance benefits.

Weather insurance is different from crop insurance in that it does not insure against specific losses, which vary from farm to farm. Rather, it pays out when specific quantifiable weather events do or do not occur. For example, in areas without irrigation, a weather insurance contract could pay if the rainy season starts late, or if rainfall during a specific part of the crop growth period is below some target level. Such a design of insurance contracts could substantially reduce transactions costs, moral hazard and adverse selection. Transactions costs are reduced because the insurer does not need to monitor large numbers of individual farms and make subjective judgments regarding

crop losses (such judgments can also lead to corruption). Instead, it is only necessary to monitor a set of, for example, rain gauges. Moral hazard is reduced because the payout is not contingent upon a yield loss in the farmers' field. Thus, the farmer has more incentives to manage the crop properly in the event of a natural hazard such as drought. Adverse selection is reduced because all purchasers of the insurance pay the same premium and would receive the same payouts under all possible scenarios. In other words, no individual client or group of clients is more likely to receive payments than another.

Furthermore, weather insurance can be made available to all people who are affected by the weather, not only farmers. Because it is potentially available even to the very poor, it has been touted as an "insurance equivalent of microfinance." For example, a landless labourer might lose employment during the harvest period if there is no harvest because of drought. Or a retailer of clothes might suffer lost sales if farmers have no discretionary income with which to purchase clothing. While these individuals cannot purchase crop insurance if they are not farmers, they could purchase weather insurance.

To date, there are projects in several countries that are testing these types of insurance contracts, and they will provide some valuable lessons. Not surprisingly, weather insurance can have problems of its own. First, purchasers of the contract might suffer an actual loss but not be paid because the trigger event did not occur. For example, a farmer might suffer a yield loss because of water shortages, but not be compensated because rainfall as measured at the nearest rain gauge was above the minimum level stipulated in the insurance contract. Of course, the reverse could also happen; a farmer might get paid even without suffering losses. This phenomenon is known technically as basis risk, and if this risk is large enough (i.e. the correlations between rainfall across plots, or between measured rainfall and crop yields in different plots, are low enough), the contract ceases to function as an effective hedging mechanism and may become more akin to gambling.

A second problem is that a local insurance company providing weather insurance could become bankrupt if it had to make many simultaneous payments in the event of a severe region-wide drought. The solution to this problem is re-insurance with larger insurance companies that can spread risks over many different businesses, but large private international companies may not be interested in providing re-insurance if the volume of business from a particular area is too small. Thus, it may be difficult to test the viability of weather insurance with a small group of farmers to see how it works. Instead, it may be necessary to start with a large group of farmers. Alternatively, there may be a role for government to assume the re-insurance risks for an initial period of time in order to buy time and get the private sector interested. If this path is followed, it will be important to establish actuarially fair premiums from the start; government support should be necessary only in the event of a truly catastrophic event. It should not provide support on an annual basis, or else this will undermine the interests of the private sector to participate (the discussion in this section was based on Morduch, 2001 and Skees, Hazell and Miranda, 1999).

Trade liberalization, poverty and food security

The impact of trade policy on poverty, food security and inequality in developing countries is at the centre of a crowded international debate on the role of international trade in development. The current Doha Round of WTO negotiations makes development and poverty impacts a top priority. In addition, the Millennium Declaration underscores the importance of international trade in the context of development and the elimination of poverty.

Increased openness to international trade is unlikely, on its own, to lead to major improvements in economic growth, poverty reduction, or food insecurity. Complementary policies and investments in infrastructure, human capital and safety nets are crucial if trade liberalization is to support food security strategies. Nevertheless, participation in international trade does allow countries access to larger markets for their products. At the same time, trade also provides access to larger and less expensive food supplies than does reliance on domestic production alone. International trade can also be a powerful channel for technology transfer that expands the potential for productivity increases in farming, agro-processing and retailing.

For example, with the help of international trade opportunities, China is reallocating land resources and moving out of grains production into labour-intensive production in which it has a comparative advantage. Between 1991 and 2003, the proportion of land allocated to fruit and vegetable production increased from 8 percent to 18 percent, while area planted to grains, cotton and sugar crops fell. Export opportunities and domestic demand are encouraging rapid expansion both in vegetable production and in the supply chains that move the products to consumers. Between 2000 and 2004, fruit and vegetable exports increased from $3.6 to $6.4 billion (FAO, 2006a). China now supplies around three quarters of the Republic of Korea's fresh vegetable imports, and its share of Japan's fresh vegetable imports increased from less than 10 percent in 1989–1991 to 37 percent in 2002–2004 (Huang and Gale, 2006). China's comparative advantage in vegetable production has attracted foreign investment, reorganized supply chains and linked producers in China with supermarkets in Japan and the Republic of Korea. It takes 21 days for onions to reach Japan from the United States of America, but only 3 days from China (Chen, Chen and Shi, 2003).

But comparative advantage varies tremendously from crop to crop, and China is also a source of demand for other agricultural products. Thailand concluded a free trade agreement with China in 2003 for various agricultural products, and has been running a large trade surplus for these commodities. Thailand exports cassava, longans, durian and prawns to China, while importing apples, pears, mushrooms, carrots and nuts (Hindu, 2005).

Conceptual linkages between trade and poverty

Trade reforms affect the economy through both price and income effects. Changes in the relative prices of commodities will affect consumers and producers differently, and this omnipresent tension is at the heart of many food policy debates. In trying to understand the effects of trade liberalization, it is important to consider the interests of all those who are poor or food insecure, not just farmers or just consumers.

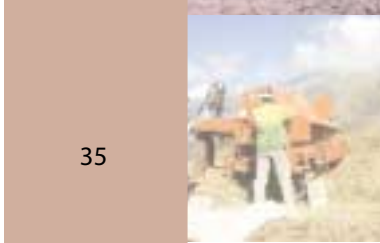
Linkages between trade and poverty include several distinct components, with the first linkage at the border. The border price can be affected by domestic trade reforms, e.g. a lowering of tariffs, or liberalization in other countries. From the border, the focus moves to how prices transmit to producers and consumers, and to households in general. The extent to which households and businesses in the economy experience these price changes is quite varied, and depends on the quality of infrastructure and











the behaviour of domestic marketing margins, as well as geographic factors. The empirical literature suggests that the degree of price transmission from the border to the local market can vary widely from commodity to commodity, even within a single country.

The initial impact of trade liberalization on households occurs once the local market price changes are determined. Not surprisingly, households that are net sellers of products whose prices rise, in relative terms, benefit in this first round. Net purchasers of such goods lose. However, the empirical literature demonstrates that first round effects can be altered as households adjust consumption and production in response to changing relative prices. In this second round of effects, households modify their consumption basket, adjust working hours and possibly change their occupation. For example, Friedman and Levinsohn (2002) showed that welfare losses from the financial crisis in Indonesia were reduced by about 50 percent after taking account of consumer substitution among goods and services. Wages in labour markets can also be affected, as described below.

Effects of trade reforms on poverty

The effects of trade reforms on poverty and food security are complex, and will vary depending on social structure (e.g. the proportion of landlessness in the rural population, inequality of land ownership), infrastructure, the specific commodity involved (e.g. whether it is preferentially consumed by the poor or well to do, whether it is being imported or exported in any particular country) and many other factors. This complexity means that analyses of specific countries and commodities are highly valuable, although some generic lessons can be gleaned from the studies described briefly below.

For example, the elimination of all forms of support and protection to agriculture by the OECD countries is expected to increase border prices of temperate-zone agricultural products about 5 to 20 percent (FAO, 2005a). If such reforms are realized (the outcomes of the Doha Round so far indicate limited movement in that direction), higher commodity prices will benefit countries with a comparative advantage in agriculture. While some developing countries in Asia are net exporters of agricultural products, many are net importers. These latter countries are probably benefiting from OECD subsidies. This is not to say that these farm subsidies make an important contribution to poverty reduction, which is a doubtful proposition because most of the funds benefit wealthy farmers in the OECD countries. The large amounts of money spent on these subsidies could be used for better purposes, including well targeted development assistance. The subsidies also create an uneven playing field for poor farmers in developing countries. Finally, these subsidies make progress on trade negotiations in other sectors more difficult.

Even net exporters with a comparative advantage in agriculture will need to compete with land surplus countries throughout the world (e.g. in South America) in order to gain lasting benefits from the hypothetical elimination of OECD support, as technological progress may contribute to a continued downward trend in international commodity prices even if major trade reforms occur. To further complicate matters, net agricultural exporting countries are net importers of many commodities, and conversely, net agricultural importing countries are net exporters of many commodities.

Thus, elimination of OECD support and protection will have complex effects, and it is hardly a panacea for poor farmers and consumers in developing countries. Indeed, the review of the empirical evidence on trade liberalization in FAO (2005a; chapter 4) suggests that the largest gains to developing countries tend to come from their own trade-liberalizing measures and domestic reforms. Thus, the discussion below will focus on understanding the effects of domestic trade reforms.

Studies of the rice sector in Viet Nam (Minot and Goletti, 2000) indicate that higher rice prices help to alleviate poverty and food insecurity in this particular context.

Liberalization of export quotas allows farmers greater access to foreign consumers and serves to raise rice prices within the country, as the supply available for domestic consumption is reduced. Viet Nam has a comparative advantage in rice production because of its large river deltas and is thus a net exporter of rice (in fact, all four quartiles in the income distribution are net producers of rice), so higher prices have a positive effect on aggregate household income, similar to the effect of a positive terms of trade shock (this is in addition to the increased income from the removal of market distortions). As a result, export liberalization was estimated to reduce the number of poor by a net 5 percent. The positive effect would have been larger except that, even in rice-exporting Viet Nam, there are large numbers of poor who do not produce a rice surplus, even in response to the higher prices, and are thus hurt by the reforms.

As noted earlier, "second round effects" are important in understanding the effects of changes in trade policies. For example, the Viet Nam study took into account the fact that higher rice prices stimulate rice production and cause some households that are net buyers of rice before the reforms to become net sellers of rice after the reforms. Another "second round effect" that can cause net consumers of food to benefit from higher food prices works through labour markets. Higher agricultural prices, by stimulating the demand for unskilled labour in rural areas, can result in a long run increase in rural wages, thereby benefiting wage labour households in addition to self-employed farmers.

Ravallion (1990), using a dynamic econometric model of wage determination and data from the 1950s to the 1970s, concludes that the average landless poor household in Bangladesh loses from an increase in the rice price in the short run (because of higher consumption expenditures), but gains slightly in the long run (after five years or more). This is because in the long run, as wages adjust, the increase in household income (dominated by unskilled wage labour) is large enough to exceed the increase in household expenditures on rice. However, this study used relatively old data, when rice farming was a larger sector of the economy and thus had a more profound impact on labour markets. Rashid (2002), using co-integration techniques and updating the data used by Ravallion (1990), found that since the mid-1970s, rice prices in Bangladesh no longer have a significant effect on agricultural wages. Thus, if higher rice prices no longer induce higher rural wages in Bangladesh, where agriculture is a larger share of the economy and rice dominates the agricultural sector to a greater extent than in most other Asian countries, it seems that higher grain prices are unlikely to stimulate the rural labour market in economies that have a more diversified range of employment opportunities.

Higher agricultural prices can help to reduce poverty in some circumstances, as shown in the case of Viet Nam above. But high food prices may not have the same benefits in food importing countries with different social structures, especially when those higher prices are the result of trade barriers that distort geographical patterns of comparative advantage. For example, in the Philippines there is a large class of landless labourers because of greater inequality in land distribution than in Viet Nam. In addition, corn is also an important crop in the Philippines, and corn farmers are the poorest class of farmers in the country. Thus, the poorest twenty percent of the income distribution buys more rice than it sells, and this is especially pronounced for the bottom ten percent (Balisacan, 2000; by contrast, in Viet Nam, the poorest quarter of the population is a net producer of rice). Thus, in terms of first round effects, higher rice prices are likely to hurt the poor in this context. This negative distributional effect of high rice prices is compounded because the high rice prices result from import restrictions that distort relative prices, lead to a misallocation of resources in the economy and reduce the level of national income (known as "deadweight losses" in economics jargon). In the case of Viet Nam, the reforms that led to higher rice prices removed distortions, thus reducing deadweight losses. An analysis of Indonesia by Warr (2005) also concludes that import barriers to rice increase poverty in that country.













Because the share of agriculture in the Philippine economy is relatively low, and because rice occupies a lower share of crop area harvested in the Philippines than in Bangladesh, it is unlikely that higher rice prices raise wages for unskilled labourers in the Philippine context. Furthermore, the main substitute crops that Philippine farmers are likely to plant instead of rice are corn and vegetables. Corn has about the same labour intensity as rice, but vegetables are substantially more labour-intensive. Thus, favouring rice at the expense of vegetables may reduce labour demand and worsen the impact on the poor (Dawe, Moya and Casiwan, 2006).

The contrasting examples of Viet Nam and the Philippines, and even Bangladesh at different points in time, show why it is not possible to come up with simple "one size fits all" rules about the effects of food prices or trade liberalization on poverty, and highlight the importance of detailed situation specific analysis.

Protectionism is dangerous, although it may be necessary in some circumstances

Price protection for agriculture (e.g. import restrictions on competing products, output price support, input subsidies) can be justified on efficiency grounds if there is a technology that is profitable at long-run prices but has not been adopted by farmers who are risk averse or do not have sufficient knowledge of the technology.[1] In these circumstances, subsidies can spur farmers to take risks or acquire knowledge that will lead to adoption. But understanding when such market failures exist and are causing serious resource misallocation is not necessarily easy, as there are market failures in many parts of the economy. Furthermore, tilting the terms of trade in favour of agriculture simultaneously tilts the terms of trade against other sectors, which then presumably discourages adoption of promising new technologies in those sectors.

In the absence of a key profitable technology waiting to be adopted, price protection for agriculture (or any other sector) simply redistributes income from one group to another. Such redistribution can have implications for both equity and growth. It obviously affects equity, but, at least in the Asian context, it is not quite so simple as redistributing income from relatively well off urban dwellers to relatively poor rural residents. The complexity arises because of the large pools of functionally landless labourers in countries such as India, Indonesia, Bangladesh and the Philippines. These landless labourers are usually the poorest of the poor, do most of the production work and are net consumers of food. Thus, many poor people in rural areas would be hurt by higher food prices caused by protection. Unfortunately, nearly all of the popular trade liberalization debate that is carried out in a global context focuses on farmers, to the exclusion of the landless poor in rural areas.

Price protection also has implications for hunger and food security. For example, Block et al. (2004) found that increased rice prices in Indonesia during the financial crisis caused mothers in rural Central Java to reduce the intake of nutritious foods in order to balance the food budget, while maintaining consumption of rice at relatively constant levels. This decision to sacrifice consumption of nutritious foods led to increased prevalence of anaemia in both mothers and children. In addition, mothers buffered the caloric intake of their children, resulting in increased maternal wasting. The negative effects on anaemia were less, however, for mothers who had higher levels of nutrition knowledge and thus reduced the consumption of nutritious foods to a lesser extent (Block, 2004). This shows the importance of complementary reforms to increase knowledge that allow households to make more informed decisions.

Price policy can also have implications for economy-wide growth if it redistributes income in favour of those with a higher propensity to consume domestically produced goods (as opposed to imports), thus raising aggregate domestic demand. But again the

[1] Technology is being used in a broad sense to mean any change in farming practices or inputs.

existence of landless labourers complicates the matter beyond a simple comparison of rural and urban or agriculture and industry, because the rural landless most likely have an even greater marginal propensity to consume out of domestic production than do farmers, who in turn are less likely to consume imports than urban dwellers.

Price protection may also have the potential to lock farmers into production of a crop with little growth potential, thus discouraging productivity growth in the economy, which is ultimately the only sustainable way to alleviate poverty and food insecurity. Indeed, the Philippines and Sri Lanka, the two developing countries where protection of rice has been the most pronounced for a long period of time, have had the lowest growth rates of agricultural output per worker among major rice-producing Asian countries since 1980.

A further consideration is that high food prices caused by protection for grains may reduce the competitiveness of unskilled labour via a wage good argument. This could slow growth and hinder movement of the economy towards sectors in which it has a medium-term comparative advantage, which for many developing countries may be in the realm of labour-intensive manufactures (or crops). Of course, there are many factors that affect economic growth, but it is interesting to note that the most dynamic developing countries in Asia seem to have followed a policy of low staple food prices, while the more stagnant economies have suffered from relatively high food prices.

For example, China, Thailand and Viet Nam have all avoided price protection for rice for decades, during which time all experienced quite rapid growth. Indonesia did the same (on average) during its period of rapid growth that came to an abrupt end with the onset of the Asian financial crisis. During the past few years in Indonesia, rice prices have been above import parity levels, although clearly this is not the main reason for the slowdown in economic growth. On the other hand, real GDP per capita in the Philippines has been stagnant for the past 20 years, during which time rice prices have been highly protected and well above levels in neighbouring developing countries. Sri Lanka has also had high levels of protection for its rice sector during this time. Its growth performance has been substantially better than that of the Philippines, with a doubling of per capita income from 1980 to 2002. This performance was not nearly as strong, however, as that of China, Thailand, Viet Nam and, before the crisis, Indonesia.

While agricultural protectionism has many difficulties associated with it, there may be circumstances in which it is justified. For example, what if the agricultural sector of a particular country is not competitive at world prices for any crops? The theory of comparative advantage states that every country must have a comparative advantage in something, given appropriate exchange rates. But that comparative advantage need not be found in the agricultural sector. If in fact a country has no comparative advantage in agriculture, how does one go about moving all the workers into other sectors? Agriculture is the single largest employer in most developing countries, so this presents a major problem. Clearly the process will take decades at a minimum, so what are agricultural workers to do in the meantime? If labour markets are imperfect, and farmers and agricultural workers are simply thrown out of work without alternative forms of employment, then even aggregate GDP will not necessarily increase in response to liberalization (never mind the distributional consequences). These implications for rural to urban migration must be taken into account for the developing countries, which have a much larger proportion of their labour force in agriculture than do the developed countries.

But if protection is necessary, some types of protection will likely help more than others. For example, a positive across the board uniform agricultural tariff will allow comparative advantage within agriculture to be maintained while preserving some absolute advantage as the labour force is slowly being transferred out of agriculture.[2]

[2] An undervalued exchange rate would be similar, but not identical, in its effects because most agricultural output is tradable, at least in theory. However, government trade policies often transform tradable goods into non-tradables. Furthermore, there are many tradables outside the agricultural sector that benefit from an undervalued exchange rate.

One could also make an argument for preferential protection of labour-intensive crops such as vegetables in order to support the income of rural landless labourers, although it would be important to couple this with increased educational opportunities for such households so that they have a viable long-term strategy for exiting poverty. Unfortunately, agricultural protection in actual practice is often skewed in favour of commodities produced by relatively well to do farmers (relative to other farmers, that is, not well to do in some absolute sense).

Experience with trade liberalization

Many people fear that reduced protection will cause a catastrophic decline in domestic production and expose nations to food insecurity. However, farmers and the agricultural sector can adapt to change. To take an example outside of Asia, there were concerns that maize production in Mexico would suffer greatly from lower prices and trade liberalization under the North American Free Trade Agreement (NAFTA). In fact, maize production in Mexico has not fallen in the wake of these price declines. Local labour and land markets were able to redistribute land away from large commercial producers towards smaller subsistence farmers as land rents dropped (Taylor, Yunez-Naude and Dyer, 2003). Subsistence producers, who expanded cultivated area, bolstered maize production in the wake of the price drops.

Price stability is also a concern when opening to external markets. However, trade can play an important role in ensuring price stability, as in the case of Bangladesh during the "flood of the century" in 1998 that caused a drop in rice production. The government eliminated tariffs on rice imports during the crisis, and the increased supplies brought in from India by private traders kept domestic prices stable (Dorosh, 2001). In addition to trade, government storage also has a role to play in ensuring price stability, but the costs of food reserves are often much higher than the benefits. Tariffs that vary in response to changing world prices and domestic harvests (either according to a predetermined schedule or on an *ad hoc* basis) may be a more cost-effective mechanism for stabilizing domestic prices. This is a more feasible option today than it was in the 1970s, because the world rice market is more stable as the result of a greater prevalence of irrigation and pest-resistant modern varieties (Dawe, 2002). Such tariffs should be imposed only for key commodities, confined to a low level and used to moderate price fluctuations, not provide protection for an extended length of time.

Some general lessons

Research on and experience with agricultural trade liberalization around the globe allows us to draw some useful generic lessons (FAO, 2005a):

- Reforms can be conducive to poverty reduction and improved food security if they are carefully designed and implemented within an explicit pro-poor strategy. Every situation is different, and it is important to conduct detailed analysis of specific situations in order for trade to benefit the poor as much as possible.
- The sequencing of reforms is important. Appropriate output incentives should be assured before (or at the same time as) input prices are raised, even at the cost of maintaining some well targeted input subsidies during a transitional adjustment period. In addition, whenever possible, reforms should not be too abrupt. Phased reforms are likely to result in less backsliding, and they also allow society to study unanticipated outcomes that emerge during implementation.
- Finding mechanisms to encourage and assist the private sector to fill the gaps left by dismantling state agricultural marketing institutions is vital, and new policies may be needed to ensure price stability of important commodities.
- Improving rural infrastructure is important for successful policy reform in most countries, but it is particularly needed in low-income areas, along with support for productive investments by small farmers. Without such investments it is difficult for such farmers to respond to price incentives.













- Policies to encourage the development of rural non-farm employment are also important for the rural poor. These can include the development of microfinance, simplification of regulatory regimes, infrastructure improvement and special incentives for rural industrialization in poor areas.
- As complementary policies to facilitate adjustment of the kind mentioned above can take time to bear fruit, transitional compensatory measures, targeted on lower-income groups, may be needed.

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