

THE STATE OF FOOD AND AGRICULTURE 2001

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Foreword

Almost five years have elapsed since world leaders, meeting at the World Food Summit in Rome in 1996, pledged their commitment to achieving food security for all. The participants set themselves the goal of eradicating hunger in all countries, with a quantifiable intermediate target of halving the number of undernourished by 2015. It is now time to take stock of what has been achieved and where we stand today. For this reason, a follow-up meeting, the World Food Summit: five years later, will be held at FAO headquarters in Rome in November 2001. Heads of State and Government will be invited to outline the efforts taken to achieve the goal, review performance to date and agree on measures for accelerating progress.

The road travelled since 1996 has not been easy. In addition to the intrinsic difficulty of achieving the targets set by the Summit, the efforts of even the most determined governments and organizations have often been frustrated by events beyond their control, aggravating the already difficult food security situation. Natural disasters and unfavourable climatic events have taken a heavy toll on many countries. This is especially true in countries where agriculture is the mainstay of the economy and levels of undernourishment are high. A number of droughts, floods, hurricanes and earthquakes have reminded us of the fragility and vulnerability of agricultural production and food security to natural calamities. The latest FAO estimates suggest that the declining trend in the prevalence of hunger has recently come to a near standstill, with approximately 826 million people undernourished. Improvements in some subregions, notably East Asia, have been offset by a deterioration in others, especially sub-Saharan Africa and Central America and the Caribbean.

It is a moral responsibility of all societies, communities and individuals to ensure that hunger is eradicated. It is the suffering endured by the world's hungry that keeps this commitment foremost in our minds, yet increasing recognition is also given to the fact that hunger and malnutrition act as an impediment to economic growth and welfare improvements. This year's issue of *The State of Food and Agriculture* features a review of the existing evidence on the link between nutrition and productivity and economic growth. While it is perhaps unsurprising that economic growth should have a positive effect on nutrition levels, there is also evidence that, through its effect on human capital development, improved nutrition itself feeds back into higher growth and incomes. Hunger is both a consequence and a cause of poverty. The implication is that public investment to increase agricultural production and facilitate access to food is a sound resource allocation, and it often constitutes a precondition for long-term economic growth and poverty alleviation. Fighting hunger should be considered an initial and vital step towards the alleviation of poverty. As long as there is widespread hunger, little progress can be made in ameliorating other dimensions of poverty, such as a lack of health care and education.

A serious threat to food security today is the spread of the HIV/AIDS

epidemic. Of the 36 million people infected worldwide, 95 percent are in developing countries. *The State of Food and Agriculture 2001* draws attention to the seriousness of the situation, particularly in sub-Saharan Africa – currently the worst-affected region, with 24.5 million of the total number of people infected globally. The human tragedy of the epidemic is accompanied and amplified by the serious negative economic impacts it creates. It deprives agriculture as well as other sectors of much-needed labour power and puts heavy demands on the health systems of the affected countries. Thus, development and food security are seriously impaired, as is the ability of governments to manage them.

The five years since the World Food Summit have also seen an enhanced awareness of the complex challenges facing agriculture and conditioning the achievement of global food security and sustainable management of natural resources. Issues include environmental degradation, scarce water resources, the spreading of plant pests and animal diseases, consumer concerns about food safety, and the impact of conflicts, human-caused disasters and climate change.

At the same time, adaptation to the inexorable process of globalization, with its attendant risks and opportunities, is one of the greatest challenges facing all countries, and especially developing countries, today. Some of the risks involved were illustrated by the unexpected emergence and rapid spread of the financial crisis in East Asia in 1997 and 1998. The real challenge for the developing countries is to be able to reap the potentially large benefits that result from participation in open global markets, while limiting their risk of exposure to major external shocks.

Ensuring the full, equitable and beneficial participation of all parties in an open, globalized world system is a shared responsibility. *The State of Food and Agriculture 2001* discusses the negotiations on international agricultural trade, which have been launched within the World Trade Organization. Agricultural trade is of particular importance to most developing countries, in their capacity as either exporters or importers, and frequently both. Barriers to agricultural trade still represent a significant obstacle for many of them. While the Agreement on Agriculture resulting from the Uruguay Round has contributed to changes in domestic and trade policy instruments, actual changes in the levels of support and protection to the sector have not been deep enough for the agreement to have a significant impact on world agricultural trade. The complexity of import regimes and the cost of complying with sanitary and phytosanitary standards and technical barriers to trade can constitute insurmountable obstacles, particularly for small developing countries. It is important that these new negotiations lead to greater opportunities for developing countries to participate in international agricultural trade.

The effects of globalization can be numerous and unpredictable. Among the effects that have recently come to the fore is the ease with which numerous plant pests and animal diseases are now able to spread. Plant pests and animal diseases are a permanent threat to crop and livestock producers and can have major economic implications. However, diffusion has in many cases been facilitated by increased and faster trade, expanded trade in fresh products and live animals and

the opening of new trade routes. The rapid spread of bovine spongiform encephalopathy (BSE) and especially foot-and-mouth disease, which has caused major concern in recent months, are but two significant examples. The economic impact of plant pests and animal diseases is the topic of this year's special chapter, which points to the need for increased regional and international cooperation. In particular, it is important to enhance the capacity of developing countries both for national action and for participation in international collective efforts, not only in their own interest but also in that of the global community as a whole. Given the growing economic and scientific complexity of the issue, it certainly warrants priority attention.

Five years after the World Food Summit, and at the beginning of the twenty-first century, *The State of Food and Agriculture* reflects on some of the main challenges faced in eliminating world hunger and poverty. The task may be daunting, but so are the numbers of hungry and undernourished people whose fate is dependent on decisive and accelerated action. I am convinced that, with a renewed commitment and determined, concerted effort, the goal of the World Food Summit can be met.

A stylized, handwritten signature in black ink, consisting of a large 'D' and 'A' intertwined with a horizontal line.

Jacques Diouf
FAO DIRECTOR-GENERAL

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Glossary

ACPC	Association of Coffee Producing Countries
ADLI	agricultural development-led industrialization
AFTA	ASEAN Free Trade Area
AIDS	acquired immunodeficiency syndrome
AsDB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
ATC	Agreement on Textiles and Clothing
BANDESA	Banco Nacional de Desarrollo Agrícola (Guatemala)
BMI	body mass index
BMR	basal metabolic rate
BSE	bovine spongiform encephelopathy
CARICOM	Caribbean Community and Common Market
CBPP	contagious bovine pleuropneumonia
CIS	Commonwealth of Independent States
CMEA	Council for Mutual Economic Assistance (superseded by OIEC in 1992)
CONTAG	Confederação Nacional dos Trabalhadores na Agricultura (Brazil)
DAC	Development Assistance Committee
DALYs	disability-adjusted life years
DES	dietary energy supply
DFID	Department for International Development (United Kingdom)

DNA	deoxyribonucleic acid
EC	European Communities (also called European Union)
EC	European Community
EFSR	Emergency Food Security Reserve
EIU	Economist Intelligence Unit
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases
EU	European Union (also called European Communities)
FAC	Food Aid Convention
FDI	foreign direct investment
FIVIMS	Food Insecurity and Vulnerability Information and Mapping Systems
FUNDACEN	Fundación Centavo (Guatemala)
GAP	Southeast Anatolia Project (Turkey)
GATT	General Agreement on Tariffs and Trade
GCC	Gulf Cooperation Council
GDP	gross domestic product
GEF	Global Environment Facility
GIS	geographic information system
GMO	genetically modified organism
GNP	gross national product
GTZ	German Agency for Technical Cooperation
HDI	Human Development Index

HIV	human immunodeficiency virus
IAEA	International Atomic Energy Agency
IBRD	International Bank for Reconstruction and Development
ICO	International Coffee Organization
ICCO	International Cocoa Organization
ICSU	International Council of Scientific Unions
IDA	International Development Association
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMF	International Monetary Fund
INCORA	Instituto Nacional Colombiano de la Reforma Agraria (Colombia)
INCRA	Instituto Nacional de Colonização e Reforma Agrária (Brazil)
INTA	Instituto Nacional de Transformación Agraria (Guatemala)
ISA	International Sugar Agreement
IUCN	World Conservation Union
kcal	kilocalorie
LIFDC	low-income food-deficit country
MBM	meat and bone meal
MFN	most favoured nation (WTO)
MST	Movimento dos Trabalhadores Rurais Sem Terra (Brazil)

NAFTA	North American Free Trade Agreement
NGO	non-governmental organization
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OIE	International Office of Epizootics
OIEC	Organization for International Economic Cooperation
OPEC	Organization of the Petroleum Exporting Countries
PADETES	Participatory Demonstration and Training Extension System (Ethiopia)
PAHO	Pan-American Health Organization
PEM	protein-energy malnutrition
PRONAF	Programa Nacional de Fortalecimento da Agricultura Familiar (Brazil)
PSE	producer support estimate
RPPO	Regional Plant Protection Organization
SCOPE	Scientific Committee on Problems of the Environment (ICSU)
SD	standard deviation
SIP	sectoral investment programme
SPS	Agreement on the Application of Sanitary and Phytosanitary Measures (WTO)
SSG	special safeguard (provisions)
TSE	total support estimate

TSE	transmissible spongiform encephalopathies (EC regulation)
UN-ACC	United Nations Administrative Committee on Coordination
UNAIDS	Joint United Nations Programme on AIDS
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
vCJD	variant Creutzfeldt-Jakob disease
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization

Explanatory note

The statistical information in this issue of *The State of Food and Agriculture* has been prepared from information available to FAO up to April 2001.

Symbols

The following symbols are used:

- = none or negligible (in tables)
- ... = not available (in tables)
- \$ = US dollars

Dates and units

The following forms are used to denote years or groups of years:

- 1996/97 = a crop, marketing or fiscal year running from one calendar year to the next
- 1996-97 = the average for the two calendar years

Unless otherwise indicated, the metric system is used in this publication.

“Billion” = 1 000 million.

Statistics

Figures in statistical tables may not add up because of rounding. Annual changes and rates of change have been calculated from unrounded figures.

Production indices

The FAO indices of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 1989-91. They are based on the sum of price-weighted quantities of different agricultural commodities after the quantities used as seed and feed (similarly weighted) have been deducted. The resulting aggregate therefore represents disposable production for any use except seed and feed.

All the indices, whether at the country, regional or world level, are calculated by the Laspeyres formula. Production quantities of each commodity are weighted by 1989-91 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 1989-91.

Trade indices

The indices of trade in agricultural products are also based on the base period 1989-91. They include all the commodities and countries shown in the *FAO Trade Yearbook*. Indices of total food products include those edible products generally classified as “food”.

All indices represent changes in current values of exports (free on board [f.o.b.]), and imports (cost, insurance, freight [c.i.f.]), expressed in US dollars. When countries report imports valued at f.o.b., these are adjusted to approximate c.i.f. values.

Volumes and unit value indices represent the changes in the price-weighted sum of quantities and of the quantity-weighted unit values of products traded between countries. The weights are, respectively, the price and quantity averages of 1989-91 which is the base reference period used for all the index number series currently computed by FAO. The Laspeyres formula is used to construct the index numbers.

PART I

WORLD REVIEW



I. Current agricultural situation – facts and figures

I. CROP AND LIVESTOCK PRODUCTION¹

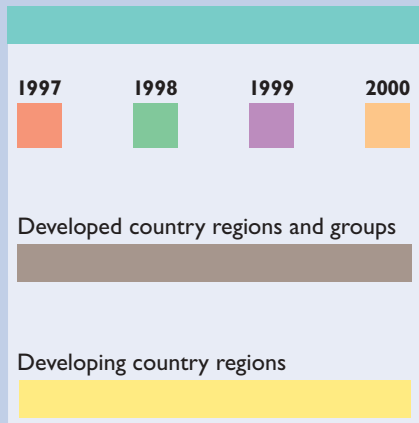
- World agricultural output in 1999 is estimated to have increased by 2.3 percent, which is a modest improvement on the 1.4 percent growth rate achieved in 1998. Crop production, in particular, expanded more strongly in 1999 than in the previous year. The more favourable outcome is largely due to a rise in output in the developed countries, estimated to be 1.5 percent. This follows on from a 0.7 percent decline in overall output in 1998, when crop production fell by 3.4 percent. The performance of the developing countries as a group continued to be relatively disappointing during 1999. Their agricultural production increased by only 2.8 percent, which was about the same rate as in 1998 but lower than the 3.2 percent of 1997 and well below the high rates of between 4 and 5 percent recorded from 1993 to 1996.

- Estimates of agricultural production in 2000 are still provisional but point to an expansion in agricultural production of about 1 percent. Crop production is estimated to increase by less than 1 percent, as in 1998. The slowdown is due to reduced growth in both developed and developing countries, with the former estimated to record growth of less than 1 percent and the latter about 1.5 percent in 2000. In the case of developing countries, the poor performance continues the trend of the last four years towards slower growth.

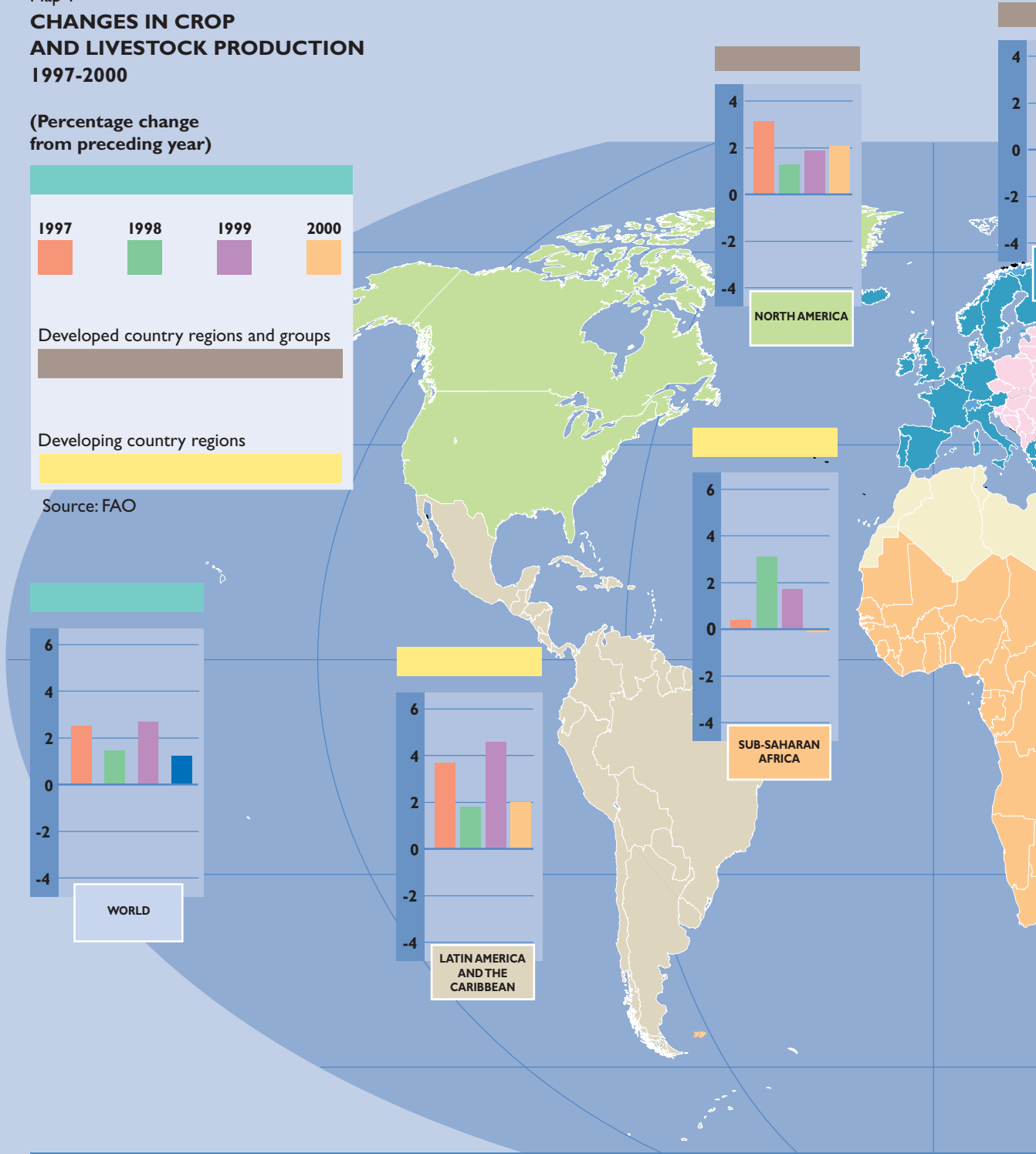
- Among the developing country regions, the strongest performance in 1999 was recorded in Latin America and the Caribbean, where growth in agricultural output strengthened significantly to an estimated 4.6 percent, after a growth rate of only 1.8 percent in 1998, when the El Niño phenomenon had negatively affected agricultural activity, particularly in the Andean region, and Hurricane Mitch had caused severe damage in Central America. The main contributing factor behind the good performance in 1999 was the strong 5.1 percent growth in output in South America, where Brazil in particular increased its agricultural production by an estimated 7 percent. Growth in output was somewhat more modest in Central America but, at 3.4 percent, it represented a significant improvement on the 1.1

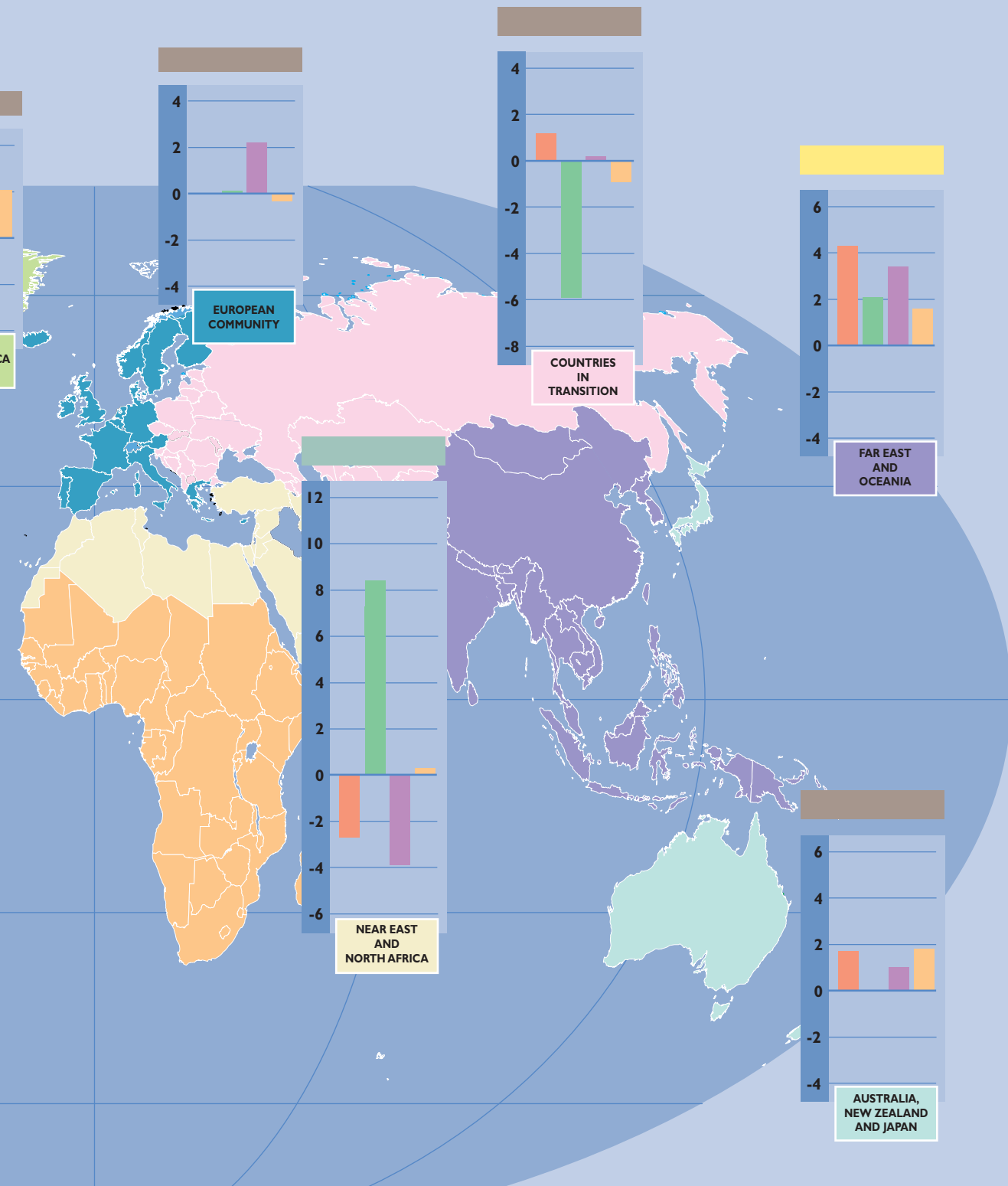
Map 1
**CHANGES IN CROP
 AND LIVESTOCK PRODUCTION
 1997-2000**

(Percentage change
 from preceding year)



Source: FAO





percent recorded in 1998. By contrast, agricultural production declined by about 1 percent in the Caribbean. For 2000, preliminary estimates suggest output growth in the region of only about 2 percent. Growth is expected to be somewhat higher in Central America than in the Caribbean and South America.

- In developing East Asia and the Pacific, agricultural performance also improved somewhat in 1999, expanding by 3.4 percent after the lower 2.1 percent recorded in 1998. The rate of overall agricultural production growth in the region has nevertheless declined in the past few years, and output growth for 2000 is preliminarily estimated to be only 1 to 2 percent. The main factor behind the declining trend in the last few years is the slowdown in production growth in China which, from an annual average of about 6 percent in 1991-97, slowed to 4 percent in 1998 and 3 percent in 1999, with the provisional estimate for 2000 pointing to another increase of about 3 percent. After stagnating in 1998, Indian agriculture saw production expand by nearly 4 percent in 1999, while estimates for 2000 point to a small decline of less than 1 percent.

- In sub-Saharan Africa, 1999 was another disappointing year in terms of agricultural output, as overall agricultural production lagged behind population growth rates for the third consecutive year. Output increased by 2.1 percent in 1999, after increasing by 0.4 and 2.3 percent in 1997 and 1998, respectively. In Nigeria, production growth slowed from more than 4 percent in 1998 to slightly less than 3 percent. The preliminary estimates for 2000 suggest no improvement in the sluggish performance of the last few years and overall agricultural production appears to have expanded by only 0.5 percent.

- In the Near East and North Africa region, agricultural output fell by 3.9 percent in 1999 after recording growth of 8.4 percent in 1998. Drought was the dominant factor affecting agricultural output in the region in 1999, with cereal production recording particularly sharp falls in Afghanistan, Algeria, Iraq, the Islamic Republic of Iran, Jordan, Morocco, the Syrian Arab Republic and Tunisia. In Turkey, too, inadequate rainfall led to an agricultural production decline of nearly 5 percent. By contrast, overall output expanded strongly in Egypt. In 2000, drought conditions are expected to continue having an adverse effect on production in Afghanistan, Algeria, Iraq, the Islamic Republic of Iran, Morocco and Tunisia, while some

recovery is expected in Jordan, the Syrian Arab Republic and Turkey. Provisional estimates suggest an increase of less than 0.5 percent in the region's overall agricultural production in 2000.

- Among the developed countries, the transition countries recorded virtually unchanged agricultural production in 1999, following a 5.9 percent decline in 1998. The Russian Federation experienced a fall in output of 2.7 percent and most of the other larger agricultural producers in the region witnessed some minor declines in agricultural output in 1999, the major exceptions being Kazakhstan and Romania, both of which saw agricultural production rebound after the sharp drops experienced in 1998. Provisional estimates for 2000 suggest a small contraction of agricultural production of less than 1 percent. Among the major producers, positive performances are expected only in the Russian Federation and Ukraine.

- In the developed market economies, agricultural output expanded by an estimated 1.8 percent in 1999, following the more modest 0.8 percent recorded in 1998. Output grew the most (by 2.2 percent) in the European Community (EC) and slightly less in North America (by 1.9 percent), although Canada alone recorded an expansion of 6.2 percent after its already high rate of 5.9 percent in 1998. In the developed countries of Asia and the Pacific, overall output growth was estimated to be 1.0 percent, with Japan recording less than 1 percent, Australia at 1 percent, and with production actually declining by 5.1 percent in New Zealand. Estimates for 2000 point to a lower increase, of about 1 percent, in overall output, covering an anticipated rise of around 2 percent in North America, 1.8 percent in developed Asia and the Pacific and a marginal contraction in the EC.

2. INTERNATIONAL AGRICULTURAL PRICES

- International wheat and coarse grain prices increased moderately during the first half of the 2000/01 season (July-December 2000), amid indications of lower production and prospects for a large drawdown of stocks among the major exporters. For wheat, the overall price increase proved limited because of the availability of large export supplies from a number of non-traditional sources such as India and Pakistan. Furthermore, in some importing countries such as China, where domestic production fell sharply, the decline was mostly met by a larger drawdown of their own stocks rather than by larger import volumes. For coarse grains, particularly for maize, the impact of the surge in world import demand was mitigated by a near-record crop in the United States, continued large sales from China and abundant supplies of the competing feed-quality wheat in international markets. Against this background, a stronger recovery in prices could not be envisaged for at least another season, and only in the event of a notable cutback in grain production in 2001.

- Contrary to the developments in other major cereal markets, international prices of high-quality and low-quality grains as well as long and medium rice varieties fell during most of 2000, reaching their lowest level since 1987. The main reason for this was the type of policies adopted by many countries in the wake of the rice shortfalls and high international prices that were witnessed in 1998 and early 1999. The most important rice-importing countries reduced their import demand, while some exporters pursued aggressive export drives in order to cope with large stocks. Barring any unexpected shock, rice prices were expected to continue on a downward trend during the first quarter of 2001 as new rice crops from exporters in the Southern Hemisphere and in Viet Nam came on to the market. Moreover, the policy measures being considered by India – to boost exports – and in Indonesia, Malaysia and Nigeria – to raise import restrictions – could all contribute to an aggravation of the price weakness.

- During the 1999/00 season (October-September), international prices for oils and fats were under downward pressure. The decline was largely the result of ample supplies. Stocks of oils and fats reached record levels, preventing a recovery of international prices. By contrast, prices for oilseeds and oilmeals strengthened as the expansion in global supplies

of these products came to a halt despite a strengthening demand. Prices of oilseeds and products were forecast to continue moving in opposite directions in 2000/01. The anticipated ample supplies of oils and fats relative to demand were likely to limit the chances for a sustained recovery of prices for oils and fats. The tightening supply and demand situation for oilseeds, oilcakes and oilmeals could lend support to their prices.

- World coffee prices fell throughout almost all of the 2000 calendar year, only showing a marginal increase for the month of December. The International Coffee Organization (ICO) composite price fell from \$1 679 per tonne in January 2000 to \$1 084 per tonne in December. For the year as a whole, the composite price averaged \$1 416 per tonne compared with \$1 890 in 1999, a fall of 25 percent. This continues the downward trend of 1999, when prices fell by 22 percent over the previous year's levels. Coffee prices in 2000 were at their lowest level since 1993, and at only half of their average level for the 1980s. In spite of slightly lower production in the 1999/00 coffee year (October-September), resulting from adverse weather in some major producing countries, exports continued to grow. In the absence of any significant increases in consumption, importers' stocks also continued to accumulate during the year. The market was further weakened by expectations of a recovery in production levels in excess of consumption growth for the 2000/01 coffee year. The persistence of historically low prices prompted the Association of Coffee Producing Countries (ACPC) to agree to the implementation of a coffee retention plan in May 2000. Participating countries will retain 20 percent of their coffee exports when the ICO indicator price (a 15-day moving average of the ICO composite price) falls below a specified lower limit, releasing the retained stocks on to the market when the price rises above a specified upper limit.

- Cocoa bean prices fell by 22 percent in 2000, following the 32 percent fall in 1999 to reach levels not seen since the early 1970s. The International Cocoa Organization (ICCO) daily average price averaged \$888 per tonne in 2000, compared with an average of \$1 140 per tonne in 1999 and \$1 465 per tonne over the previous five years. The depressed prices reflect a tendency for growth in production to outstrip growth in consumption. Production and consumption had been approximately in balance for the three previous years, but

production in 1999/00 grew by almost 8 percent while consumption, as measured by grindings, grew by less than 6 percent. On the demand side, global per capita consumption has risen by less than 1 percent per year since 1990, reflecting sluggish growth in the United States, Western Europe and East Asia.

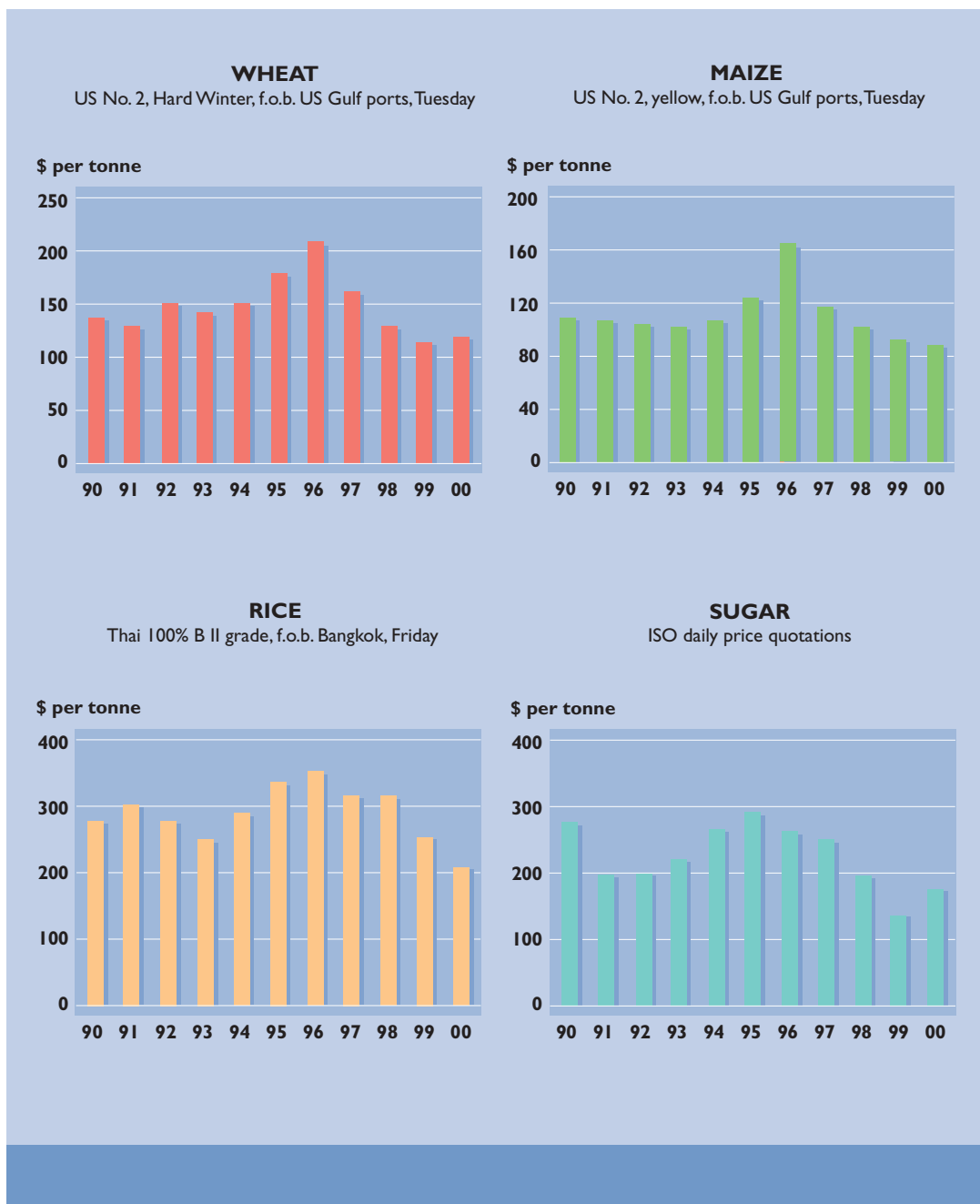
- Tea prices strengthened in 2000. The FAO composite price for tea (a weighted average price of tea traded in the major markets of India, Kenya and Sri Lanka) averaged \$1 830 per tonne in the first quarter of 2000, weakened to \$1 770 per tonne in the second quarter in line with seasonal demand trends, then increased to \$1 880 per tonne in the third quarter before falling back to the level of the first quarter. The FAO composite price for tea in 2000 averaged \$1 829 per tonne. This was 7 percent higher than the average of \$1 707 per tonne in 1999, when weak demand kept prices lower than 1998 levels for most of the year. Tea prices in 2000 were 5 percent higher than the average for the previous five years but remained below the peak levels of nearly \$2 000 per tonne reached in 1997.
- After falling to \$0.98 per kilogram in December 1999, their lowest level for 15 years, world cotton prices started to recover in 2000. The Cotlook “A” index, an indicator of world prices, reached \$1.45 per kg in July and August 2000, about 15 percent higher than a year earlier, owing to slow growth in overall global production and strengthened demand. Demand for cotton has been stimulated by the implementation of the Agreement on Textiles and Clothing (ATC) and the North American Free Trade Agreement (NAFTA), which have increased trade in textiles. FAO and the International Cotton Advisory Committee predict that the ATC, which is intended to eliminate all quota restrictions on textile trade by 2005, will increase global cotton consumption by up to 3 percent. Growth in the world economy provided a further stimulus to higher import demand. The continuing recovery from the financial crisis of 1998 is expected to result in larger cotton imports by countries in Southeast Asia. World cotton prices in 2000 also benefited from the higher oil prices and higher synthetic fibre prices, as well as by the lower level of stocks in China.
- After falling to their lowest point for a number of years in August 1999, rubber prices recovered on major world exchange markets. Prices of RSS1 rubber in the London and Malaysian

markets in mid-2000 were about 20 percent higher than at the same time in 1999. This price recovery reflected the strengthened demand for natural rubber, together with the impact of higher oil prices, which made synthetic rubber more expensive. World rubber prices are expected to remain firm in the near future, largely as a result of high oil prices. However, no further substantial price improvement would be expected because of the great potential for increased supply from more intensive tapping and from the increased production capacities in new producer countries such as Viet Nam. In addition, the recent slowdown in economic growth in the United States may result in lower demand for natural rubber.

- World sugar production increased by 4 percent to 135.8 million tonnes (raw sugar equivalent), another record level, in 1999/00. This resulted in unprecedented high global stocks as supply significantly outstripped consumption. Thus, after having fallen by 22 percent in 1998, and by a further 30 percent in 1999 to reach \$138 per tonne, by March 2000 the annual average International Sugar Agreement (ISA) price had reached a 14-year low of \$113 per tonne. However, estimates for 2000/01 point to a 4 to 5 percent reduction in production to 130 million tonnes, continued expansion in exports, a consequent decline in the high level of global sugar stocks and a continuing strengthening of prices. Prices followed an upward trend starting in April 2000 and, in spite of falling back slightly towards the end of the year, the annual average price for 2000 reached \$180 per tonne, 30 percent up on 1999. However, average prices in 2000 were still 20 percent lower than in 1998.

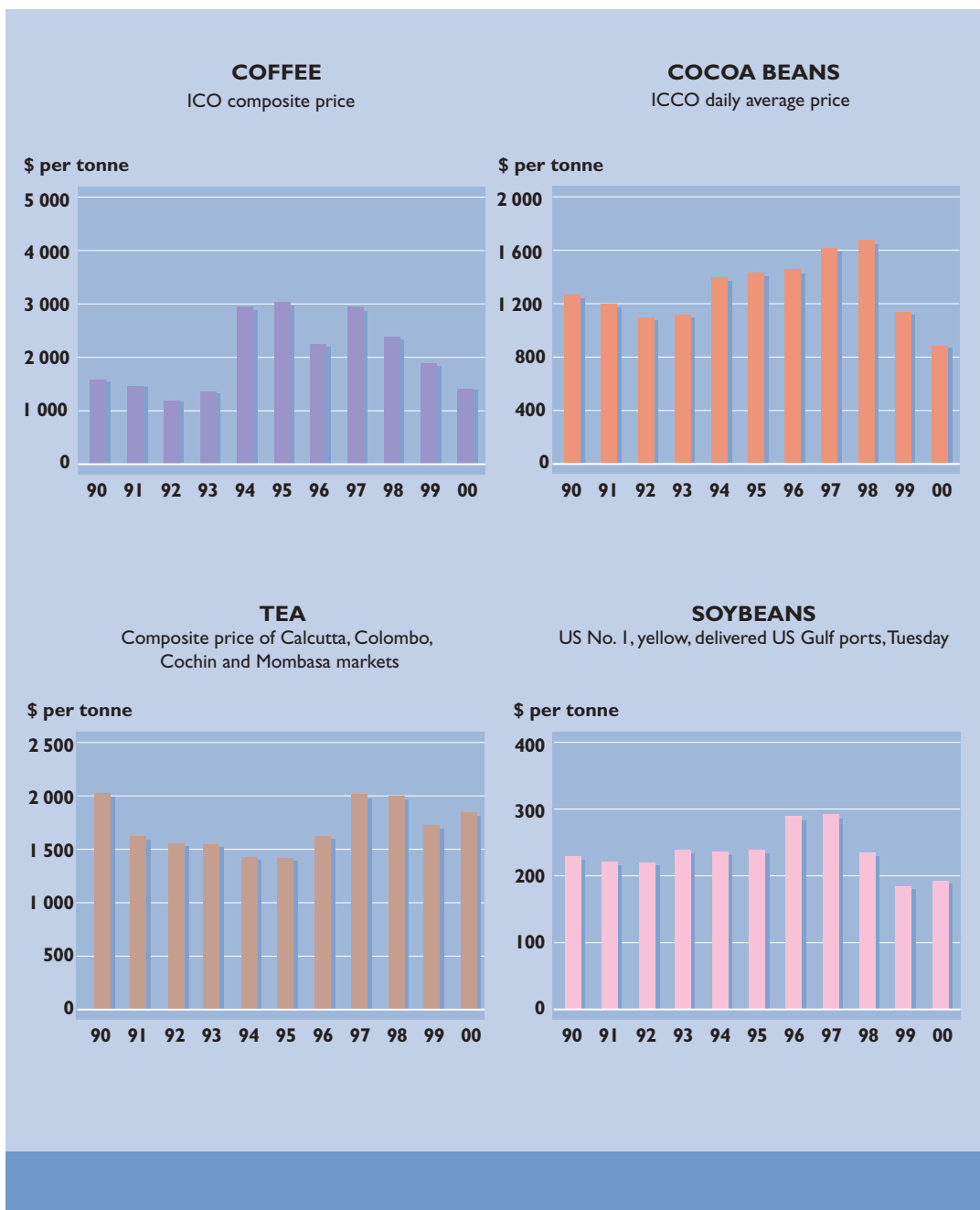
- In the first quarter of 2000, banana prices on major markets recovered from the record low levels they had reached at the end of 1999. This rise was partly due to the conjunction of lower production in several Latin American countries that were affected by adverse weather conditions and higher demand in several markets, notably Japan, China and Central and Eastern Europe. However, prices started to decline in May as production gradually recovered in countries that had been affected by Hurricane Mitch (notably Honduras) and demand was curtailed in Northern Hemisphere countries by competition from the domestic summer fruit harvests. Overall, the price average expressed in local currencies was higher in 2000 than in 1999 in the United States and Central and Eastern Europe, but lower in Western Europe and Japan. The combination of lower exports in Latin America and weak dollar prices in the

Figure 1
EXPORT PRICES OF SELECTED COMMODITIES*



* Averages derived from weekly or daily price quotations

EXPORT PRICES OF SELECTED COMMODITIES*



*Averages derived from weekly or daily price quotations

Source: FAO

European Community (EC), traditionally the most profitable of the major banana markets, led to a significant drop in export earnings for many developing countries. The profitability of the banana industry was further curtailed by higher input and transport costs in the wake of rising oil prices.

3. WORLD CEREAL SUPPLY SITUATION AND OUTLOOK²

Production

- World cereal output in 2000 fell to 1 852 million tonnes (including rice in milled equivalent), which is nearly 2 percent below the previous year's level and also below the average for the past five years. A number of factors contributed to the contraction in cereal output in 2000, ranging from natural disasters and low prices prevailing in recent years to government policies aimed at cutting excess supply.
- Global wheat production fell slightly to 586 million tonnes. This was mostly because of unfavourable weather, particularly severe drought in parts of Europe and North Africa as well as in several countries in Asia, including China, where policy changes also played an important role in reducing plantings.
- World output of coarse grains in 2000 registered a drop of 2 percent to 869 million tonnes. The decline mostly resulted from weather-damaged crops in parts of Asia and Europe. A drought-plagued season sharply reduced China's maize output, which fell by 24 million tonnes. Drought conditions throughout most of Eastern Europe particularly affected maize and barley crops.
- Global rice output fell to 397 million tonnes (in milled equivalent), down by almost 3 percent compared with 1999. Despite this sharp decline, rice production was still the second highest on record. The contraction was primarily induced by a decision on the part of farmers to diversify crops in response to the weak rice prices that had prevailed since 1999. In some instances, particularly in the case of China, government policies to cut surpluses contributed to the contraction.
- Early indications for the 2001 wheat crop in the Northern Hemisphere which, as of February 2001, was mostly planted, suggest that output could at best remain close to the reduced level of 2000. In Asia, early indications pointed to smaller wheat crops in China, India and Pakistan. In Europe, the wheat area in the EC was expected to decrease while, elsewhere in Europe, some recovery in production could be expected after the drought-reduced output of 2000. In North Africa, conditions for the winter wheat crops were generally favourable and output was expected to recover somewhat. In the Southern

Hemisphere, wheat planting for the 2001 harvest was to begin in April.

- Regarding 2001 coarse grains, crops were already planted in some of the major Southern Hemisphere producer countries. In southern Africa, output could decline as result of a reduction in area. In South America, growing conditions were generally favourable. Planting of coarse grains in the Northern Hemisphere was to start from around April.

- In the Southern Hemisphere and around the equatorial belt, the 2001 paddy season (main crops) was well advanced and harvesting of the crop was expected to begin around March. In the Northern Hemisphere, planting for the 2001 season was to begin only in April and May.

Utilization and stocks

- World cereal utilization in 2000/01 was expected to outpace global production for the second consecutive year. Total cereal utilization was forecast to reach 1 909 million tonnes, up 0.6 percent from the previous season, although use for direct human consumption was expected to rise by around 1.2 percent. The most significant increases were anticipated for developing countries in Asia. The animal feed utilization of cereals in 2000/01, on the other hand, was forecast to expand slightly, by about 0.6 percent.

- Estimates of the cereal carryover stocks in China (excluding Taiwan Province and Hong Kong Special Administrative Region) have undergone an upward revision since the last issue of *The State of Food and Agriculture*. The result has been a substantial increase in the estimates of China's inventories which, in turn, have led to noticeably higher figures than reported earlier for global stocks. This one-time adjustment made to the historical series of cereal stocks in China should not be perceived as either a reflection of, or cause for, changes in the market fundamentals.³ In fact, neither the volume nor the direction of annual variations in global stocks changed significantly because of this revision.

- World cereal stocks by the close of the seasons ending in 2001 were forecast to approach 640 million tonnes, down by 52 million tonnes or 7 percent from their opening levels, and the lowest in four years. The expected drawdown during the 2000/01 season reflected lower 2000 cereal production and

higher expected utilization. The biggest declines in cereal stocks were likely to be in countries where production was forecast to fall the most, namely China and the United States. Total ending cereal stocks in major exporting countries were put at 237 million tonnes, 12 million tonnes below their opening levels. Nevertheless, their share in total global stocks was forecast to rise slightly from the previous year to about 37 percent because of a larger drawdown in other countries.

- World stocks of wheat for crop years ending in 2001 were 239 million tonnes, down 7 percent from the previous year. Lower carryovers were expected for all five major exporters, except for the EC. Total coarse grain inventories for crop years ending in 2001 were reported to be 246 million tonnes, down 10 percent from the previous year, mainly as a result of an expected sharp fall (21 million tonnes) in stocks held in China following a drastic decrease in its maize production in 2000. Total stocks in major exporting countries were likely to remain unchanged at around 77 million tonnes. Global rice inventories at the end of the seasons in 2001 were forecast to be 155 million tonnes, approximately 5 percent below their opening level. Most of the reduction was expected to be concentrated in China, following a sizeable cut in production in 2000.

Trade

- World cereal trade in 2000/01 was forecast to peak at 236 million tonnes, slightly up from the previous year's record volume, mostly on account of higher demand for coarse grains and rice. The expansion in world cereal imports since 1999/00 would put world trade in cereals at about 25 million tonnes or 11 percent above the average for the previous decade.

- World trade in coarse grains in 2000/01 (July/June) expanded to a record level of about 105 million tonnes, 2 percent higher than in 1999/2000. World rice trade in 2001 was also expected to increase by more than 3 percent to 23 million tonnes. By contrast, international trade in wheat and wheat flour (in grain equivalent) in 2000/01 was forecast to decline slightly to 108 million tonnes.

- Total cereal imports by the developing countries in 2000/01 were expected to reach 168 million tonnes, which would be above average but slightly below the record volume reached in 1999/00. In value terms, the cereal imports bill of the developing countries was expected to total \$23 billion in

2000/01, almost \$2 billion or 9 percent more than in 1999/00. Total imports by the low-income food-deficit countries (LIFDCs) in 2000/01 were forecast to be about 70 million tonnes, slightly below the previous year's estimated level. Overall, total cereal import expenses for the LIFDCs as a group were forecast to be \$9.5 billion, up by 8 percent from 1999/00, mostly because of relatively stronger prices during the 2000/01 marketing season.

4. FOOD SHORTAGES AND EMERGENCIES

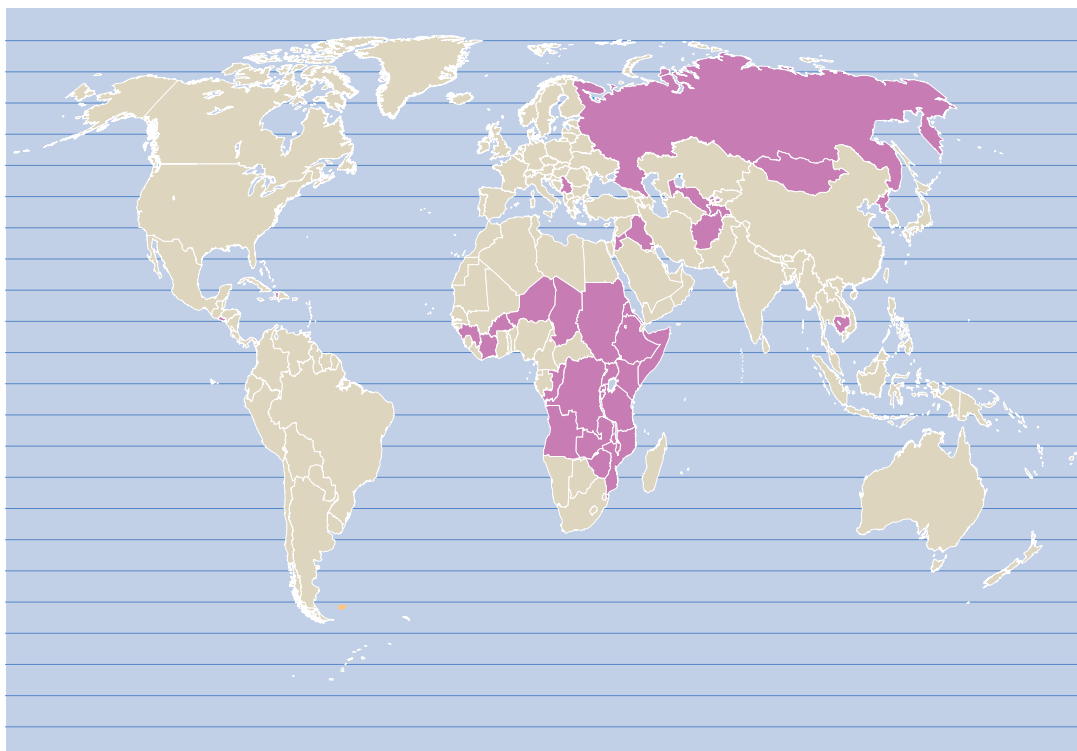
- Food shortages caused by natural and human-caused disasters continue to affect many countries in all regions of the world. As of early 2001, there were 33 countries and more than 60 million people facing food emergencies of varying intensity.
- In eastern Africa, some 18 million people still rely on food assistance because of the lingering effects of last year's drought, coupled with conflict in some parts. The situation is particularly severe in Eritrea, Ethiopia, Kenya and the Sudan, where recent droughts have sharply reduced food production and killed large numbers of livestock. However, recent rains, and the near-normal rainfall forecast for most of eastern Africa during the March to May 2001 cropping season, have improved the food outlook for the subregion. In Kenya, the severe drought in 1999/00 seriously undermined the food security of nearly 4.4 million people. In Eritrea, more than 1.8 million people are in need of urgent assistance owing to displacement by the war with neighbouring Ethiopia and to drought. The outlook for the 2001 agricultural season remains bleak, with farmers so far unable to return to their farms and large tracts of land still inaccessible because of the risk of landmines. In the Sudan, serious food shortages have emerged in western and southern parts as a result of drought. The continuing civil conflict is aggravating the situation by impeding rural households' cultivation activities. In Ethiopia, a good main season crop has improved the country's overall food availability. However, some 6.5 million people, affected by drought and war with neighbouring Eritrea, are dependent on food assistance. In Somalia, a satisfactory secondary season, preceded by a favourable main harvest, has improved overall food prospects. Consequently, the number of people in need of food assistance has declined from 750 000 to 500 000.
- Following severe floods in southern Africa, approximately 900 000 people in parts of Malawi, Mozambique, Zambia and Zimbabwe urgently need humanitarian assistance. Damage to infrastructure and housing as well as serious crop losses are reported in the affected areas. The damage is particularly serious in central Mozambique along the Zambezi Valley. Heavy rains and overflowing rivers have also displaced large numbers of people and damaged infrastructure and crops in Malawi, Zimbabwe and Zambia. In Angola, ravaged by civil-strife and where the number of internally displaced people is estimated to

be more than 2.5 million, the food supply situation remains serious. For the subregion as a whole, aggregate cereal production is forecast to decline substantially, reflecting sharp reductions in plantings and lower yields following dry spells and excessive rains. Several countries, including Botswana, Lesotho, Namibia, South Africa and Zimbabwe, expect reduced harvests in 2001.

- In central Africa, the food supply situation in the Democratic Republic of the Congo is critical for an estimated 2 million internally displaced people who urgently need food and other humanitarian assistance. However, insecurity continues to hamper relief distribution. In Burundi and Rwanda, despite

Map 2

COUNTRIES EXPERIENCING FOOD SUPPLY SHORTFALLS AND REQUIRING EXCEPTIONAL ASSISTANCE*



* In current marketing year

Source: FAO

improved production in the first season of 2001, food assistance is still needed in areas that suffered reduced harvests as a result of drought, and for large numbers of other vulnerable people.

- In western Africa, the food supply situation has tightened following reduced harvests in parts of the Sahel, notably in Chad and parts of Burkina Faso. Despite some improvement in food production, Liberia and Sierra Leone remain heavily dependent on international food assistance, while in Guinea rebel attacks in border areas are affecting agricultural activities and have caused population displacements.
- In South and East Asia, the food supply situation remains very difficult in several countries, largely on account of natural disasters. In Mongolia, a succession of droughts and extremely cold winters have killed large numbers of livestock, which are the sole source of livelihood and income for more than one-third of the population – mainly nomadic herders. The UN has appealed for international assistance to be provided to the country. In the Democratic People's Republic of Korea, the coldest winter in decades and a reduced harvest in 2000 exacerbated the already precarious food situation that has affected the country for the past six years.
- In several countries of the Near East, the livelihoods of millions of people have been affected by a prolonged, severe drought, followed by a harsh winter in some parts. In Afghanistan, freezing temperatures have caused loss of life and exacerbated the very serious food crisis that has emerged after two consecutive years of drought and continuing civil conflict. The drought has seriously affected crops and livestock across the country, leaving more than 3 million people in urgent need of assistance. In Iraq, two years of drought have seriously reduced food production, while in Jordan the drought has severely affected crops and pastures, leaving thousands of herders in need of assistance.
- In central Asian countries of the Commonwealth of Independent States (CIS), the effects of the recent severe drought are still being felt. This is particularly true in Armenia, Georgia and Tajikistan, where food assistance continues to be needed for approximately 4 million people.
- In Latin America, a series of earthquakes hit El Salvador between early January and mid-February, causing loss of life and

extensively damaging homes and infrastructure. Food production and marketing in 2001 will be constrained by the damaged infrastructure. In Bolivia, torrential rains and drought caused localized damage, and the government declared a state of emergency in some of the affected departments. In Haiti, food assistance is needed as a result of chronic economic problems.

- In Europe, food assistance continues to be needed for about 1 million vulnerable people in the Balkans, especially in Yugoslavia and the Russian Federation. The flare-up of conflict in The Former Yugoslav Republic of Macedonia is anticipated to increase the number of people in need of assistance.

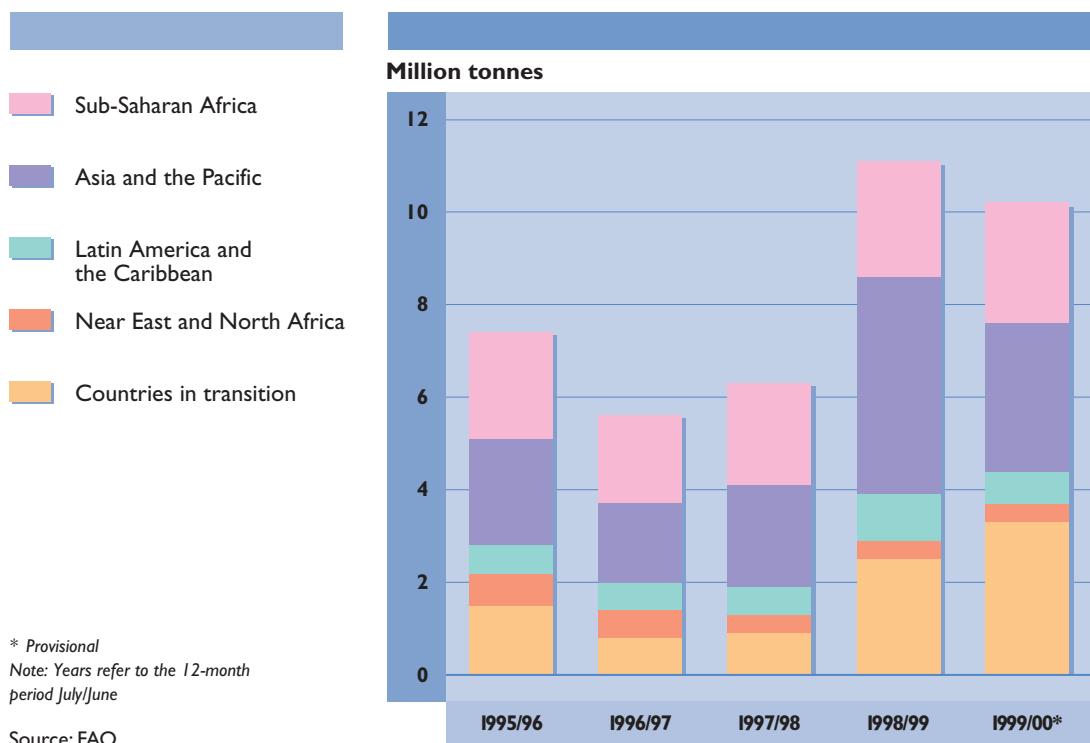
5. FOOD AID FLOWS

- According to the latest information supplied by the World Food Programme (WFP), total cereal shipments in 1999/00 (1 July through 30 June) under programme, project and emergency food aid amounted to 10.2 million tonnes, 800 000 tonnes down from the previous year, despite larger shipments to the Russian Federation.
- Cereal shipments from the United States rose to 6.7 million tonnes in 1999/2000, accounting for nearly 65 percent of the world total, up from 58 percent in 1998/99, largely on account of higher shipments to the Russian Federation. By contrast, cereal donations from Japan, mostly rice, declined sharply and those from the EC also fell. Shipments from most other origins remained close to 1998/99 levels.
- On the recipient side, shipments to the Russian Federation in 1999/00 soared to 2.4 million tonnes, which was close to the record amount shipped in 1993/94 and up by nearly 500 000 tonnes from the already high level of the previous season.
- Excluding the Russian Federation, total food aid shipments to the rest of the world in 1999/00 registered a decline of about 1.3 million tonnes, or 14 percent, to 7.7 million tonnes. Nevertheless, food aid by major donors exceeded the “minimum commitments” agreed under the 1999 Food Aid Convention (FAC) by at least 2.8 million tonnes. The 1999 FAC sets the minimum “guaranteed annual tonnage” at about 4.9 million tonnes (in wheat equivalent), but excludes the Russian Federation from the eligible food aid recipients.
- Total cereal shipments as food aid to the LIFDCs in 1999/00 fell to about 7 million tonnes, down by 1.1 million tonnes from 1998/99. Most of the decline was in Asia, while shipments to Africa rose slightly. In Asia, Bangladesh was the largest recipient (964 000 tonnes) followed by the Democratic People’s Republic of Korea (733 000 tonnes) and Indonesia (438 000 tonnes). Nevertheless, total shipments to these three countries registered a drop of about 1.4 million tonnes, or 39 percent, compared with 1998/99. By contrast, in Africa, shipments to Ethiopia in 1999/00 doubled from the previous year to 1.2 million tonnes. Rwanda (179 000 tonnes) and Kenya (120 000 tonnes) ranked as the second and third largest

recipients in Africa. In Latin America and the Caribbean, cereal shipments to Cuba, Haiti and Honduras increased slightly. In Europe, smaller shipments were made to Albania and Bosnia-Herzegovina but shipments to The Former Yugoslav Republic of Macedonia increased from 6 000 tonnes in 1998/99 to 92 000 tonnes in 1999/00.

- Preliminary indications suggest that cereal food aid shipments in 2000/01 could reach 10 million tonnes, close to the estimated volume for the previous year. Shipments to the Russian Federation are forecast to decrease sharply following the improved harvest in that country in 2000. However, food aid needs are expected to be larger, mostly in Africa, but also in the Democratic People's Republic of Korea and the southern countries of the CIS.
- According to WFP, total shipments of non-cereals as food aid reached 1.6 million tonnes in 1999 (January-December),

Figure 2
**RECIPIENTS OF SHIPMENTS OF FOOD AID
 IN CEREALS**
 (In grain equivalent)



700 000 tonnes, or 80 percent, more than in the previous year and the largest amount in five years. However, in the case of cereals, most of the increase was due to larger shipments to the Russian Federation, which soared from just 400 tonnes in 1998 to a record 800 000 tonnes in 1999. Most of this was accounted for by pulses (595 000 tonnes, mainly from the United States) and meat (159 000 tonnes, mainly from the EC). Total shipments to the LIFDCs rose slightly to 635 000 tonnes.

- Among the non-cereal food categories, shipments of nearly all commodities, except for edible fats and vegetable oils, rose in 1999 compared with 1998. Shipments of pulses surged to 1 million tonnes, 133 percent more than in 1998. At this level, food aid in pulses, 85 percent of which originated in the United States, represented 62 percent of the overall total food aid in non-cereals in 1999 and accounted for almost 13 percent of world trade of pulses.
- Another major non-cereal food category is meat and meat products. Shipments of these products showed a dramatic increase, from only 4 000 tonnes in 1998 to 163 000 tonnes in 1999, mostly accounted for by larger shipments from the EC.

6. EXTERNAL ASSISTANCE TO AGRICULTURE

- Data available as of February 2001 indicate that, in 1999, \$10.7 billion were committed by the major bilateral and multilateral donors to developing countries as official development assistance (ODA) for agricultural development. (At present, the data for 1999 are provisional because complete details regarding the commitments made by Development Assistance Committee [DAC] member countries are not yet available.)
- Relative to the \$12.6 billion of external assistance committed to agriculture in 1998, the estimate for 1999 constitutes a decline of approximately \$2 billion, inverting the upward trend begun in 1995. When measured in real terms (constant 1995 prices), the decline amounts to 12 percent.
- About 76 percent of this fall in external commitments to agriculture is attributable to declining assistance from multilateral donors. Overall multilateral assistance, which represents slightly more than 60 percent of the total, appears to have declined from \$8 billion in 1998 to 6.6 billion in 1999, a nominal decline of 17 percent. This is largely accounted for by a \$1.6 billion (or 33 percent) decline in commitments from the World Bank, which is the main multilateral donor, only partly compensated by an increase of \$0.4 billion (or 26 percent) in commitments from the regional development banks.
- On the bilateral side, the data indicate a nominal reduction in commitments from \$4.6 billion in 1998 to \$4.1 billion in 1999, meaning a decline of 11 percent. Australia, Austria, Denmark, Norway and the United Kingdom significantly increased their commitments. However, several countries, including France, Germany, Japan, the Netherlands and Sweden, recorded declining levels of commitments to agriculture in 1999.
- In spite of a 9 percent decline in its commitments to agriculture in 1999, Japan remains by far the largest bilateral agricultural donor, while the United Kingdom (after expanding its commitments to agriculture by 25 percent in 1999) overtook the United States and Germany to take second place, leaving those two countries in third and fourth position, respectively. Between them, these four bilateral donors

Figure 3
**COMMITMENTS OF EXTERNAL ASSISTANCE
 TO AGRICULTURE***
 (At constant 1995 prices)

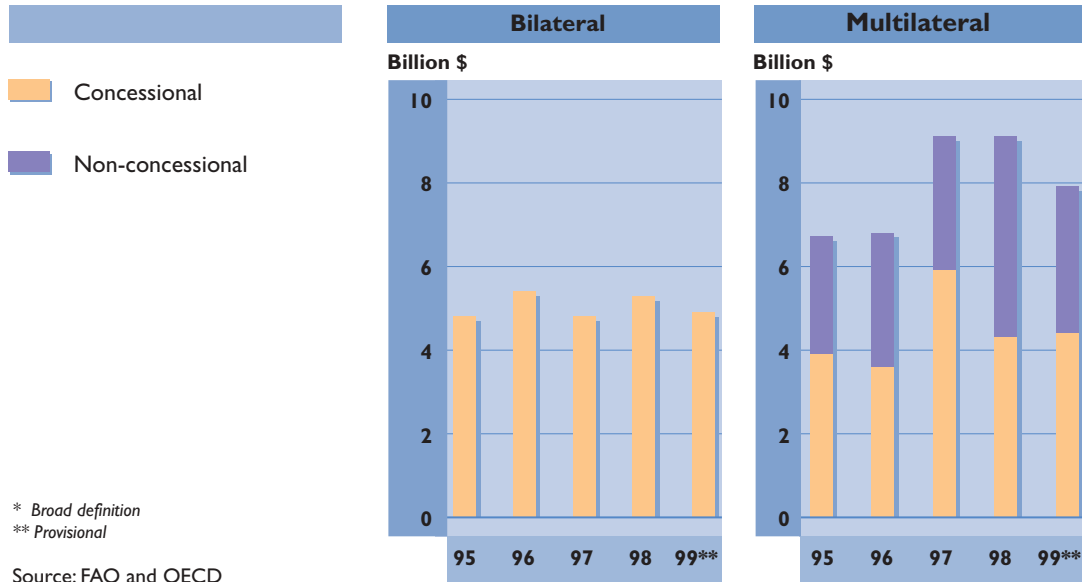


Figure 4
**COMMITMENTS OF EXTERNAL ASSISTANCE
 TO AGRICULTURE, BY MAIN PURPOSE**
 (At constant 1995 prices)

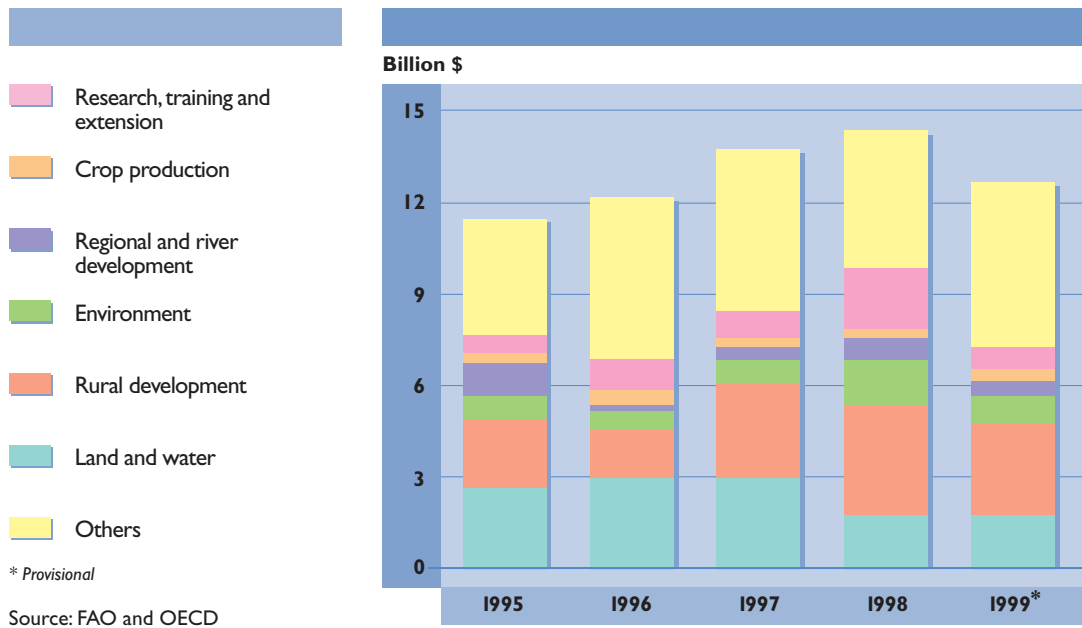
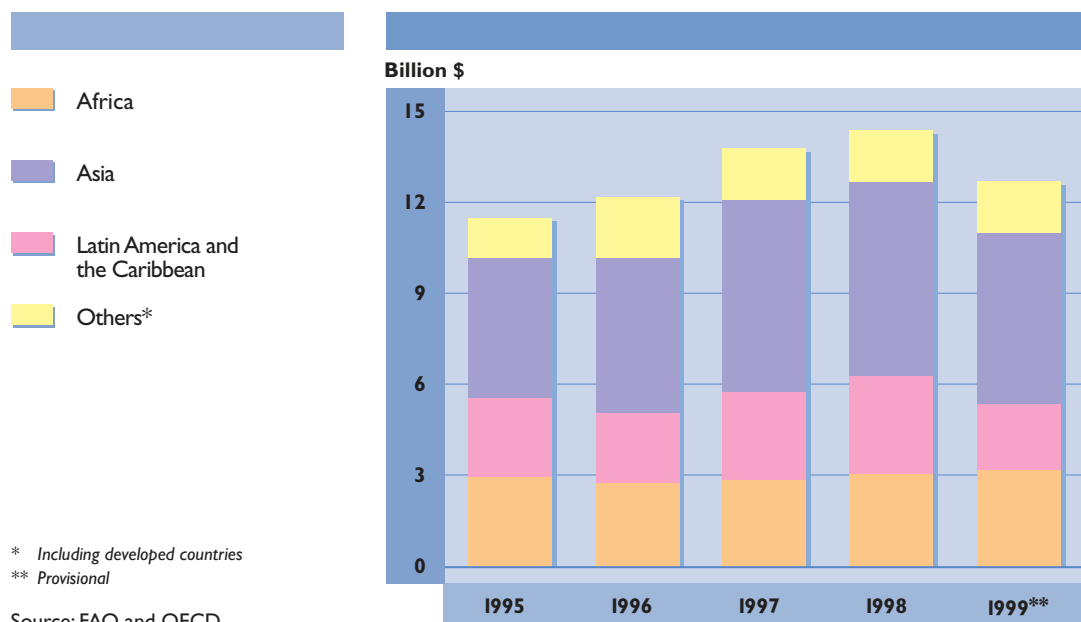


Figure 5
**COMMITMENTS OF EXTERNAL ASSISTANCE
 TO AGRICULTURE, BY MAIN RECIENT REGIONS**
 (At constant 1995 prices)



contributed about 72 percent of total DAC bilateral commitments to agriculture in 1999, with Japan accounting for the lion's share (41 percent), and the United Kingdom, the United States and Germany accounting for 12, 11 and 7 percent, respectively.

- When external assistance to agriculture is classified in terms of concessionality, the largest part of the decline is accounted for by non-concessional assistance, despite the fact that it has traditionally represented significantly less than 50 percent of total commitments. Thus, non-concessional commitments, all of which were multilateral, declined from \$4.2 billion in 1998 to 3 billion in 1999, corresponding to a reduction of 29 percent. Almost all the decline was due to reduced concessional commitments from the World Bank (specifically the International Bank for Reconstruction and Development [IBRD]). At this level, non-concessional commitments corresponded to 28 percent of total commitments to agriculture, compared with 33 percent in 1998.

- Concessional commitments, which represented 72 percent of the total in 1999, declined by 8 percent in 1999 to \$7.8 billion, less than the non-concessional commitments, thereby increasing their share of total commitments from 67 to 72 percent. The bilateral part of the concessional commitments declined most sharply, falling by 11 percent to \$4.1 billion, while the multilateral part declined by only 4 percent, to \$3.6 billion.
- In terms of the destination of assistance, commitments to developing countries, which in 1999 represented 94 percent of the total, declined from \$12 billion in 1998 to \$10.3 billion in 1999, representing a reduction of 11 percent when measured in real terms. Among the developing country regions, in 1999 Africa experienced an increase in real terms of 6 percent, while levels of assistance in Asia and Latin America and the Caribbean declined by 11 and 33 respectively. Assistance to the transition countries declined for the third consecutive year, falling from about \$600 million in 1998 to about 450 million in 1999.
- Regarding the sectoral distribution of assistance, commitments to agriculture, narrowly defined,⁴ increased by 10 percent to \$6.3 billion. This represented 59 percent of the total. In the broader definition of agriculture, the most important component is assistance to rural development and infrastructure, which accounted for 24 percent of the total although it underwent an absolute decline of 18 percent from \$3.1 billion in 1998 to \$2.6 billion in 1999.

7. FISHERIES: PRODUCTION AND TRADE

- World production of fish, shellfish and other aquatic animals increased from 117 million tonnes in 1998 to 125 million tonnes in 1999. Capture fisheries production amounted to 92.3 million tonnes; although this represents an increase of 7 percent compared with 1998, it is still 1.4 million tonnes below the record levels reached in 1996 and 1997. Aquaculture increased by 2 million tonnes to reach 32.9 million tonnes in 1999.
- The increase in landings from capture fisheries occurred as fish stocks in the Southeast Pacific recovered from the effects of the El Niño atmospheric phenomenon, which affected those stocks in 1997/98. Landings of Peruvian anchovy and Chilean jack mackerel, which had decreased to a low of 3.7 million tonnes in 1998, amounted to 10.1 million tonnes in 1999. China reported capture fisheries production of nearly 17 million tonnes in 1999. Other major fish producers were Peru (8.4 million tonnes), Japan (5.2 million tonnes) and Chile (5 million tonnes).
- Aquaculture production from both inland and marine waters continued to increase in 1999. The Asian region (particularly China) continued to dominate world production.
- In 1999, about 30.4 million tonnes of fish were used for reduction, 6.5 million tonnes more than in the preceding year. Availability of fish for human consumption fell slightly to an estimated 15.8 kg per capita (liveweight equivalent).
- Exports of fish products expanded to \$52 200 million in 1999. Developed countries accounted for nearly 85 percent of the value of total imports of fishery products. Japan was again the biggest importer of fishery products, accounting for some 25 percent of the global total, which is a substantial decline from the 30 percent share that this country used to have. Japanese imports of fish and fishery products declined in 1997 and 1998 as a result of the economic recession and have not fully recovered yet. The EC further increased its dependency on imports for its fish supply. Its share in total world imports of fishery products in value terms expanded to 35 percent; however, about half of the EC's imports originate from intra-Community trade. The United States, besides being the world's fourth major exporting country, was the second biggest importer of fish and fishery products in 1999, accounting for 16 percent of the total.

Figure 6
WORLD FISH CATCH

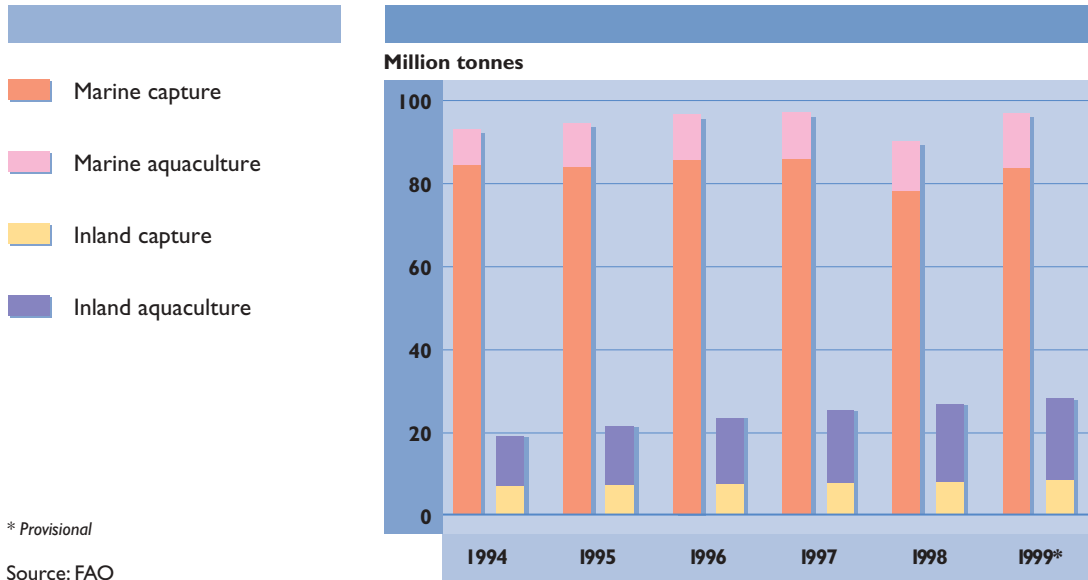


Figure 7
PER CAPITA FISH SUPPLY FOR FOOD

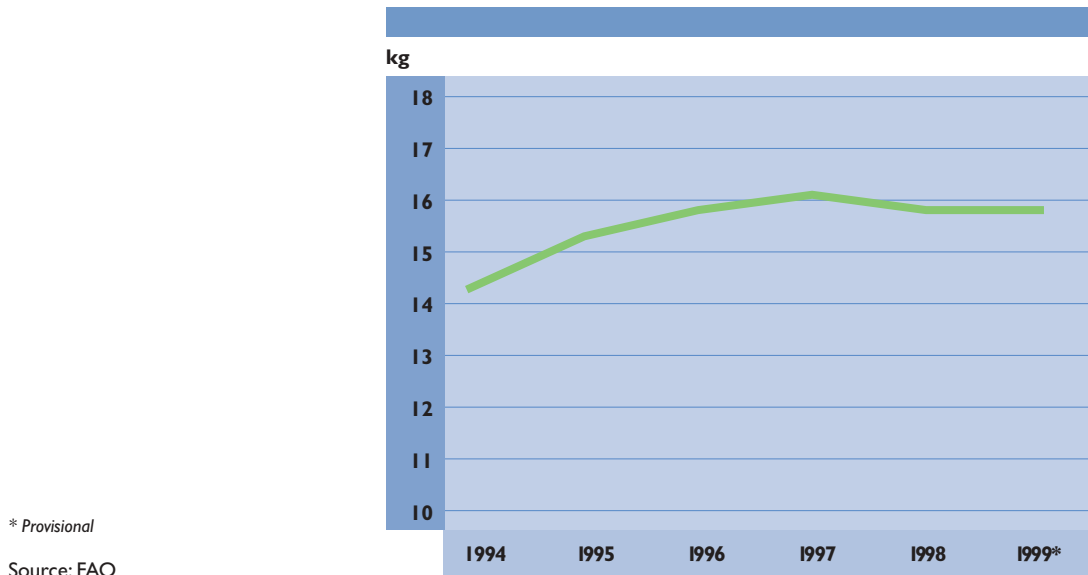
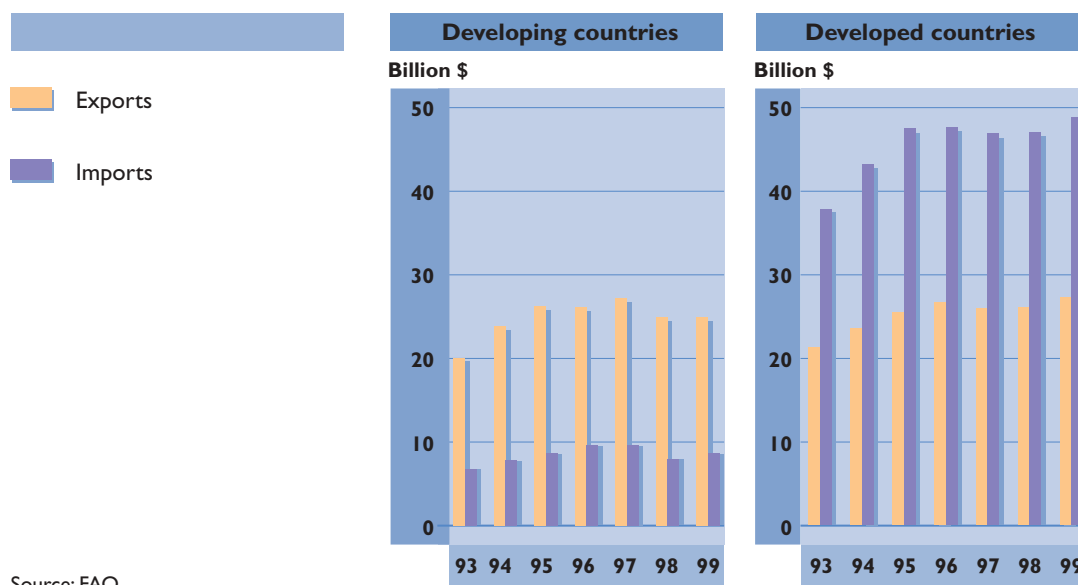


Figure 8
TRADE IN FISHERY PRODUCTS



Source: FAO

- Thailand and Norway are the world's major exporters of fish products in value terms. Together their exports accounted for 15 percent of total world exports. Developing countries continue to record an impressive trade surplus in fish products. The value of their fish exports less the value of their fish imports has now stabilized at between \$16 billion and \$17 billion per year. Thus, for many developing nations, fish trade represents a significant source of foreign currency earnings.

- Shrimp is the most important commodity, accounting for about 20 percent of international trade in value terms. This share remained stable over the past 20 years, despite the substantial changes in trade patterns and supply of fish and fishery products to the world market. Groundfish (i.e. demersal fish) is another important group of species. It accounts for 12 percent of fishery trade. Tuna – traded fresh, frozen or canned – represented 9 percent of the total in 1999. The relative importance of fishmeal and of squid, cuttlefish and octopus has decreased over the past years to reach 3 and 4 percent, respectively, of the value of world exports in 1999. At the same time, however, exports of fresh, frozen, smoked and canned salmon have been increasing, and represented 7 percent of the total in 1999.

8. PRODUCTION AND TRADE OF FOREST PRODUCTS

- Global markets for forest products recovered slightly in 1999, owing to strong growth in the developed countries and the start of economic recovery in Asia. Overall, global roundwood production increased by 1.5 percent to 3 275 million m³. In the developing countries, which account for about 60 percent of total roundwood production, production increased by 0.9 percent, while the developed countries' production increased by 2.6 percent.
- Industrial roundwood production (which excludes the production of wood used for fuel) accounted for about 47 percent of total roundwood production in 1999 and increased by 1.4 percent to 1 525 million m³. Developed countries account for the largest share of industrial roundwood production (about 73 percent) and production in these countries rose by 2.4 percent to 1 117 million m³. Developing countries' production fell slightly from 413 million to 409 million m³.
- Global production of solid wood products (which includes sawnwood and wood-based panels) also increased during 1999, rising by 3.2 percent to 590 million m³. Sawnwood production increased by 3.1 percent to 430 million m³, while wood-based panel production increased by 3.5 percent to 160 million m³. Again, the increase in production was led by the developed countries, where production increased by 3.7 percent as opposed to an increase of only 1.6 percent in the developing countries.
- Production of pulp and paper also increased in 1999. Overall, global output of pulp and paper products increased by 4.2 percent in 1999 to 480 million tonnes. However, in contrast to the previous year, the developing countries led the recovery. Production of pulp and paper products in the developing countries increased by 11.2 percent in 1999 to just under 100 million tonnes. In the developed countries, there was only a 2.6 percent increase to 380 million tonnes.
- Global trade in forest products also recovered from the poor performance experienced the previous year. A significant proportion of forest products output is traded on international markets each year, including - in 1999 - 30 to 35 percent of

Figure 9
OUTPUT OF MAIN FOREST PRODUCTS

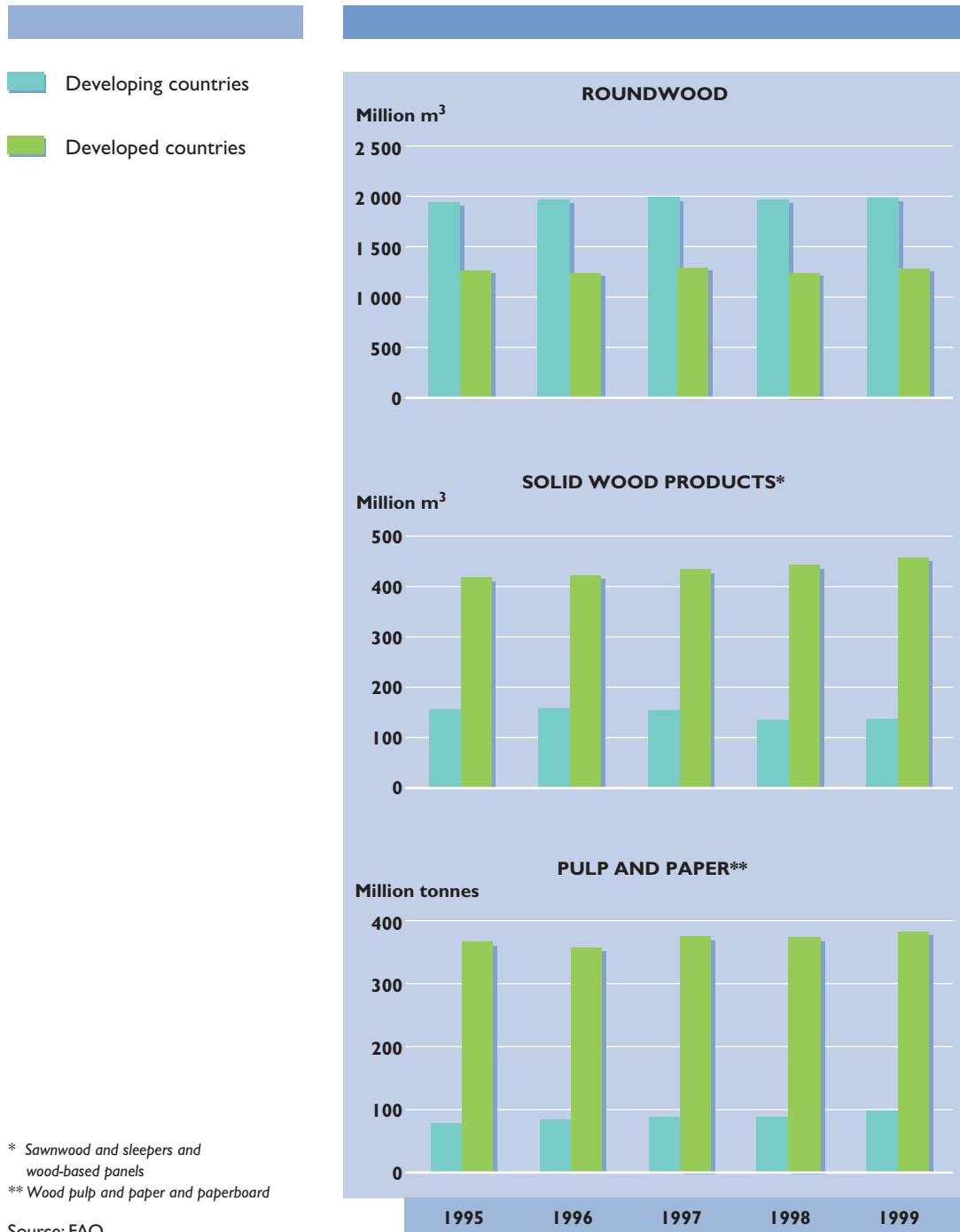
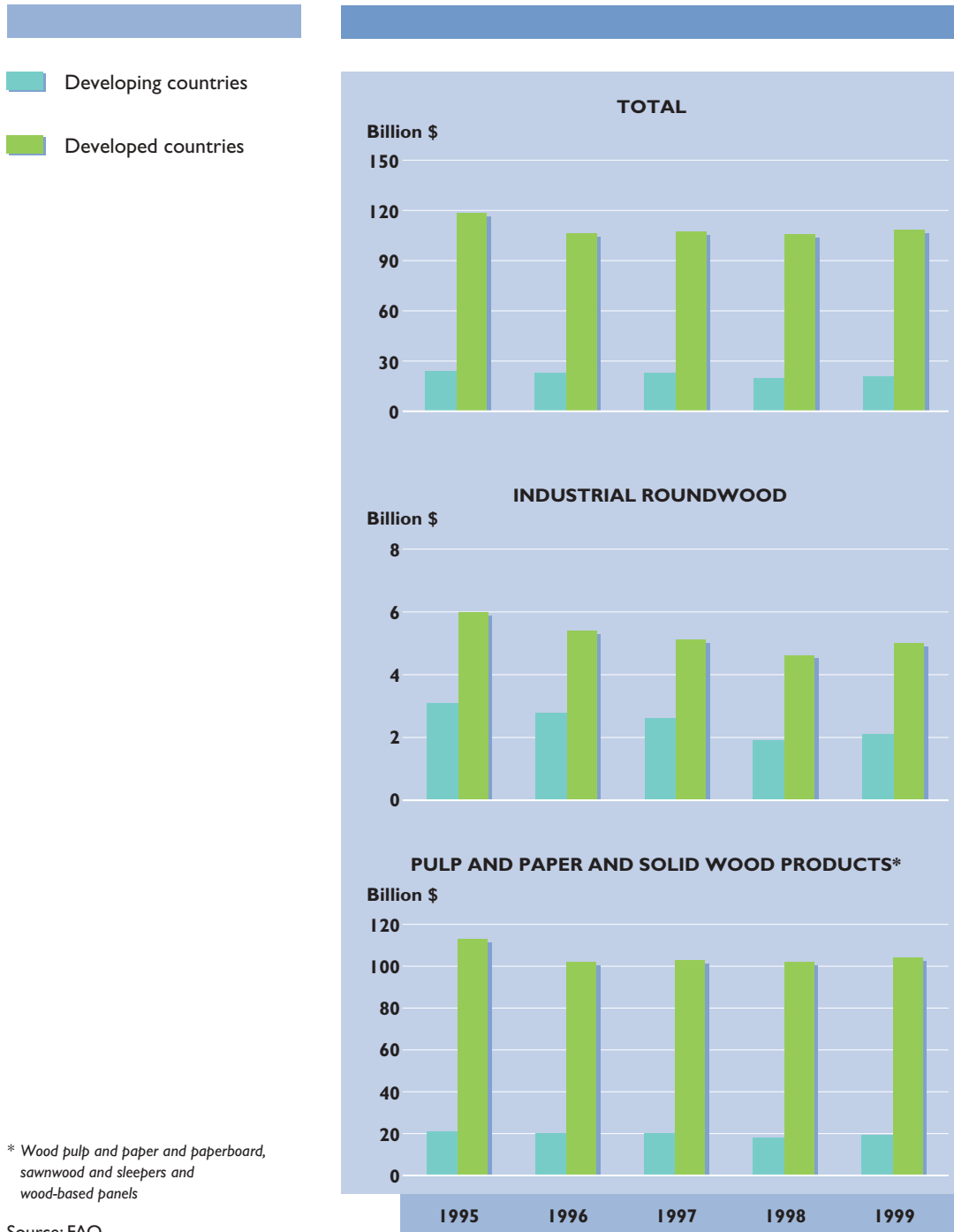


Figure 10
EXPORT VALUES OF MAIN FOREST PRODUCTS



* Wood pulp and paper and paperboard, sawnwood and sleepers and wood-based panels

Source: FAO

sawnwood, wood-based panel and paper production in the developed countries and 40 percent of wood-based panel and wood pulp production in the developing countries. During 1999, exports increased across all regions in the solid wood sector but remained flat in the pulp and paper sector.

- The value of global industrial roundwood exports in 1999 increased by 10 percent to \$7.2 billion. Exports from the developing countries increased by 12.4 percent in 1999 to \$2.1 billion, while exports from the developed countries increased by 8.8 percent to more than \$5 billion. These export levels are still well below the averages for previous years.

- Exports of sawnwood increased by 6.8 percent to \$23.7 billion. Exports from the developed countries increased by 7.9 percent to \$20.6 billion and accounted for nearly all of this growth. By contrast, exports from the developing countries increased by only 0.3 percent. In the wood-based panels sector, the opposite situation occurred. Exports increased overall by 11.9 percent to \$17.6 billion and developing countries led the way. Exports from the developing countries increased by 25.2 percent to \$6.5 billion, while exports from the developed countries increased by only 5.3 percent. Economic recovery in Southeast Asian economies such as Indonesia and Malaysia accounted for much of this growth.

- Exports of wood pulp, paper and paperboard in 1999 amounted to just over \$81 billion and remained unchanged from the previous year. This situation of zero growth occurred both in developed and developing countries. The volume of exports increased slightly in 1999, but the value of exports remained unchanged because of a slight fall in prices.

II. The global economy and agriculture

WORLD ECONOMIC ENVIRONMENT

During 2000 there was a further strengthening of the economic recovery that had already manifested itself in 1999, after the global slowdown caused by the financial crisis in Asia in 1997 and 1998. World GDP was expected to grow by 4.7 percent, reflecting stronger economic activity in most regions of the world.⁵ Despite the higher economic growth, inflation rates edged up only modestly in response to higher energy prices. Growth in the volume of world trade, which had slowed to 4.3 percent in 1998 and increased to only 5.1 percent in 1999, is also expected to have gained strength to a rate of about 10 percent in 2000. The steep increase in oil prices influenced economic performance worldwide, although the shock was absorbed relatively well at the global and regional levels. However, net oil importers faced significant increases in their import bills which, for the poorest of them, translated into pressure to reduce other imports, domestic consumption and investment.

Figure 11

GROWTH IN WORLD ECONOMIC OUTPUT

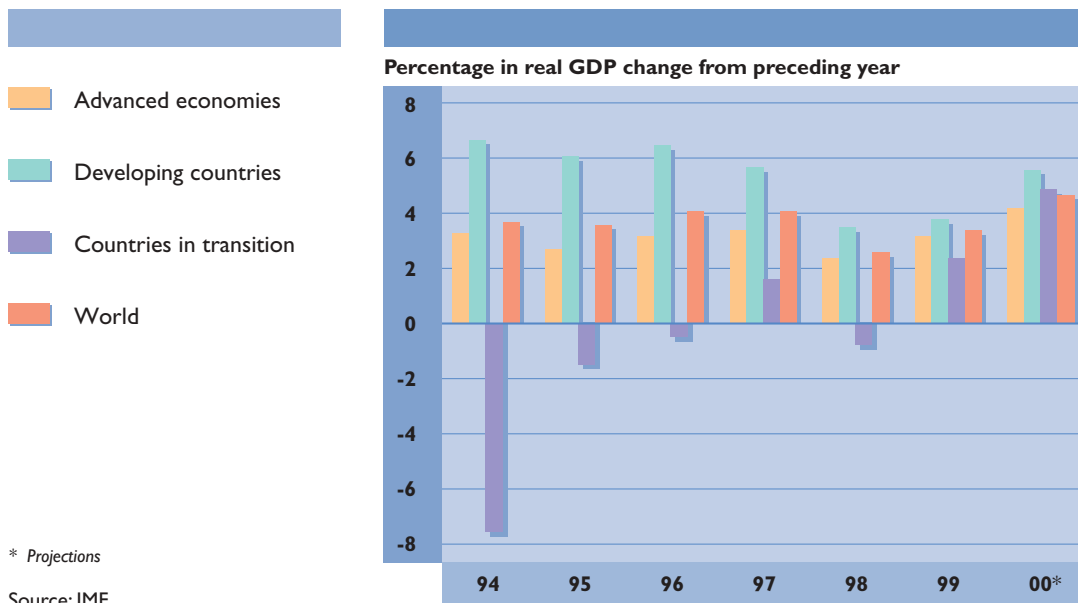


Figure 12
**ECONOMIC GROWTH IN DEVELOPING
 COUNTRY REGIONS**

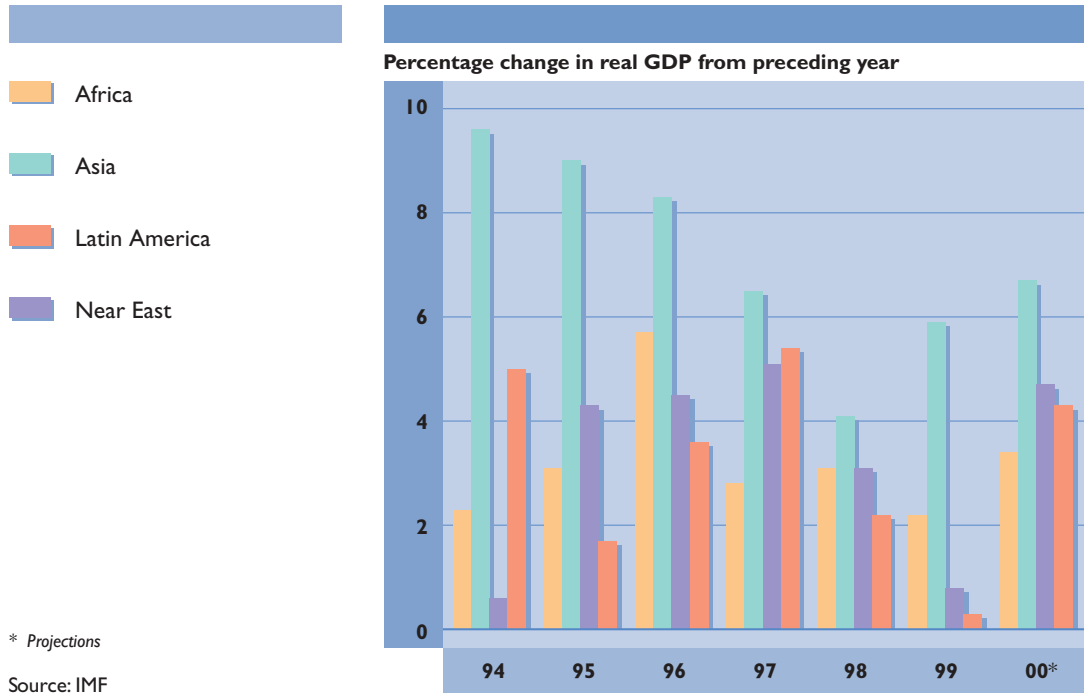
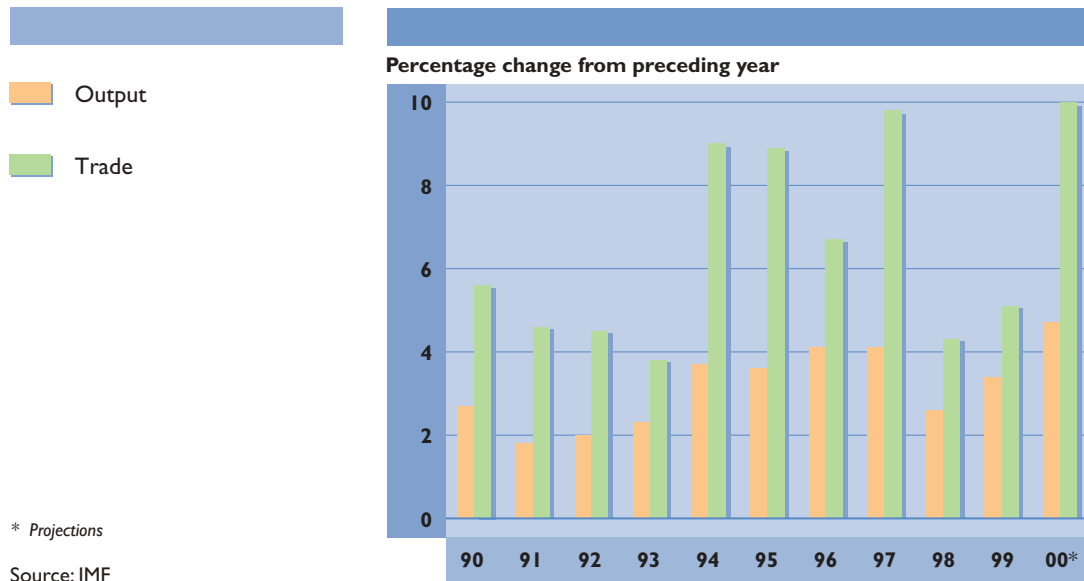


Figure 13
**GROWTH IN WORLD OUTPUT AND
 VOLUME OF TRADE**



The advanced economies⁶ are estimated to have grown by 4.2 percent in 2000, up from 3.2 percent in 1999. A major factor underlying the improved performance for these economies was continuing growth in the United States (at an estimated rate of 5.2 percent), supported primarily by sustained labour productivity gains. Growth also gained strength in the EC (reaching an estimated 3.4 percent), as several major countries entered a cyclical upturn from the second half of 1999. The euro area made significant progress in reducing unemployment, which fell below 10 percent for the first time since 1993. Some recovery appeared to be taking hold also in Japan, with GDP growth projected to rise to 1.4 percent, mainly reflecting a rebound in business investment and a slow recovery in consumption demand.

In spite of the improved economic situation, prospects for the short and medium term in the advanced economies are uncertain. Persisting macroeconomic imbalances within and among the major economies present potential risks. These include uneven patterns of growth and demand and imbalances in intercountry payments, in particular strong trade and current account deficits in the United States and surpluses in Japan. The ability of the United States to reduce growth to sustainable levels in an orderly manner will be particularly important.

Indeed, in early 2001, concerns about the world economy were increasing as world economic growth appeared to be weakening following a slowdown in the United States economy and a waning of the recovery in Japan. The International Monetary Fund (IMF) announced an expected downward revision of its forecasts of world economic growth for 2001, initially projected to be 4.2 percent.

The transition economies have continued to exhibit major intercountry differences in reform and macroeconomic achievement. Being more advanced in the transition process, countries in Central and Eastern Europe and the Baltic states have shown better performances in output growth and inflation rates than the CIS (for a further discussion, see relevant section in Part 2, Regional review).

The developing countries are also estimated to have accelerated their economic growth, from 3.8 percent in 1999 to 5.6 percent in 2000. All developing country groups shared in this improved economic outlook. Indeed, current expectations are for a consolidation of economic recovery in most of the crisis-affected countries in Asia and a rebound after the previous year's slowdown in Latin America and the Caribbean, Africa and the Near East. However, the improvement

in 2000 was uneven among regions and countries. In Africa in particular, per capita incomes were expected to grow by only 1 percent, after having fallen in 1999 and expanded only marginally in the previous two years.

Beyond region-specific factors, which are examined in more detail in the Regional review, the overall economic improvement experienced in 2000 largely reflected more favourable developments in the international economic and financial scene. The developing countries benefited in particular from the strengthening of economic activity in the advanced economies, which are their main sources of trade and financing. On the other hand, many developing countries were hit hard by the weakness of most non-oil commodity prices during the past three years, as reviewed in the following section.

Commodity prices

Following the financial crises in Asia, Brazil and the Russian Federation, agricultural commodity prices weakened markedly from 1997, and only gave weak signs of stabilization or, in some cases, recovery in the course of 2000.

The decline affected food and non-food agricultural commodities alike. After having increased by a cumulative 20 percent during the “commodity boom” years, 1995 and 1996, prices of food products fell sharply in 1997, 1998 and 1999 before stabilizing somewhat in 2000. Price trends were

Table 1

PRIMARY COMMODITY PRICE INDICES IN US DOLLAR TERMS¹

Year/ quarter	Non-fuel primary commodities					Petroleum
	All	Food	Beverages	Agricultural raw materials	Metals	
1995	118.1	113.6	151.1	131.3	100.2	74.8
1996	116.7	127.5	124.9	127.7	88.2	88.6
1997	113.0	114.0	165.5	119.0	91.5	83.9
1998	96.4	99.7	140.3	99.5	76.6	56.9
1999	89.6	84.1	110.5	101.8	75.5	78.3
2000 ²	91.0	83.7	92.2	103.1	84.6	122.8
2000 Q1	93.7	84.5	102.8	106.1	87.4	115.6
2000 Q2	92.0	84.1	95.5	106.5	82.7	116.7
2000 Q3	89.3	80.2	88.6	101.2	85.6	129.7
2000 Q4 ²	89.1	86.0	81.8	98.4	82.8	129.2

¹ 1990 = 100.

² Provisional data.

Source: IMF.

also extremely unfavourable for tropical beverages – except for in 1997 when temporary short supplies led to strong price increases – as well as for raw material prices which, however, strengthened moderately in 1999. Beyond commodity-specific factors (reviewed in Current agricultural situation – facts and figures 2), the persisting weakness of commodity prices was generally related to the inability of production to adjust to the slump in demand in 1998-99. Such downward adjustment is naturally slow to occur for crops such as tropical beverages and sugar cane. In the case of non-perennials, such as cereals and oilseeds, prices were under downward pressure in the late 1990s, following improved weather conditions and larger harvests and stocks, especially in North America. Some firming of commodity prices is expected in the short term, but it is unlikely that they will regain the levels of 1995-97.

The value of world trade in the principal primary agricultural commodities fell sharply in 1999 for the second year in a row, dropping by 6 percent to \$203.7 billion as a result of both low commodity prices and flat trade volumes (Table 2). Estimates

Table 2

VALUE OF GLOBAL EXPORTS OF MAJOR AGRICULTURAL PRODUCTS

	1998	1999	2000	1998-1999	1999-2000
	<i>(Billion \$)</i>			<i>(Percentage change)</i>	
Beverage crops	18.0	12.4	11.2	-31.1	-9.7
Cocoa	2.8	2.2	1.7	-21.4	-22.7
Coffee	11.0	7.4	6.6	-32.7	-10.8
Tea	2.9	2.8	2.9	-3.4	3.6
Sugar	10.2	7.6	9.2	-25.5	21.1
Bananas	3.5	3.4	3.0	-2.9	-11.8
Citrus	5.0	4.9	4.0	-2.0	-18.4
Cereals	39.9	36.0	35.8	-9.8	-0.6
Meat	41.0	47.5	48.9	15.9	2.9
Milk and milk products	26.7	24.6	25.2	-7.9	2.4
Oils, oilseeds and meals	54.9	51.8	46.9	-5.6	-9.5
Agricultural raw materials	17.5	15.5	17.5	-11.4	12.9
Cotton	8.3	7.5	8.9	-9.6	18.7
Jute	0.6	0.4	0.4	-33.0	0.0
Hard fibres	0.4	0.3	0.3	-25.0	0.0
Natural rubber	3.6	3.0	3.4	-16.7	13.3
Hides and skins	4.6	4.3	4.5	-6.5	4.7
TOTAL OF THE ABOVE	216.7	203.7	201.7	-6.0	-1.0

Source: FAOSTAT (trade data for 1998). Data for 1999 and 2000 are preliminary, based on FAO estimates of trade volumes and market prices.

for 2000 indicate a substantial slowdown in the decline, largely owing to a notable increase in growth in the global economy which stimulated demand for some commodities. Nevertheless, international prices of many agricultural commodities remained near or below the depressed levels of 1999. This conferred substantial benefits on consumers, especially in importing countries, but caused economic difficulties for farmers in the producing countries.

Medium-term prospects for agriculture in developing countries

Medium-term projections for agricultural output and trade have been prepared for FAO by the Project LINK. The projections are produced in conjunction with Project LINK's global macroeconomic projections. The specific projections have a time horizon of 2000-2004. They were prepared in November 2000 and are consistent with the macroeconomic projections elaborated after the Project meeting in October 2000. It should be noted that the projections have not taken full account of the latest setback in the United States economy, which was faster than expected, or the serious slump in the Japanese economy, which became more evident in 2001. Agricultural GDP projections for the developing country regions are presented in Table 3.

Against a background of projected good global macroeconomic growth, the projections suggest relatively strong growth also for the agricultural GDP of the developing countries as a whole. Throughout the projection period, annual agricultural GDP growth is expected to be in the range of 4 to

Table 3

PROJECTED ANNUAL GROWTH OF AGRICULTURAL GDP

	1999	2000	2001	2002	2003	2004	Average 2001-04
	<i>(Percentage)</i>						
DEVELOPING COUNTRIES	3.3	4.4	4.0	4.4	4.7	4.7	4.5
Latin America and the Caribbean	0.4	3.9	4.1	4.9	4.5	4.5	4.5
Sub-Saharan Africa	3.2	4.7	3.8	5.0	5.6	5.6	5.0
Near East and North Africa	4.1	5.4	6.1	5.2	5.8	5.4	5.6
Asia and the Pacific	4.3	3.8	3.5	3.5	3.3	3.7	3.5
China	1.2	1.9	1.6	0.9	0.4	1.9	1.2
India	8.1	3.3	3.3	3.7	3.7	2.9	4.3
Others	4.7	6.1	5.3	5.6	5.6	5.7	5.6

Source: Project LINK.

5 percent, strengthening towards the end of the period. At this rate, agricultural GDP in the developing countries would nevertheless grow less strongly than overall GDP for the developing countries, which is projected to grow at a rate of 5 to 6 percent throughout most of the period.

Agricultural trade of the developing countries is projected to expand relatively briskly throughout 2001-2004, with agricultural exports growing at an annual rate of about 6.6 percent over the period. The export expansion would be slightly stronger in Asia and the Pacific (7.5 percent – with 8.4 percent for China) and sub-Saharan Africa (7.4 percent), and slightly lower in the Near East and North Africa (6.3 percent) and Latin America and the Caribbean (5.3 percent).

Agricultural imports would, however, expand even more rapidly, at an average annual rate of 8.1 percent. Imports would grow strongly in Asia and the Pacific (9.5 percent – with 10.5 percent for India) and Latin America and the Caribbean (8.9 percent), but more slowly in sub-Saharan Africa (5.2 percent) and the Near East and North Africa (5 percent).

Only small changes are projected by Project LINK for the terms of trade of agricultural exports. After a deterioration of 3 percent in 2000, overall agricultural barter terms of trade would improve on average by less than 1 percent per year over the period 2001-2004 for the developing countries as a whole.

Countries highly dependent on agricultural trade

There are two groups of countries for which agricultural trade is particularly important, and they are therefore especially sensitive to changes in the international economic and agricultural environment.

The country groups are: i) economies highly dependent on agricultural exports; and ii) low-income food-deficit countries (LIFDCs) with the lowest capacity to finance food imports. The economic and agricultural situation of these countries and their future prospects have particular relevance in the current context of weak prices of the commodities on which they largely depend, either as importers or exporters. The two groups, which are not mutually exclusive, have been more specifically defined as follows:

Exporters. This group includes developing countries for which exports of agricultural, fishery and forestry products are equivalent to at least 20 percent of their total exports or 20 percent of their total imports. It comprises a total of 53

countries (27 in sub-Saharan Africa, five in Asia and the Pacific, 20 in Latin America and the Caribbean and one in the Near East and North Africa).⁷

Importers. This group is a subgroup of the FAO's LIFDC category. There are three criteria that determine the classification of a country as low-income and food-deficit: i) a per capita GNP below the ceiling used by the World Bank to determine eligibility for IDA assistance and for 20-year IBRD terms; ii) the net food trade position of a country averaged over three years (volume-based and aggregated by calorie content); and iii) a criterion of self-exclusion at the request of the country. The subgroup of LIFDCs with the lowest capacity to import food, i.e. importers, comprises those countries for which food imports represent 25 percent or more of total export earnings and thus constitute a particularly heavy economic burden. The group comprises 37 countries (19 in sub-Saharan Africa, five in Latin America and the Caribbean, six in Asia and the Pacific and seven in the Near East and North Africa).⁸

For these two groups of countries, in addition to the medium-term projections elaborated by Project LINK, IMF has provided short-term macroeconomic forecasts (for 2000 and 2001) that are consistent with those contained in the October 2000 issue of *World Economic Outlook*.

For the group of exporters in 2000-2001, IMF projections indicate:

- After two years of stagnation, GDP growth is expected to gain momentum in 2000-2001, rising to about 4.3 percent yearly. On the whole, however, economic activity in these countries is expected to remain less dynamic than that in the developing countries as a whole (where an expansion of more than 5 percent is expected for 2000-01).
- Merchandise exports are forecast to expand significantly from the depressed levels to which they had fallen in 1998-99. After many years of deficit, this would allow a positive net trade position and some reduction in the overall deficit in current accounts.

Prospects for the medium term suggest stronger agricultural sector growth in these countries. Indeed, according to Project LINK projections:

- agricultural value added should expand at a similar rate to that of the economy as a whole, i.e. about 4 to 4.5 percent in the period 2000-04;
- the agricultural exports of the group as a whole are forecast

- to expand at about 5 percent in 2000 and at an average rate of 4.8 percent in 2001-04;
- the barter terms of trade of these countries' agricultural exports, which deteriorated markedly between 1997 and 2000, are forecast to improve somewhat starting in 2001, although insufficiently to compensate for previous losses.

For the group of exporters, short-term prospects also point to an improvement compared with recent years. According to IMF forecasts for 2000 and 2001:

- economic growth should be similar to that of developing countries as a whole, i.e. at about 5 to 5.5 percent in 2000-01 (up from 1.5 percent during 1991-97, 4.5 percent in 1998 and 5 percent in 1999);
- the chronic current account deficit, like that of the exporters, is forecast to widen significantly, from \$6.9 billion in 1997 to about 10.9 billion in both 1998 and 1999 and to about \$13 billion in 2000-01.

Medium-term prospects for these countries appear mixed. Project LINK forecasts to the year 2004 indicate that:

- at about 4 percent, agricultural GDP growth should accelerate from previous years' rates but lag behind the growth of other sectors;
- both agricultural exports and imports should accelerate from the sluggish growth rates of the late 1990s and early 2000, but imports should increase at a faster rate. Already in heavy deficit, the agricultural trade balances would deteriorate further;
- agricultural barter terms of trade, which deteriorated strongly during 1999 and 2000, are forecast to remain broadly unchanged over the period 2001-2004.

III. Selected issues

The future of the agricultural trading environment: issues in the current round of negotiations on agriculture

INTRODUCTION

The Uruguay Round of multilateral trade negotiations, concluded at Marrakesh in April 1994, brought a new quality to the rule-based international trading environment. It established the World Trade Organization (WTO) as an intergovernmental platform for trade negotiations and settlements of trade disputes, and it enhanced the disciplines on international trade policies in various sectors. One issue that received serious attention from the negotiating parties was the deeper integration of agriculture into the international trading system, based on market openness and free trade. The negotiations on agriculture were difficult but the final outcome did indicate the way forward.⁹ The negotiating parties finally agreed on improved disciplines as well as on comprehensive, binding and reduction commitments in the three broad areas of market access, export competition and domestic agricultural support. All of these were eventually incorporated in the WTO Agreement on Agriculture and in countries' schedules of specific commitments.¹⁰

However, the Uruguay Round did not completely eliminate the exceptional treatment of agriculture in the international trading system. The agriculture sector is still subject to various exemptions from general WTO disciplines. Export subsidies are still allowed within the limits specified in countries' schedules of commitments. Special safeguard provisions are foreseen in the area of market access. Under the so-called "Peace Clause" of the Agreement on Agriculture (Article 13, Due Restraint), some specific domestic subsidies to an enterprise or industry are non-actionable; in other words they enjoy immunity from challenges under the General Agreement on Tariffs and Trade 1994 (GATT 1994).¹¹ Moreover, the Peace Clause calls for due restraint, at least up to the year 2003, in establishing countervailing actions and other GATT 1994 challenges against export subsidies and domestic subsidies that are in conformity with the provisions in the agreement and whose product-specific support does not exceed the amount granted in 1992.

WTO members stressed their willingness to continue the negotiations of substantial progressive reductions in support

and protection as set out in Article 20 of the Agreement on Agriculture. Remarkably enough, not only does Article 20 set the starting point for the continuation of negotiations on further reform at one year before the end of the implementation period of the Uruguay Round provisions, i.e. 1999, but it also contains a specific list of subjects to be negotiated. WTO members agreed to take into account the experience gained from the implementation of the Uruguay Round commitments and their effect on world agricultural trade. They also committed themselves to focus on “non-trade concerns, special and differential treatment to developing country members, and the objective of establishing a fair and market-oriented trading system ...”.¹²

At the Singapore Ministerial Conference, held in December 1996, WTO members launched an “analysis and information exchange” procedure as a platform for communication on agricultural matters in preparation for the continuation of the reform process. This procedure has been used extensively to circulate members’ recommendations for revisions of the Agreement on Agriculture. Numerous countries have already come up with specific proposals on agricultural matters, in preparation for the Seattle Ministerial Conference in 1999, for example, and for the negotiations on agriculture that have been under way since March 2000.¹³ The debate has not yet gone beyond a more general exchange of views, but the parties have agreed to open negotiations on the details of future provisions and commitments in agriculture at the beginning of 2001.

The proposals submitted by countries so far differ significantly in their degree of specificity. However, none of the negotiating parties questions the need for the further liberalization of agricultural trade as such. The following sections give a preliminary overview of the status of discussions as of November 2000, first summarizing the discussion on “traditional” issues related to the Agreement on Agriculture – namely market access, export competition and domestic support – and then moving on to discuss non-trade concerns and development issues.

“TRADITIONAL” ISSUES CONCERNING THE AGREEMENT ON AGRICULTURE

Market access

The current debate on further reform in the area of market access concentrates on three key issues: i) most-favoured-nation (MFN) tariff bindings; ii) minimum access established through tariff rate quotas; and iii) special safeguard (SSG) provisions

Box I

SELECTED WTO TERMS**Amber box measures**

Domestic agricultural support that is considered to distort trade and is therefore subject to reduction commitments.

Blue box payments

Payments made as part of certain domestic support policies (mainly those of the European Communities [EC] and the United States) that are specifically exempt from reduction commitments.

Ceiling bindings

Tariff bindings imposed by developing countries on commodities that were not formerly subject to binding commitments.

***De minimis* payments**

Domestic agricultural support payments representing only a small percentage of transfer to producers (less than 5 percent of the production value for developed countries and 10 percent for developing countries). Even if the effects of *de minimis* payments are potentially production- or trade-distorting, such support is exempt from reduction commitments.

Green box measures

Support measures that are considered to have no, or minimal, trade-distorting or production-related effects. Such payments are therefore exempt from domestic support reduction commitments.

MFN tariff

A tariff applied on a most-favoured-nation basis and which, therefore, does not discriminate against individual suppliers.

Special and differential treatment

Exceptional treatment reserved for developing countries, allowing greater flexibility in establishing support and protection measures.

Tariff escalation

Increasing tariff protection on products in line with their stage of processing. Tariff escalation implies protection of the processing industry.

Tariff rate quota

A two-tier tariff system under which a given quota volume of imports is charged

at an in-quota tariff rate, which is lower than the above-quota MFN tariff.

Tariffication

The transformation of non-tariff import measures (e.g. variable levies and quantitative import restrictions), formerly applied by WTO members, into ordinary customs duties. The calculation for this transformation was based on the price gap between the external and domestic market prices, including the price effects of the non-tariff measure during the base period (1986-88).

applicable to agricultural commodities in the event of import surges.

Regarding further reductions of MFN tariff bindings, two issues are of principal relevance: i) the scope of further reform, including the question of what to use as the starting-point; and ii) whether to follow an approach that covers all tariff lines, or whether to negotiate further reductions on a product-by-product basis, which would allow exemptions for individual and sensitive commodities. The supporters of the most liberal trade policies, notably the Cairns Group¹⁴ and the United States, propose a rather radical reform. A principal aim of the Cairns Group is to bring trade in agriculture on to the same basis as trade in other goods. Accordingly, it advocates deep cuts in all tariffs, using a formula approach that provides greater reductions of higher tariffs and includes a curtailment of tariff peaks and tariff escalation.¹⁵ Furthermore, the United States calls for substantial reductions, if not the elimination, of all tariffs. The same applies to tariff dispersion and tariff escalation. With regard to the starting-point for further tariff reductions, the United States advocates the use of applied rates rather than the binding commitments specified in the countries' schedules.¹⁶ Here, as well as in other areas of the Agreement on Agriculture, the United States also favours so-called sectoral initiatives, meaning more progressive liberalization in some.¹⁷ The EC proposes a more conservative approach and regards further reductions of market access commitments "as an ongoing process resulting in fundamental reform" but not as one that should be fully completed within the current round of negotiations.¹⁸ The Republic of Korea favours a "flexible and gradual approach" that would take into account the "special nature of agriculture".¹⁹ Japan takes a similar position but refers less to the special role of agriculture than to the characteristics and domestic importance of individual commodities. Japan calls for further reductions on a product-by-product basis, which could take into account the characteristics of individual sensitive commodities and the "necessity of maintaining a certain level of domestic agricultural production".²⁰

India and other developing countries also ask for more flexibility in maintaining border protection as a means to address development concerns. For the same reason, however, they also call for substantial tariff cuts and the curtailment of tariff dispersion and tariff escalation of developed countries in order to improve the opportunities for their exports to enter these markets.²¹

Another key issue of concern in the area of market access is minimum market access, which has been ensured in the Uruguay Round through tariff rate quotas to encourage trade in products that have undergone tariffication. Most of the proposals submitted so far address both quota size and quota administration. Again, the United States and the Cairns Group advocate a substantial increase in quota volumes, in order to expand market access opportunities.²² They also call for improved disciplines in order to make quota administration more transparent and to ensure more competitive distribution of the rights to trade using the in-quota tariff.²³ This would appear to conform with the proposal of the EC,²⁴ although the EC has not yet addressed the question of quota increases. Japan and the Republic of Korea also remain silent on quota sizes but call for flexibility in applying different methods of quota administration.²⁵ Various developing countries emphasize the need for a simplified, more transparent and equitable administration of tariff rate quotas established by developed countries in order to improve the opportunities for imports granted under the minimum access provisions.²⁶

A similar picture emerges in the discussion on SSG provisions which, for the duration of the reform process, give countries the right to establish additional tariffs on agricultural products that have undergone tariffication, if explicitly defined trigger levels on import prices or import volumes are exceeded.²⁷ The United States and the Cairns Group call for an elimination of such exceptional treatment, which would leave the more restrictive general contingency measures such as anti-dumping, countervailing and emergency safeguards as the only possible safeguards against agricultural imports. This is opposed by other WTO members, including the EC.²⁸ Some developing countries, most of which do not have the right to establish SSGs because they were not required to engage in tariffication, are also calling for the opportunity to do so. India, for example, argues that SSGs would be “a must for sustainable agricultural development in developing countries” because they protect domestic farmers from “unfair competition”.²⁹

Export competition

In the discussion on export competition, three categories of border measures play a key role: i) export subsidies; ii) instruments such as export credits or actions undertaken by state trading enterprises; and iii) export taxes. The first category is already subject to rather comprehensive Uruguay Round binding and reduction commitments. For the second category,



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Packing fruit for export

Export competition is one of the traditional trade issues under debate in the current round of negotiations

however, only rather general disciplines exist, which prohibit the circumvention of existing provisions and commitments. Export taxes are not currently subject to any commodity or measure-specific commitments.

For export subsidies, the United States, the Cairns Group and several developing countries advocate prohibition,³⁰ arguing that they cause the most detrimental distortions on the world market and that the resulting depressed world market prices are particularly harmful to the competitiveness of their domestic agriculture sectors. The EC, whose share in world export subsidies granted in the past is by far the largest, is inclined to discuss further reductions on export subsidy commitments but only on the condition that there be improved disciplines on other export measures such as export credits or operations pursued by state trading enterprises.³¹ Some net food-importing developing countries such as Mauritius, however, express their concern that stricter disciplines on export subsidies, and the possible resulting increase in import prices, might increase their food import bills. These countries therefore call for a cautious and pragmatic approach.³²

Stricter and more specific provisions on other instruments affecting export competition, such as export credits and state

trading enterprises, are another key concern of many countries. As set out in the Agreement on Agriculture (Article 10, paragraph 2), WTO members agreed in the Uruguay Round to work towards stricter disciplines on export credits and export insurance programmes, but they have not yet made any progress in this respect. Some WTO members, such as the EC, make stricter disciplines on these instruments a condition for further reform of export subsidy commitments.³³ The United States and members of the Cairns Group also address this issue. While the United States expresses its willingness to conduct negotiations on stricter disciplines within the Organisation for Economic Co-operation and Development (OECD),³⁴ members of the Cairns Group appear to question the necessity of special disciplines. Some net food-importing developing countries regard export credits as beneficial. As for export subsidies, they call for a cautious approach in working towards stricter disciplines on this measure. They also oppose the idea of pursuing negotiations on these issues within the OECD, as this would exclude them from the negotiations.³⁵

The third category of concerns in the area of export competition is export taxes. Because such taxes tend to keep domestic prices below the world market level, they could curb domestic production and export supply and cause price increases on the world market. Moreover, if export taxes are applied in a variable manner, i.e. if they insulate the domestic market from world market price fluctuations, these measures could also adversely affect world market price stability. The strongest supporters of stricter disciplines on export taxes are members of the Cairns Group and the United States.³⁶ The latter even calls for a prohibition. They argue that export restrictions have negative effects on the food security situation of net food-importing countries and should therefore be disciplined. Some net food-importing developed countries also call for stricter rules on export taxes. Japan, for example, considers stricter rules on export competition, including export taxes and quantitative export restrictions, to be essential for a more balanced approach towards importers and exporters in the course of further reform.³⁷ The EC has taken no position on export taxes so far, while some developing countries reject any ban on export taxes.³⁸ Indeed, some developing countries apply export taxes to keep domestic prices below world market levels, thereby subsidizing domestic consumers. The importance of export taxes as a source of budget revenue may also play a role. In addition, in calling for a maintenance of export taxes, India for example has given supply management as a reason.

Furthermore, some developing countries use such measures to discourage exports of raw materials with a view to offsetting the negative effects that tariff escalation – practised by some of their trading partners – may have on their domestic processing industry.

Domestic support

Here again, the Cairns Group and the United States have presented rather progressive reform proposals. The Cairns Group wishes all trade-distorting measures to be eliminated,³⁹ while the United States calls for substantial reductions of support provided by trade-distorting domestic measures of the so-called amber box, the sum of which is already subject to reduction commitments.⁴⁰ A rather new feature in the United States proposals is to reduce aggregate support to a fixed percentage of a member's total value of agricultural production. Such an approach would result in different reduction rates for individual countries. As regards the exemptions from such reduction commitments, the United States and the Cairns Group refer to the green box, which covers explicit criteria-based measures that are deemed to create no, or at least minimal, trade-distorting effects. The United States has also declared its readiness to negotiate the inclusion of additional exempt policies in the green box.⁴¹

Other members strongly reject limitations on domestic support policies, which are currently exempt from reduction commitments. The EC and other WTO members, such as Japan, Norway, the Republic of Korea and Switzerland, also call for a revision of their general and/or policy-specific green box criteria.⁴² They argue that maintenance, or even extension, of the set of exempt policies is essential in order to address non-trade concerns. The EC and Japan also advocate the maintenance of the blue box, covering measures under production-limiting programmes that are not decoupled from production, and which would thus not meet the requirements of the green box. They argue that such measures are needed in order to “facilitate conversion [of their domestic support policies] towards a market-oriented policy”.⁴³

Developing countries also advocate exemptions on domestic support measures, which they regard as essential to address specific development objectives. Some even call for a specific development box.⁴⁴ Similarly, some transition economies consider the green box exemptions insufficient for their specific needs⁴⁵ and favour specific exemptions that recognize and address their transition problems.

NON-TRADE CONCERNS

Non-trade concerns play a key role in the current phase of political debate on the future agricultural trading environment. They are explicitly mentioned in Article 20 of the Agreement on Agriculture as a matter for consideration in furthering reform in agriculture, and they are prominent in various proposals and recommendations that have been submitted to WTO so far. The notion of non-trade concerns refers to the existence of objectives other than the fundamental WTO objective of free trade, but which are also of relevance for a multidimensional welfare function of individuals, countries or the world as a whole. It is also implied that these other objectives may require a limitation of the primacy of free trade within WTO. The most prominent objectives under non-trade concerns are subsumed under the concept of the multifunctional role of agricultural production, which also covers environmental concerns and food security. The core question in the debate is whether these concerns justify departures from WTO's liberalization objectives, or whether they could also be achieved by other means that would not be in conflict with the objective of free trade.

Multifunctional role of agriculture

The concept of the multifunctional role of agriculture (referred to in this section as multifunctionality) has been addressed by several, mostly developed, WTO members – notably the EC, Japan, Norway, the Republic of Korea and Switzerland. The concept of multifunctionality covers various specific policy objectives. For the EC, the main concern is the maintenance of the ability of the agriculture sector to supply public goods, especially with respect to the environment, and the viability of rural areas.⁴⁶ Norway emphasizes the preservation of cultural heritage and of agrobiological diversity as well as the maintenance of “good plant, animal and public health”.⁴⁷ Switzerland mentions food security, the “needs of a scattered population”, environmental and landscape preservation issues and food quality.⁴⁸ The Republic of Korea mentions multifunctionality as an issue to be considered, but without referring to specific policies.⁴⁹ The set of policy aims referred to by Japan is similar to that of the other countries, but particular emphasis is put on the role of domestic agricultural production in meeting food security objectives.⁵⁰

The proponents of the multifunctionality concept stress that agricultural production creates positive externalities⁵¹ and produces intangible public goods⁵² in addition to its food supply function. They argue that the supply of these intangible

goods would not be guaranteed by market mechanisms alone and that support to agriculture, including the maintenance of the exceptional position of agriculture within GATT/WTO, is therefore necessary to address them.⁵³ Regarding the specific measures proposed to meet these objectives, the EC emphasizes direct payments with no, or minimal, trade impact, i.e. policies that may even meet the principal condition of the green box.⁵⁴ Switzerland's proposal follows in the same direction.⁵⁵ Norway only calls for separate treatment of these issues within the multilateral trading system, but – as is also the case for the Republic of Korea – provides no details on specific measures.⁵⁶ Japan calls for a “certain level of interventions”, and explicitly refers to tariffs as a means to address concerns with regard to the multifunctional role of agriculture.⁵⁷

Other countries, notably the United States and various Cairns Group members, strongly oppose the inclusion of the concept of the multifunctional role of agriculture in trade negotiations. The United States does not question the legitimacy of governments addressing non-food concerns, but emphasizes the need for doing it in a way that is not trade-distorting.⁵⁸ The United States notes that “WTO does not make judgements about countries' objectives. Rather, the WTO restricts countries' agricultural and trade policies based on the *instruments* they use to achieve these objectives.”⁵⁹ It argues that the achievement of objectives addressed by the proponents of multifunctionality would not require production-related domestic subsidies or even border measures and considers targeted and non-production related measures more appropriate for achieving these objectives and for avoiding adverse distortions in both domestic and external markets. Targeted and decoupled⁶⁰ payments could reward farmers, or even non-farmers, directly for landscape preservation activities. Structural adjustment programmes designed to increase off-farm employment or to improve rural infrastructure are suggested as more effective means to address the viability of rural areas.⁶¹ Such measures should meet the principal conditions of the green box. If necessary, the United States would be willing to renegotiate or extend the list of specific policies given this category.

The Cairns Group calls for the elimination of the exceptional treatment of agriculture under GATT/WTO. Accordingly, they object to the introduction of multifunctionality considerations in the trade negotiations. Like the United States, the Cairns Group⁶² calls for domestic support measures to be “targeted, transparent and fully decoupled so that they do not distort production and trade”.⁶³

Food security

The discussion on food security has certain features in common with the multifunctionality debate. A group of mainly developed net food-importing countries, such as Japan, Norway, the Republic of Korea and Switzerland, puts strong emphasis on domestic, or national, aspects of food security. They argue that a certain level of self-sufficiency would reduce the negative effects of world market instabilities generated by changing climatic conditions and/or the influence of dominant exporters and importers on the world market.⁶⁴ Such world market volatility is identified as being particularly detrimental to net food-importing countries and would thus require a certain level of domestic agricultural production to be maintained. Preserving national food security through domestic agricultural production would qualify as a non-trade concern and thus legitimize exceptional treatment of agriculture within WTO. In general, the proposals submitted so far focus on two aspects. First, the proponents call for exemptions on domestic and import measures that would allow them to establish production-related measures in order to meet the self-sufficiency goals. Second, they advocate stricter disciplines on export measures used by their exporting trading partners, namely export taxes, quantitative export restrictions, state trading enterprises and export subsidies.

Various developing countries also address food security as a non-trade concern.⁶⁵ They also invoke the need for production-related measures, greater flexibility in adopting border measures, and even “moderately high tariffs”.⁶⁶ However, their claims in this regard are raised in the broader context of development issues, where food security is just one of many concerns.

The position of the United States and the Cairns Group on the proposed policies is different. In particular, they strongly oppose the notion of self-sufficiency as an appropriate means to address food security. They argue that food security is an issue that “involves the ability to purchase food, while self-sufficiency policies – policies aimed at supporting domestic production above market levels – often slow down economic growth, reduce incomes and fix resources in unproductive sectors of the economy”.⁶⁷ More targeted measures, such as public stockholding or the encouragement of unused production potential, would be more appropriate for addressing food shortages in times of crisis. Some countries also point out that food security is indeed a trade-related issue and that trade-distorting measures and restrictions would adversely affect the

distribution of food, while border measures would destabilize the world market and thus have detrimental effects on food security.⁶⁸

DEVELOPMENT ISSUES AND SPECIAL AND DIFFERENTIAL TREATMENT

Development concerns have been part of multilateral trade negotiations since the establishment of GATT in 1947. Indeed, rules addressing these concerns are set out in the General Agreement as well as in other multilateral trade agreements under WTO. Under the provisions of so-called special and differential treatment, stipulated in Part 4 of GATT, developing countries are exempted from the reciprocity principle, i.e. they are not expected to grant other countries the same trade concessions that they themselves receive.

In agriculture, developing countries are also subject to less restrictive binding and reduction commitments, e.g. under the Agreement on Agriculture (Article 6), domestic support that forms an integral part of development programmes is exempt from the reduction requirement. Direct food aid, which is granted in conformity with Article 10. 4, is also not subject to any reduction commitments.⁶⁹ These and other exemptions for developing countries reflect the GATT signatories' persisting perception that some member countries facing underdevelopment problems should be granted specific privileges in the international trading system.

For developing countries, "real, robust and operational [special and differential] provisions in agriculture"⁷⁰ are a key concern. They emphasize the large contribution of their agriculture sectors to GDP, employment and foreign currency earnings. With reference to the significant role of subsistence farming in their countries, developing countries point out that measures promoting domestic agricultural production are also essential to overcome food security problems. In this context, some also take recourse to existing inefficiencies in their domestic infrastructure that would limit an adequate supply of imported food products. India puts it in more general terms: "their capacity to participate in the international trade is limited. Therefore, the prospects of trade-stimulating economic growth in such agrarian countries are not very significant in the short and medium term."⁷¹

India and other developing countries demand at least some protection of their domestic agriculture sector, including the option to grant production-related support, in order to meet their specific development concerns. They also emphasize that

such privileges would be indispensable in order to overcome the negative effects arising from the ongoing subsidization by developed trading partners. The list of proposed policies addressing the needs of developing countries includes “moderately high tariffs” and the right to impose special safeguard measures.⁷² Some countries also call for a specific “development box”, comprising exemptions for developing countries, such as the flexibility to raise tariffs on key products in order to safeguard against cheap imports from the world market, and an increase in the *de minimis* level for reduction-exempted domestic support levels from the current 10 percent to 20 percent of the value of domestic agricultural production.⁷³ Some developing countries, however, stress that they should have full flexibility to adopt any measure they deem suitable to address the development of their domestic agriculture sectors.⁷⁴

At the same time, in order to improve their international competitiveness as a key element for economic development, some developing countries (mostly net exporters) call for an elimination of agricultural export subsidies and domestic support granted by developed countries. They also demand improved market access opportunities through a substantial reduction of tariff barriers, tariff peaks and tariff escalation applied by their trading partners.⁷⁵ As mentioned, net food-importing developing countries, on the other hand, call for a more cautious approach to implementing stricter or further disciplines on export subsidy and credit commitments.

It would appear that, in principle, all negotiating parties acknowledge special and differential treatment of developing countries as a legitimate means to overcome development problems, including that of food security. Some declare their willingness to discuss the issue in the course of the negotiations, while other negotiating parties refer only to certain aspects of special and differential treatment. The United States, for example, advocates the creation of additional criteria for exempt domestic support measures. Such measures should be part of specific programmes that are designed to improve domestic distribution, assist risk management at the farm level and foster productivity of subsistence farming.⁷⁶ This approach, however, implies a rejection of the full flexibility proposed by India and other developing countries. It follows the same criteria-based and policy-specific approach that was established during the Uruguay Round and incorporated in the Agreement on Agriculture, Article 6.2, which currently exempts specific domestic support measures applied by developing countries

from the reduction requirement. The Cairns Group proposals are more restrictive and refer to a longer implementation period and a continuation of current exemptions for developing countries only.⁷⁷

As regards market access of developing countries, the United States is ready to discuss deeper tariff cuts on products of interest to developing and least-developed countries. Exemptions or full flexibility for developing countries to apply higher tariffs are not suggested. The Cairns Group's proposal is similar to that of the United States. It calls for cuts on all market access restrictions, and thus implicitly on market access restrictions of developing countries. However, Canada declares its willingness to discuss special and differential treatment in the area of market access after concrete ideas on exemptions for developing countries have been presented.⁷⁸ The EC explicitly refers to least-developed countries and suggests the establishment of duty-free market access opportunities for products exported by these countries.⁷⁹

CONCLUSIONS

At the end of 2000, the current WTO negotiations on agriculture were still in a phase of general political discussion and showed considerable differences among the negotiating parties' attitudes towards further reforms in this sector. This is understandable, given the different national interests and problems involved. What is remarkable, however, is the fact that none of the WTO members had questioned the need for further reform as such. The negotiating parties can refer to a comprehensive set of provisions and commitments established in the Uruguay Round as the starting-point for further reductions in protection and support to agriculture. Moreover, the notification requirements agreed in the Uruguay Round significantly improved the transparency of agricultural policies pursued by individual member countries. All these features form a strong basis for the continuation of the reform process and could certainly be regarded as assets in the ongoing discussion on further reform in agriculture.

To date, the recommendations and proposals submitted have been relatively general in nature, but they do show the direction that individual WTO members wish the negotiations to take. Three broad factions of WTO members can be identified: i) a group of developed countries calling for the elimination of WTO exemptions for agriculture, preferably to be concluded in the current round; ii) a group of more conservative developed countries which, in contrast to the first group, would like to

preserve the exceptional role of agriculture under GATT/WTO; and iii) various developing country members who call for exemptions under the principle of special and differential treatment. This last group, in particular, is likely to play a more prominent role than was the case in the Uruguay Round, as suggested by their active participation in the current debate and the recognition given to their concerns in other countries' proposals.

The justifications for the individual attitudes towards further liberalization differ significantly. The first group regards the elimination, or substantial curtailment, of the exceptional role of agriculture as being important for achieving an expansion in world trade of agricultural products and consequent welfare gains. Members of the second group refer to their domestic agriculture sectors as a source of multiple outputs in addition to that of food supply. They argue that these other functions, such as the preservation of the environment, can only be guaranteed if the exceptional role of agriculture is maintained. Developing countries emphasize the dominant role of agriculture in their entire economies. They regard a differential treatment of their agriculture sectors in the international trading environment as essential for overcoming development problems such as poverty and food security.

This pattern of negotiating positions is likely to remain throughout the negotiations, but the parties can be expected to reach a compromise on the specific topics identified here in order to bring the negotiations to a successful end. It is to be hoped that scientific studies and substantive discussions will enable acceptable solutions to be found to the major issues.

The cost of hunger

INTRODUCTION

Nutrition is an integral part of people's "basic needs" and is considered a human right. Good nutrition is increasingly perceived as an investment in human capital that yields returns today as well as in the future.

There is evidence to suggest that improved nutrition could have a substantial impact on welfare and economic growth. In 1990 the global loss of social productivity caused by four overlapping types of malnutrition – stunting and disorders related to iodine, iron and vitamin A deficiency – amounted to almost 46 million years of productive disability-free life.⁸⁰ A growing body of literature suggests that there is a strong output response to improved nutrition on the part of farm households. Moreover, nutrition raises returns on investments in education and health care. Consequently, nutrition interventions are found to have a positive effect on welfare and economic growth. Taken together, these findings provide strong evidence that public investment in improved nutrition should constitute a top priority for developing countries.

UNDERNUTRITION⁸¹

Nearly 30 percent of the world's population currently suffers from one or more forms of malnutrition, including intra-uterine growth retardation, protein-energy malnutrition (PEM) and a lack of micronutrients. Worldwide, 826 million people are undernourished, or chronically food-insecure, facing a shortfall in their basic daily energy requirements of between 100 to 400 kilocalories (kcal).

The consequences of an inadequate diet are not always visible, as most undernourished people are thin but not emaciated. However, undernourishment leads to a lower nutritional status, or undernutrition, to which the body adjusts by slowing down its physical activity and, in the case of children, growth. Undernutrition also increases susceptibility to disease, causes listlessness and limits children's ability to concentrate.

The extent of micronutrient deficiencies is also staggering:

- An estimated 740 million people suffer from disorders related to iodine deficiency, including mental retardation, delayed motor development and stunting. There are more than 16 million cretins and nearly 49.5 million people suffering from brain damage caused by iodine deficiency.

Table 4

PREVALENCE OF UNDERNOURISHMENT IN DEVELOPING COUNTRIES

Region/subregion	Undernourished population, 1996-98	Trends in the share of undernourished in total population		
		1978-81	1990-92	1996-98
	<i>(Millions)</i>		<i>(Percentage)</i>	
DEVELOPING COUNTRIES	791.9	29	21	18
Asia and the Pacific	515.2	32	21	17
East Asia	155.0	29	16	12
Oceania	1.3	31	26	29
Southeast Asia	64.7	26	18	13
South Asia	294.2	38	27	23
Latin America and the Caribbean	54.9	13	13	11
Caribbean	9.6	19	26	31
Central America	11.7	20	17	20
South America	33.6	14	14	10
Near East and North Africa	35.9	9	8	10
Near East	30.3	10	11	13
North Africa	5.6	8	4	4
Sub-Saharan Africa	185.9	38	35	34
Central Africa	38.5	36	37	50
East Africa	79.9	35	44	42
Southern Africa	34.5	33	45	42
West Africa	33.0	42	22	16

Source: FAO

- About 2 billion people are anaemic, mainly as a result of iron deficiency. Iron deficiency, the most common micronutrient disorder, reduces physical productivity as well as having a negative impact on children's cognitive skills.
- Between 100 million and 140 million children suffer from vitamin A deficiency.

CHILD UNDERNUTRITION⁸²

The growth performance of children is a commonly used measure of the nutritional status of a whole community. This is because, from a nutritional standpoint, children under five years of age represent the most vulnerable segment of the population. Widely used anthropometric indices are: height-for-age, which essentially measures long-term faltering in growth; weight-for-height, which reflects body proportion and is sensitive to acute growth disturbances; and weight-for-age, which represents a convenient synthesis of both linear growth and body proportion.⁸³

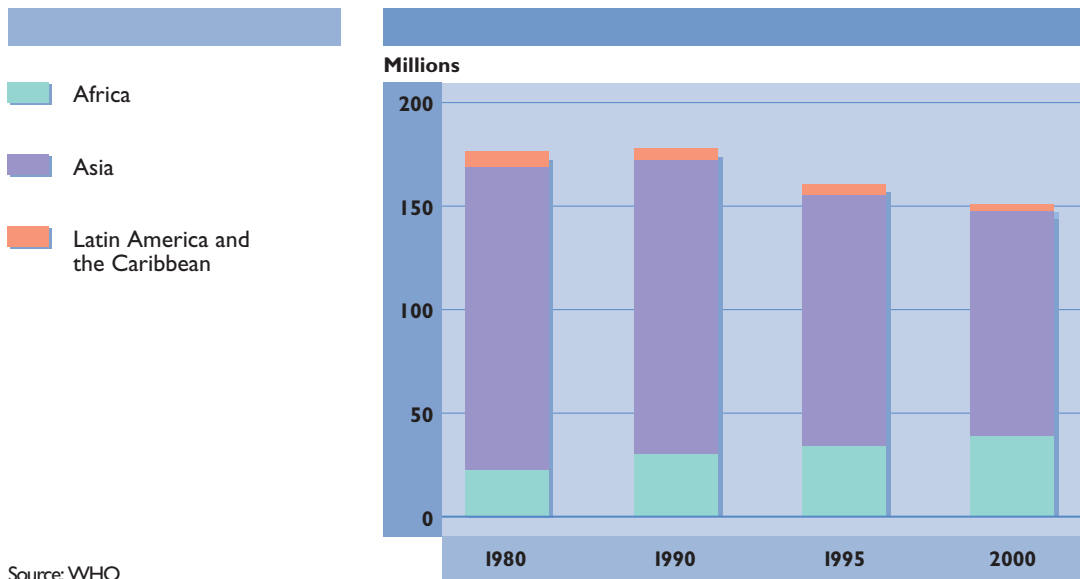
Table 5
ESTIMATED PREVALENCE OF UNDERWEIGHT, STUNTED AND WASTED CHILDREN IN DEVELOPING COUNTRIES, 1995-00

Region/country group	Underweight ¹ (weight-for-age)	Wasted ¹ (weight-for-height)	Stunted ¹ (height-for-age)
	<i>(Percentage)</i>		
Sub-Saharan Africa	31	10	37
Near East and North Africa	17	8	24
South Asia	49	17	48
East Asia and the Pacific	19	6	24
Latin America and the Caribbean	9	2	17
Developing countries	29	10	33
Least-developed countries	40	12	45

¹ Defined as <2 standard deviation (SD) from the median of reference value.
 Source: UNICEF.

There is widespread undernutrition among children, and hence among communities in developing countries in general. Nearly 156 million children under five in developing countries suffer from PEM and about 177 million are malnourished as measured by stunting.⁸⁴ The situation is particularly serious in

Figure 14
TRENDS IN THE ESTIMATED LEVEL OF PROTEIN-ENERGY MALNUTRITION IN UNDERWEIGHT CHILDREN UNDER FIVE



Source: WHO

sub-Saharan Africa and South Asia. About 17 percent of infants⁸⁵ suffer from intra-uterine growth retardation in developing countries, which is an indication of widespread poor nutrition among pregnant women. A low birth weight constitutes a high risk for serious morbidity and mortality during infancy and adulthood, as well as for reduced work capacity and strength.⁸⁶

Vitamin A deficiency is the primary cause of preventable, severe visual impairment and blindness in children. The most vulnerable are pre-schoolchildren and pregnant women in developing countries. Moreover, about 39 percent of pre-schoolchildren and 52 percent of pregnant women are anaemic, 90 percent of whom live in developing countries.

Reductions in the prevalence of PEM among infants and young children have been very uneven over the last 20 years. Indeed, in Africa between 1980 and 2000, the prevalence of PEM among children rose by 2.3 percent. Asia achieved the largest reduction, with 38 million or 14.9 percent fewer children suffering from PEM in 2000 than in 1980. Overall, the number of children suffering from PEM in developing countries fell by only 26.1 million, or 10.7 percent, between 1980 and 2000, so substantial improvements are still needed.

THE IMPACT OF NUTRITION ON LABOUR PRODUCTIVITY⁸⁷

The link between nutrition and physical activity is well established. Dividing the energy available to a person by their basal metabolic rate (BMR)⁸⁸ yields a measure of that person's physical activity level. In *The Sixth World Food Survey*,⁸⁹ FAO used this measure to calculate "minimum" and "average" energy requirements.

While this aspect of nutrition and labour productivity is uncontroversial, the same cannot be said when links are made between economic outcomes and nutrition. Much of the empirical work to date has focused on agriculture, and it attempts to link farm output, profits, wages or labour allocation choices to indicators of nutritional intake, such as calories, and/or nutritional outputs, such as weight-for-height, the body mass index (BMI)⁹⁰ and height.

Widely cited work by Strauss⁹¹ links the average calorie intake per adult in a household to the productivity of on-farm family labour in Sierra Leonean agriculture. For his sample, Strauss calculates that, on average, a 50 percent increase in calories per consumer equivalent would increase output by 16.5 percent, or 379 kg. For an increase of 50 percent in hours of family labour or in the area of cultivated land, this compares with an output

response of 30 and 13 percent, respectively. Significantly, Strauss' findings show that the lower the calorie intake is, the more significant the output response is to increased calorie intake. For example, based on a daily intake of 1 500 calories per consumer equivalent, a mere 10 percent increase in calorie intake would increase output by nearly 5 percent.

Findings from Ethiopia, presented in Croppenstedt and Muller,⁹² show that a 10 percent increase in weight-for-height and BMI would increase output and wages by about 23 and 27 percent, respectively. They also find that height, an indicator of a person's past nutritional experience, is a significant determinant of wages, with a person who is 7.1 cm above the average height earning about 15 percent more wages. These findings have to be contrasted with the effect of other productivity-augmenting investments, such as education. Nutrition would appear to compare well with the 4 percent increase in cereal output attributed to an additional year of schooling in a rural Ethiopian household.⁹³

Poor nutritional status not only reduces a person's output, it may also prevent them from carrying out certain tasks. A study on Rwanda found that those who are poorly fed have to choose activities that are physically less demanding – and less well paid.⁹⁴ A low BMI and poor nutritional status may also limit productivity indirectly through absenteeism and reduced employment opportunities. Moreover, to carry out certain activities, undernourished people may have to put their muscle mass and heart rate under much greater strain than well-nourished people. This implies that, while their output is the same, the energy they expend is not, and this may lead to health problems in the long term.

There is also an increasing awareness of the role of micronutrients in people's nutritional status. It is well established that iron-deficient anaemic children usually have poorer levels of development than non-anaemic children. In adults, iron deficiency negatively affects work capacity and productivity as well as contributing to absenteeism. Basta, Soekirman and Karyadi⁹⁵ found that among Indonesian rubber plantation workers, those with anaemia produced 80 percent of the amount produced by non-anaemic workers.

Iodine deficiency during pregnancy negatively affects child growth and mental development, and in extreme cases it causes cretinism. The costs are a loss of IQ, time required for care, and reduced labour supply and labour capacity when older. There is also some evidence that iodine deficiency during adulthood reduces productivity and work capacity.⁹⁶

THE IMPACT OF NUTRITION ON HEALTH

Inadequate consumption of protein and energy as well as deficiencies in key micronutrients such as iodine, vitamin A and iron are also key factors in the morbidity and mortality of children and adults. A staggering 55 percent of the nearly 12 million deaths each year among children under five in the developing world are associated with malnutrition.⁹⁷

Malnourished children also have lifetime disabilities and weakened immune systems.⁹⁸ Moreover, malnutrition is associated with disease and poor health, which places a further burden on households as well as health care systems.

Disease affects a person's development from a very early age. Gastro-enteritis, respiratory infections and malaria are the most prevalent and serious conditions that can affect development in the first three years of life. It is estimated that children under the age of five in developing countries suffer from 3.5 episodes of diarrhoea per year and between four and nine respiratory tract infections in their first two years of life.⁹⁹ Infections affect children's development by reducing their dietary intake; causing a loss of nutrients; or increasing nutrient demand as a result of fever.

Malnutrition also plays a significant role in morbidity among adults. The link between morbidity from chronic disease and mortality, on the one side, and a high BMI, on the other, has been recognized and analysed in developed countries primarily for the purpose of determining life insurance risk. A study on Nigerian men and women has shown mortality rates among chronically energy-deficient people who are mildly, moderately and severely underweight to be 40, 140 and 150 percent greater than rates among non-chronically energy-deficient people.¹⁰⁰

A lack of micronutrients also contributes significantly to the burden of disease. Iron deficiency is associated with malaria, intestinal parasitic infestations and chronic infections. Chronic iodine deficiency causes goitre in adults and children and also affects mental health. Vitamin A deficiency significantly increases the risk of severe illness and death from common childhood infections, particularly diarrhoeal diseases and measles. In communities where vitamin A deficiency exists, children are on average 50 percent more likely to suffer from acute measles. A UN report states that improvements in vitamin A status have been demonstrated to lead to a 23 percent reduction in mortality among children aged one to five.¹⁰¹

THE IMPACT OF NUTRITION ON SCHOOL PERFORMANCE

Nutrition has a dynamic and synergistic relationship with economic growth through the channel of education, and the evidence shows that the causality works in both directions:

- Better nutrition leads to higher cognitive achievement and increased learning capacity, and thus to higher labour productivity as well as to higher incomes.
- Higher levels of education lead to better nutrition.

This dual causality is complex and varies over the life cycle of a family. *In utero*, infant and child nutrition affects later cognitive achievement and learning capacity during school years, ultimately increasing the quality of education gained as a child, adolescent and adult. Parental education affects *in utero*, infant and child nutrition directly through the quality of care given (principally maternal) and indirectly through increased household income. Human capital development, primarily through education, has received merited attention as a key to economic development, but early childhood nutrition has yet to obtain the required emphasis as a necessary facilitator of education and human capital development.

Considering the importance of nutrition in human

School lunch

Good nutrition and higher education levels are mutually reinforcing



FAO/17011/G. BIZZARRI

development, there is a relative dearth of studies focusing on the role of the different aspects of malnutrition on cognitive achievement among children in developing countries. Nevertheless, there is sufficient empirical evidence to indicate that early childhood nutrition plays a key role in cognitive achievement, learning capacity and, ultimately, household welfare. Specifically, available studies¹⁰² have shown that:

- PEM deficiency, as manifested in stunting, is linked to lower cognitive development and educational achievement;
- low birth weight is linked to cognitive deficiencies;
- iodine deficiency in pregnant mothers negatively affects the mental development of their children;
- iodine deficiency in children can cause delayed maturation and diminished intellectual performance;
- iron deficiency can result in impaired concurrent and future learning capacity.

Children are most vulnerable to malnutrition *in utero* and before they reach three years of age, as growth rates are fastest and they are most dependent on others for care during this period. However, nutrition interventions, such as school feeding programmes, among children of school age are also important for strengthening learning capacity.

Many, if not most, of the studies showing the impact of nutrition on education have methodological problems, particularly those based on socio-economic studies. In particular, socio-economic analyses are often biased upward, attributing too much impact to nutrition and, in all cases, results must be qualified. It is therefore difficult to estimate the monetary costs associated with the impact of hunger and malnutrition on school performance. Nevertheless, Behrman¹⁰³ cites three studies suggesting that, by facilitating cognitive achievement, child nutrition and schooling can significantly increase wages.

In general, demonstrating a direct causal link between poor nutrition and cognitive achievement requires the use of experimental design trials, of which there have been surprisingly few in both developed and developing countries. Despite these drawbacks, systematic evidence supports the argument that policy interventions in early childhood nutrition are crucially important for human capital development. Behrman concludes that, while the link between health and educational attainment is not as robust as most studies suggest, and specific cost-benefit analysis is difficult to carry out, policies supporting nutrition make good sense and the empirical basis for this is as sound as that of many other conventional assumptions in economics.¹⁰⁴

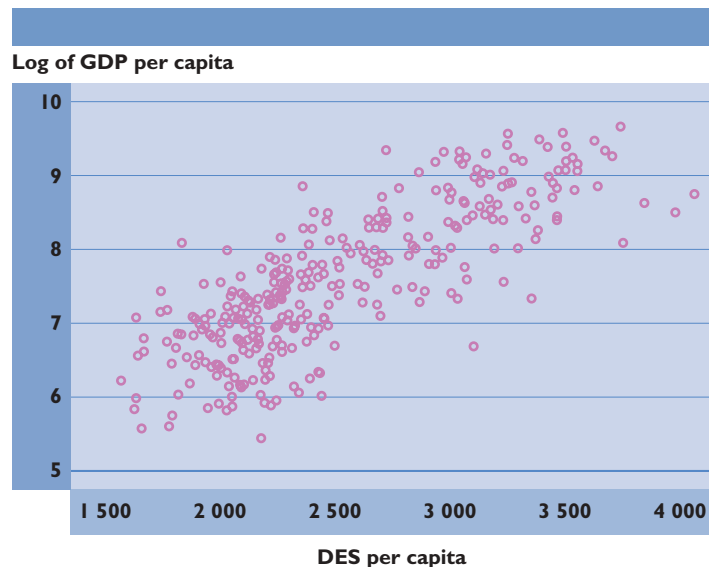
THE IMPACT OF NUTRITION ON ECONOMIC GROWTH

The impact of nutrition on labour productivity, health and education ultimately filters through to higher levels of overall economic growth. As illustrated in Figure 15, a clear association can be observed between per capita GDP and dietary energy supply (DES) per capita. However, the nature of this relationship, where the cause and effect mature over long periods, makes it difficult to identify the precise impact of improved nutrition on economic growth, and vice versa:

- Better nutrition leads to increased human capital and labour productivity through the channels of improved health and education, which in turn results in improved household and national welfare, i.e. economic growth.
- Greater economic growth (usually measured in terms of per capita GDP) results in better nutrition, principally through increased public and private spending on health, education and food consumption.

A recent study, carried out for FAO by Arcand,¹⁰⁵ indicates that nutrition has a positive impact on economic growth. Arcand's results suggest that raising the per capita to 2 770 kcal per day in countries where it is below that level would increase

Figure 15
LOG OF GDP PER CAPITA AS A FUNCTION OF DES PER CAPITA*



* kcal per day

Source: FAO. 2000. *Undernourishment and economic growth: the efficiency cost of hunger*. By J. Arcand. FAO Economic and Social Development Paper No. 147. Rome

their per capita GDP growth rate by between 0.34 and 1.48 percentage points per year. Improved nutrition affects economic growth directly through its impact on labour productivity and indirectly through improvements in life expectancy. The latter is determined as a long-term phenomenon, while in the short term it is energy intake that is relevant. This result confirms findings by Bloom and Sachs,¹⁰⁶ who looked at the roles of demography and geography in economic growth and found that life expectancy at birth is associated with an increased rate of growth. Arcand's work shows that DES has the strongest impact in countries with the highest prevalence of food insecurity, but that this impact tapers off when moving to countries with a low prevalence of food insecurity.

Neither Bloom and Sachs nor Arcand, however, control for the problem arising from the reverse causality where growth has an impact on nutrition. Their estimates of the impact of life expectancy and malnutrition on growth may thus be biased. Other studies have reversed this causality and controlled for endogeneity. Pritchett and Summers¹⁰⁷ show that differences in growth rates explain 40 percent of cross-country differences in improved mortality rates over the last three decades, while Smith and Haddad¹⁰⁸ show that about half of the decline in child malnutrition from 1970 to 1995 can be attributed to income growth.

Nobel Laureate Robert Fogel,¹⁰⁹ based on historical longitudinal studies of single countries, argues that improvements in nutrition and health account for half of the economic growth that occurred in the United Kingdom and France in the eighteenth and nineteenth centuries. Using an accounting approach with concepts from demography, nutrition and health sciences, Fogel stresses the physiological contribution to economic growth over the long term. Reductions in the incidence of infectious diseases along with changes in the composition of diet, clothing and shelter increase the efficiency with which food energy is converted into work output. Many of these thermodynamic and physiological benefits accrue from public sector investments made up to a century earlier. In the case of the United Kingdom, Fogel shows that a combination of increases in the labour force participation rate, the availability of calories for consumption by workers and thermodynamic efficiency led to a 0.5 percent annual increase in per capita income, or half of the United Kingdom's annual growth rate between 1790 and 1980. Arora¹¹⁰ has obtained similar results for eight other industrial countries. However, using adult height as a measure may generate problems with causality.

CONCLUSIONS

Human capital is a key determinant of household, community and national welfare. *In utero*, infant and childhood nutrition plays a key role in facilitating human capital development, through its impact on adult labour force participation and productivity, on improved health and developing cognitive achievement and learning capacity. The available evidence has clear policy implications.

Malnutrition plays a significant role in morbidity and mortality among infants, children and adults. Targeted action against maternal and infant malnutrition is fundamental, with investments needed in health, education and sanitation. Improved protein and energy intake as well as reduced iodine, iron and vitamin A deficiencies generate widespread health benefits for individuals as well as society. The largest impact derives from improvements in the health of women, which not only benefits families and communities today but will also have a major impact on the health and productivity of the next generation. Women's health is important for wage earning as well as for the performance of many household tasks. With regard to education, particular attention must be given to assuring equal access for girls.

Despite the controversies over methodology, there is clear evidence of the linkages between economic growth and nutrition. Increases in the rate of economic growth lead to increased public and private spending on health and education and on the quality and quantity of food consumed, thus improving nutritional outcomes. Conversely, improved nutrition feeds back into economic growth through improvements in human capital formation and productivity. The implication is that, while economic growth is necessary for improved nutritional outcomes, public sector investment in nutrition as well as in education and public and individuals' health is crucial for long-term economic growth.

NOTES

- 1 For a more detailed discussion of production developments within the regions, see Part 2, Regional review.
- 2 This report is based on information available as of February 2001. Current information on the cereal market can be found in FAO's *Food Outlook* report, issued every two months.
- 3 For further information concerning this revision, see FAO. 2001. *Food Outlook, I* (February).
- 4 The narrow definition of agriculture includes only agriculture (crops and livestock), agricultural services and input provision, fisheries, forestry and development of land and water resources. The broader definition also includes (in declining order of importance): rural development and infrastructure, environmental protection, research, training and extension, regional and river development, manufacturing of inputs and agro-industries.
- 5 Unless otherwise indicated, economic estimates and forecasts in this section are drawn from IMF. 2000. *World Economic Outlook*, October 2000. Washington, DC.
- 6 The IMF category of "advanced economies" includes developed market economies and newly industrialized economies in Asia.
- 7 The exact composition of the group of *exporters* is as follows: *Sub-Saharan Africa*: Benin, Burkina Faso, Burundi, Cameroon, the Central African Republic, Chad, the Democratic Republic of the Congo, Côte d'Ivoire, Djibouti, Ethiopia, the Gambia, Ghana, Guinea-Bissau, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Rwanda, Somalia, the Sudan, Swaziland, Togo, Uganda, the United Republic of Tanzania and Zimbabwe. *Asia and the Pacific*: Mongolia, Myanmar, Papua New Guinea, Sri Lanka and Viet Nam. *Latin America and the Caribbean*: Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama, Paraguay and Uruguay. *Near East and North Africa*: Afghanistan.
- 8 The composition of the group of *importers* is as follows: *Sub-Saharan Africa*: Burundi, Cape Verde, Comoros, the Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, the Gambia, Guinea, Guinea-Bissau, Lesotho, Mauritania, Mozambique, the Niger, Rwanda, Senegal, Sierra Leone, Somalia and the Sudan. *Latin America and the Caribbean*: Cuba, the Dominican Republic, Haiti, Nicaragua and Panama. *Asia and the Pacific*: Bangladesh, Cambodia, the Democratic People's Republic of Korea, Maldives, Nepal and Samoa. *Near East and North Africa*: Afghanistan, Egypt, Iraq, Jordan, Lebanon, Morocco and Yemen.
- 9 The outcome of the Uruguay Round negotiations on agriculture was reviewed in *The State of Food Agriculture 1994* and a more thorough discussion, including the impact of the negotiations and resulting

- Agreement on Agriculture, was presented in *The State of Food and Agriculture 1995*. Comprehensive documentation of the Uruguay Round negotiations concerning agriculture can also be found in T. Josling, S. Tangermann and T.K. Warley. 1996. *Agriculture in the GATT*, p. 113-174. London, Houndmills and New York, Macmillan.
- 10 Other WTO agreements that are also of relevance for agricultural trade, such as the Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade, are not discussed here.
- 11 As set out in the Agreement on Subsidies and Countervailing Measures, Article 8.2, in other sectors only those non-specific subsidies (to an enterprise or industry) that also meet other acceptable objectives are non-actionable. See S. Tangermann. 2000. *Agriculture on the way to firm international trading rules*. Paper prepared for the University of Minnesota Law School Conference on The Political Economy of International Trade Law, honouring Professor Robert E. Hudec, 15-16 September 2000. University of Minnesota, Minneapolis, USA.
- 12 Agreement on Agriculture, Article 20(c).
- 13 Most of the relevant documents (including those cited in notes 15 to 79) are published on WTO's Web site at www.wto.org. However, access to the country proposals and recommendations submitted as part of the analysis and information exchange process is restricted.
- 14 The Cairns Group comprises both developed and developing agricultural exporters. It includes Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Fiji, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, the Philippines, South Africa, Thailand and Uruguay.
- 15 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Communication from Australia*, p.1. WT/GC/W/156; *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Market access – tariffs. Communication from Australia*. WT/GC/W/199; and WTO. 2000. *WTO negotiations on agriculture. Cairns Group negotiation proposal – market access*, p. 2. G/AG/NG/W/54.
- 16 WTO. 2000. *Proposal for comprehensive long-term agricultural trade reform, submission from the United States*, p. 3. Committee on Agriculture, Special Session, 23 June 2000. G/AG/NG/W/15.
- 17 Ibid. (p. 8).
- 18 WTO. 1999. *Preparations for the 1999 Ministerial Conference. EC approach on agriculture. Communication from the European Communities*, p. 2. WT/GC/W/273.
- 19 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Agriculture. Communication from Korea*, p. 2. WT/GC/W/170.
- 20 WTO. 2000. *Statement by Japan*, p. 1. Committee on Agriculture, Special Session, 29-30 June 2000. G/AG/NG/W/27.
- 21 WTO. 2000. *Preparations for the 1999 Ministerial Conference*.

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- 23 A comprehensive insight into the economics of quota administration and its treatment within WTO is given in D.W. Skully. 1999. *The economics of TRQ administration*. International Agricultural Trade Research Consortium, Working Paper 99-6. Available at: www.umn.edu/iatrc.
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- 27 Agreement on Agriculture, Article 5.
- 28 WTO. 2000. *Statement by the European Community*, p. 2. Committee on Agriculture, Special Session, 29-30 June 2000. WT/AG/NG/W/24.
- 29 WTO. 2000. *Statement by India*, p. 3. Committee on Agriculture, Special Session, 29-30 June 2000. G/AG/NG/W/33.
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- 31 Op. cit., note 10. See also WTO. 2000. *European Communities proposal – export competition*. G/AG/NG/W/34.
- 32 WTO. 2000. *Statement by Mauritius*, p. 3. Committee on Agriculture, Special Session, 28-29 September 2000. G/AG/NG/W/52.
- 33 WTO, 2000, op. cit., note 31.
- 34 Op. cit. (p. 4), note 16.
- 35 Op. cit. (p. 3-4), note 32.
- 36 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture, export restrictions and taxes. Communication from Australia*. WT/GC/W/237. See also op. cit. (p. 4), note 16.
- 37 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Communication from Japan*, p. 4. WT/GC/W/220.
- 38 Op. cit. (p. 5), note 21.
- 39 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Domestic support. Communication from Australia*. WT/GC/W/177.
- 40 Op. cit. (p. 5), note 8.
- 41 WTO. 2000. *Statement by the United States*. Committee on Agriculture, Special Session, 28-29 September 2000. G/AG/NG/W/49.
- 42 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Communication from Switzerland*, p. 1. WT/GC/W/261.
- 43 Op. cit., note 20.
- 44 WTO. 2000. *Agreement on Agriculture: special and differential treatment and a development box*. Proposal to the June 2000 Special Session of the Committee on Agriculture by Cuba, the Dominican Republic,

- Honduras, Pakistan, Haiti, Nicaragua, Kenya, Uganda, Zimbabwe, Sri Lanka and El Salvador. WT/AG/NG/W/13.
- 45 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Domestic support—concerns of transition and post-transition economies. Communication from Bulgaria, Czech Republic, Hungary, Latvia, the Slovak Republic and Slovenia.* WT/GC/W/217.
- 46 Op. cit., note 18.
- 47 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on agriculture. Communication from Norway,* p. 2. WT/GC/W/238.
- 48 Op. cit. (p. 1-2), note 42.
- 49 Op. cit., note 18.
- 50 Op. cit. (p. 2-4), note 37.
- 51 Positive or negative externalities in production arise when production of a good produces benefits or costs to other producers or consumers.
- 52 Public goods are goods that cannot be withheld from single individuals without being withheld from everybody (prime examples include national defence, police protection and street lighting). For this reason, they cannot be expected to be provided by private entrepreneurs (who would not be able to request payment for the public good by the beneficiaries). The provision of public goods, therefore, normally requires public sector intervention.
- 53 Op. cit. (p. 3), note 37.
- 54 Op. cit., note 18.
- 55 Op. cit., note 42.
- 56 Op. cit., note 47.
- 57 Op. cit. (p. 5), note 37.
- 58 Op. cit., note 16.
- 59 USDA. 1999. *The use and abuse of multifunctionality,* p. 2. Washington, DC, Economic Research Service, USDA. (The emphasis is quoted.)
- 60 Decoupled payments are not linked to the level of current production.
- 61 A comprehensive list of measures and instruments that are considered to meet these conditions is presented in USDA, op. cit., note 59.
- 62 WTO. 1999. *Preparations for the 1999 Ministerial Conference. Communication from Australia.* WT/GC/W/156.
- 63 The concept of the multifunctional role of agriculture is discussed here within the framework of non-trade issues that might affect the current round of multilateral trade negotiations on agriculture. Within the specific context of FAO, the Organization is guided by *The Strategic Framework for FAO: 2000-2015*, adopted by the 30th session of the FAO Conference in 1999. Paragraph 76 of the Framework states that “as FAO’s Members have noted that there is currently no consensus on the meaning of the concept of the multifunctional character of agriculture, nor on a role for FAO with respect to work on it, they agree that the Organization should pursue and further develop its work on sustainable agricultural and rural development”.

- 64 Op. cit., note 37.
- 65 Op. cit., note 44. See also op. cit., note 29.
- 66 Op. cit. (p. 3), note 29.
- 67 Op. cit. (p. 18), note 59.
- 68 Ibid. (p. 19).
- 69 For a more comprehensive discussion of exemptions for developing countries under the Agreement on Agriculture, see S. Tangermann and T.E. Josling. 1999. The interest of developing countries in the next round of WTO agricultural negotiations. Paper prepared for the UNCTAD Programme on Developing a Proactive and Coherent Trade Agenda for African Countries. Parts of the paper are published in UNCTAD. 2000. *A positive agenda for developing countries: issues for future trade negotiations*. New York and Geneva.
- 70 Op. cit. (p. 1), note 44.
- 71 Op. cit., note 29.
- 72 Ibid.
- 73 Op. cit., note 44.
- 74 Op. cit. (p. 4), note 29; and WTO. 2000. *Special and differential treatment for developing countries in world agricultural trade. Submission by ASEAN*. G/AG/NG/W/55.
- 75 Op. cit., note 29, including sources cited therein. See also WTO, 2000. Op. cit., note 74.
- 76 Op. cit. (p. 6), note 16.
- 77 WTO. 2000b. *Statement by Australia on behalf of the Cairns Group*. Committee on Agriculture, Special Session, 29-30 June 2000. G/AG/NG/W/21.
- 78 WTO. 2000. *Statement by Canada*. Committee on Agriculture, Special Session, 29-30 June 2000. G/AG/NG/W/23. See also WTO. 1999. *Preparations for the 1999 Ministerial Conference. Negotiations on Agriculture. Market access – general. Communication from Australia*. WT/GC/W/184.
- 79 See WTO. 1999. *Preparations for the 1999 Ministerial Conference. EC approach to duty-free market access for least-developed countries. Communication from the European Communities*. WT/GC/W/195.
- 80 World Bank. 1993. *World Development Report*. Washington, DC, Oxford University Press.
- 81 Unless indicated otherwise, the data in this section have been drawn from WHO's Web site at: www.who.int/nut/pem; and FAO. 2000. *The State of Food Insecurity in the World 2000*, Rome. Available at www.fao.org/docrep/x8200e/x8200e00.htm.
- 82 For surveys of the role of nutrition in child development, see: UNICEF. 1998. *The State of the World's Children 1998: Focus on Nutrition*. Oxford, UK, Oxford University Press (available at: www.unicef.org/sowc98/sowc98.pdf); and R. Martorell. 1999. The nature of child malnutrition and its long-term implications. *Food and Nutrition Bulletin*, 20(3): 288-292.

- 83 WHO Working Group. 1986. Use and interpretation of anthropometric indicators of nutritional status. *Bulletin of the World Health Organization*, 64: 924-941.
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- 85 Ibid. Data refer to full-term babies who weighed 2.5 kg or less at 37 or more weeks of gestation.
- 86 Martorell, op. cit., note 82.
- 87 For surveys, see J.R. Behrman. 1993. The economic rationale for investing in nutrition in developing countries. *World Development*, 21(11): 1749-1771; P. Dasgupta. 1993. *An inquiry into well-being and destitution*. Oxford, UK, Clarendon Press; and J. Strauss and D. Thomas. 1998. Health and nutrition, and economic development. *Journal of Economic Literature*, Vol. XXXVI(2): 766-817.
- 88 The BMR, calculated for a particular body weight, disaggregated by age and sex, corresponds to the "minimal rate of energy expenditure compatible with life" over a 24-hour period, i.e. an immobile, resting and fasting state in a comfortable environment.
- 89 FAO. 1996. *The Sixth World Food Survey*. Rome.
- 90 With regard to adults, the generally accepted anthropometric indicator of nutritional status is the body mass index (BMI), which indicates the ratio of a person's weight to the square of their height. The BMI is a simple and relatively inexpensive indicator for assessing whether a person is deficient in energy intake. A BMI of between 18.5 and 25 is recommended by FAO and WHO as the threshold for determining healthy adults. For a thorough discussion of the use of the BMI as a measure of malnutrition, see FAO. 1994. *Body mass index (BMI): a measure of chronic energy deficiency in adults*. By P.S. Shetty and W.P.T. James. FAO Food and Nutrition Paper No. 56. Note that there is controversy over the recommended thresholds.
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- 96 See J.M. Hershman, G.A. Melnick and R. Kastner. 1986. Economic consequences of endemic goiter. In J.T. Dunn, E.A. Pretell, C.H. Daza and F.E. Viteri, eds. *Towards the eradication of endemic goiter, cretinism and iodine deficiency*. Washington, DC, Pan-American Health Organization (PAHO), Scientific Publication No. 502. See also the studies cited in Behrman, op. cit., note 87.
- 97 UNICEF, op. cit., note 82.
- 98 Ibid.
- 99 S. Grantham-McGregor, L. Fernald and K. Sethuraman. 1999. Effects of health and nutrition on cognitive and behavioral development of children in the first three years of life. Part 2: Infections and micronutrient deficiencies: iodine, iron and zinc. *Food and Nutrition Bulletin*, 20(1): 76-99.
- 100 UN-ACC Sub-Committee on Nutrition/IFPRI. 2000. *Fourth Report on the World Nutrition Situation: Nutrition Throughout the Life Cycle*. Geneva.
- 101 Ibid.
- 102 For surveys see Behrman, op. cit., note 87; J. Behrman. 1996. The impact of health and nutrition on education. *The World Bank Research Observer*, 11(1): 23-37; S. Grantham-McGregor, L. Fernald and K. Sethuraman. 1999. Effects of health and nutrition on cognitive and behavioral development in children in the first three years of life. Part 1: Low birth weight, breastfeeding and protein-energy malnutrition. *Food and Nutrition Bulletin*, 20(1): 53-75; Grantham-McGregor, Fernald and Sethuraman, op. cit., note 99; and Martorell, op. cit., note 82.
- 103 Behrman, op. cit., note 87.
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- 105 FAO. 2000. *Undernourishment and economic growth: the efficiency cost of hunger*. By J. Arcand. FAO Economic and Social Development Paper No. 147. Rome.
- 106 D. Bloom and J. Sachs. 1998. *Geography, demography and economic growth in Africa*. Harvard Institute for International Development (mimeo).
- 107 L. Pritchett and L. Summers. 1996. Wealthier is healthier. *Journal of Human Resources*, 31(4): 841-868.
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PART II

REGIONAL REVIEW



I. Africa

REGIONAL OVERVIEW

General economic performance

After an average annual GDP growth of only 0.4 percent between 1992 and 1994, economic performance in sub-Saharan Africa began to improve as of 1995.¹ This positive trend continued in 1999, although at a reduced rate, with real GDP growing by 2.1 percent. The economic slowdown was largely due to the difficult global economic conditions of the second half of 1997 and most of 1998, rather than to domestic factors. For 2000, a growth rate of 3.3 percent is expected, rising to 4.3 percent in 2001. Strengthening economic activity in South Africa and the oil-exporting countries, in particular Nigeria, is driving the rebound. The rate of inflation increased from 11 to 15 percent between 1998 and 1999 and is expected to be about 16 percent in 2000. Malawi and Zimbabwe, in particular, experienced a large increase in inflation. Economic performance across the region was diverse: Cameroon, Ghana, Mozambique, Uganda and the United Republic of Tanzania are expected to continue to grow strongly as a result of macroeconomic and structural reforms, while in many other countries, economic growth and especially agricultural activity continue to be hampered by past, ongoing or new conflicts.

The overall picture is strongly influenced by the performance of the economies of Nigeria and South Africa, which together account for about half of sub-Saharan Africa's GDP. Following

Table 6

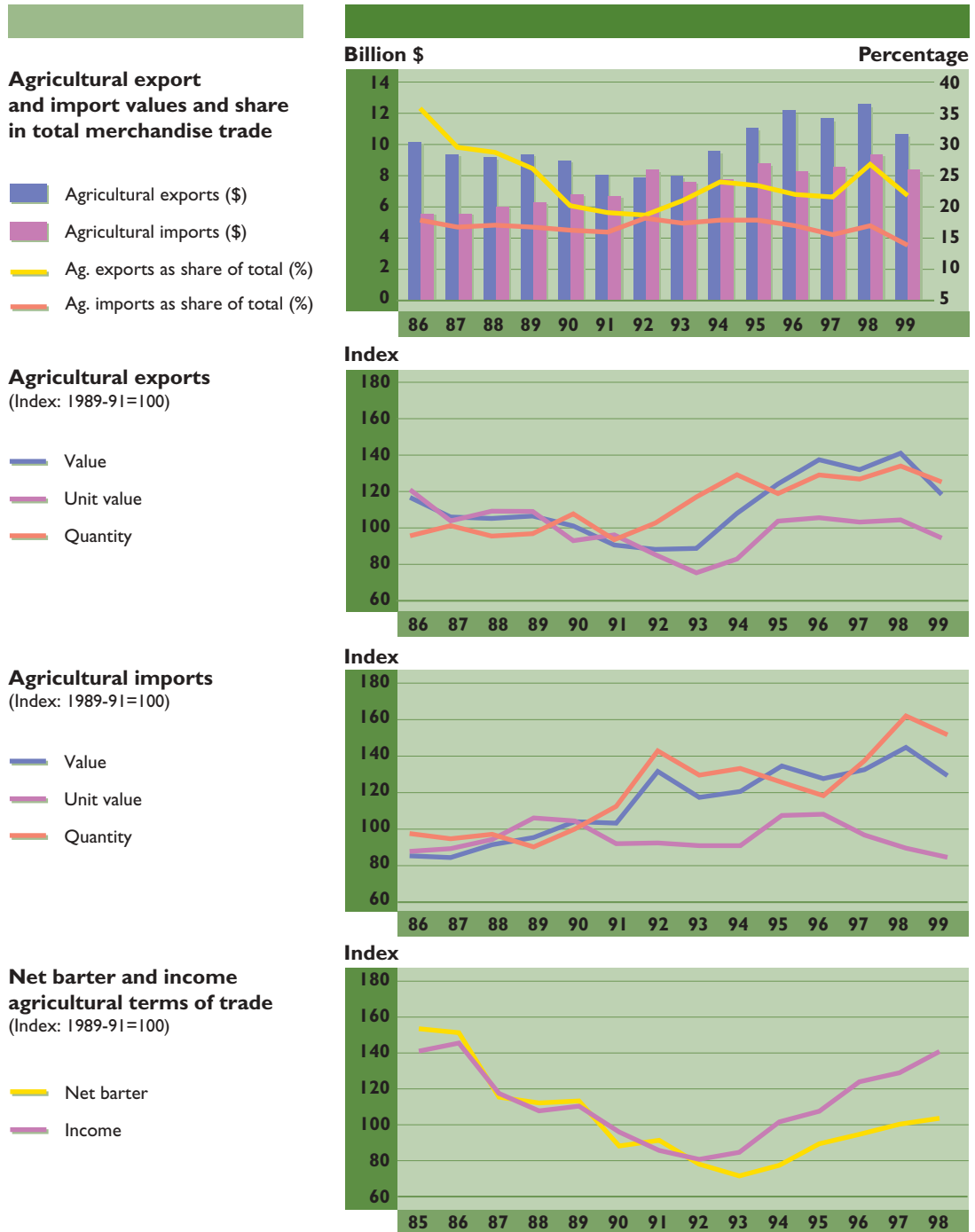
ANNUAL REAL GDP GROWTH RATES IN SUB-SAHARAN AFRICA

Year	Sub-Saharan Africa		Nigeria	South Africa
	Including Nigeria and South Africa	Excluding Nigeria and South Africa		
		(Percentage)		
1996	5.2	5.5	6.4	4.2
1997	3.4	4.0	3.1	2.5
1998	2.4	3.5	1.9	0.6
1999	2.1	2.8	1.1	1.2
2000 ¹	3.3	3.5	3.5	3.0
2001 ¹	4.3	4.6	3.6	4.0

¹Estimate.

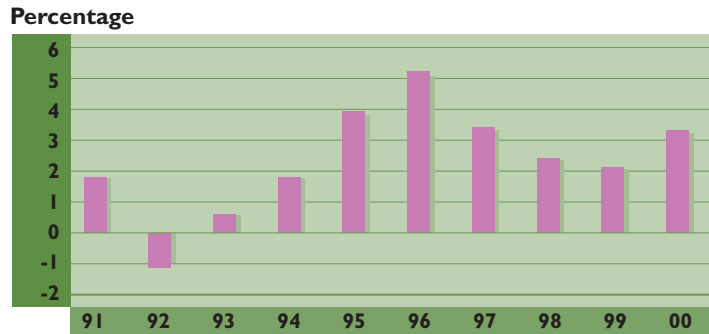
Source: IMF.

Figure 16
SUB-SAHARAN AFRICA: SELECTED INDICATORS

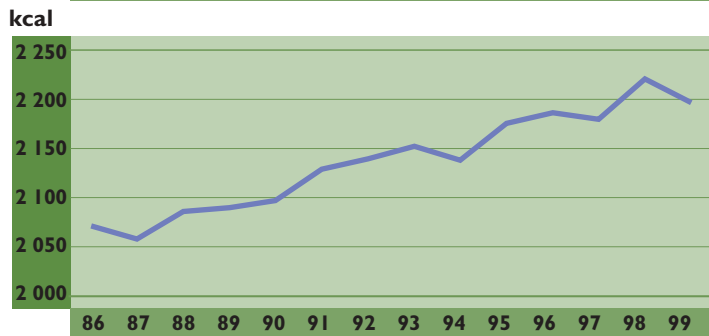


SUB-SAHARAN AFRICA: SELECTED INDICATORS

Real GDP
(Percentage change from preceding year)

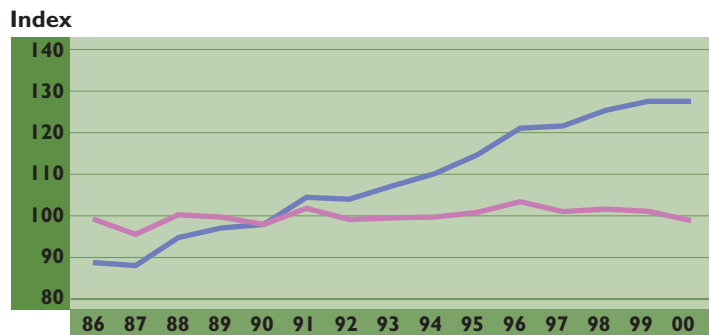


Dietary energy supplies
(kcal per capita per day)



Agricultural production
(Index: 1989-91=100)

— Total agricultural production
— Per capita food production



Source: FAO and IMF

the high growth rates of 1996, these two economies slowed to record, respectively, a 1.1 and 1.2 percent rate of real GDP growth in 1999. Over the 1996-99 period, sub-Saharan Africa grew at a rate of 4 percent, when excluding Nigeria and South Africa, and 3.3 percent when including these two countries. The South African economy is expected to grow by 3 to 4 percent in 2000 and 2001. The steep increase in petroleum prices is helping to lift Nigeria's fortunes, although robust growth in the longer term will depend on the government's ability both to restore macroeconomic stability and to improve governance.

Agricultural performance

In 1999, for the third consecutive year, overall agricultural production failed to keep up with the population growth rate (currently 2.5 percent per year) and rose by only 2.1 percent after increasing by 2.3 percent in 1998. Crop production is estimated to have increased by 2.2 percent in spite of a 0.4 percent drop in cereal production, while livestock production expanded by a more modest 1.7 percent. The estimated 2.4 percent increase in food production contrasts with a 1.8 percent drop for non-food items. Preliminary estimates for 2000 indicate that agricultural production will rise by only 0.5 percent and that only modest increases in crop, food and livestock production will be realized. Non-food production is estimated to have contracted for the second year in a row. On the other hand, cereal output is predicted to increase by 2.8 percent to 88.1 million tonnes, i.e. about 3.6 percent above the previous five-year average but 2.1 million tonnes short of the record crop achieved in 1996. In per capita terms, however, agricultural production continues to stagnate, with levels for agriculture, cereals and food items in 2000 being virtually identical to those attained in 1990.

In East Africa, drought and population displacements led to a fall in cereal production in 1999 compared with the previous year. Ethiopia, Kenya, Somalia and the United Republic of Tanzania experienced drought and erratic rainfall. Nevertheless, cereal production in Ethiopia is estimated to have recovered somewhat from the dramatic 27 percent decline experienced in 1998. Cereal output in Eritrea, Kenya, the Sudan and the United Republic of Tanzania fell by between 12 and 45 percent in 1999. Drought continued to plague this subregion in 2000, and it is estimated that about 18 million people faced serious food shortages at the beginning of 2001, a situation that will probably persist well into the year. Agricultural output in Kenya and the United Republic of Tanzania is estimated to have contracted by between 0.4 and 2 percent, and cereal production by between

Table 7

NET PRODUCTION GROWTH RATES IN SUB-SAHARAN AFRICA

Year	Agriculture	Cereals	Crops	Food	Livestock	Non-food
	<i>(Percentage)</i>					
1991-95	2.6	2.7	3.2	2.7	1.2	1.5
1996	6.8	16.6	8.6	6.5	1.7	10.4
1997	0.4	-3.3	0.3	0.3	0.9	2.4
1998	2.3	-0.6	2.4	2.2	2.5	2.5
1999	2.1	-0.4	2.2	2.4	1.7	-1.8
2000 ¹	0.5	2.8	0.3	0.5	0.9	-0.6

¹ Estimates.

Source: FAO.

13 and 17 percent, in 2000. In Ethiopia, improved rains are expected to have considerably improved the cereal harvest compared with that of 1999. Nevertheless, Ethiopia and Kenya face serious food shortages and require large cereal imports. In Eritrea, cereal production in 2000 was significantly hampered by the war, and the food supply situation is consequently very tight.

In western Africa, the Sahelian countries experienced record cereal production in 1999. The coastal countries along the Gulf of Guinea generally enjoyed good harvests, with the exception of Ghana and Nigeria, where flooding disrupted agricultural activity in some areas. In Ghana, cereal output fell by nearly 6 percent, although this was offset by an 11 to 12 percent increase in the country's roots and tubers output. In Nigeria, cereal output rose by 1.5 to 2 percent and overall agricultural output rose by almost 3 percent. In 2000, aggregate cereal production in the Sahelian countries is expected to be down significantly from the previous year. Below-average cereal production was recorded in Burkina Faso and Chad. However, Cape Verde, the Gambia, Guinea-Bissau and Senegal achieved above-average levels of production. In coastal countries along the Gulf of Guinea, growing conditions have been generally favourable. Côte d'Ivoire's agricultural output is expected to rise by about 3.5 percent in 2000, after increasing by almost 2 percent the previous year. Harvest prospects are also generally favourable in Ghana, Nigeria and Togo. Liberia's production is showing modest increases, with farming activities facilitated by the relative peace prevailing in most regions. Rice production is estimated to increase in Liberia. In Sierra Leone, however, production continues to suffer from insecurity and conflict, and prospects are likewise less favourable for Guinea which has been suffering from rebel activity.

In central Africa, agricultural performance in 1999 was mixed, with many countries suffering from the adverse effects of civil conflict. Agricultural output fell in Cameroon, where cereal production fell by 14 percent. In the Central African Republic, cereal production increased by 17 percent in 1999 but overall agricultural output declined by about 1 percent. Angola, the Congo and the Democratic Republic of the Congo experienced output losses owing to the negative effects of civil conflict. Overall agricultural production in Cameroon was expected to stagnate in 2000. While the country experienced a sharp fall in non-food production, this is estimated to be offset by a 16 percent rise in cereal output. The food insecurity situation in the Democratic Republic of the Congo remains very serious, particularly in the eastern part of the country. Cereal production is expected to fall by 1 to 2 percent in 2000, and production and marketing activities are still hampered by the civil strife.

In 1999, southern African agricultural output rose marginally in Mozambique, Namibia and Zimbabwe. On the other hand, Botswana, South Africa, Malawi and Zambia experienced growth in output of 5, 5.5, 9 and 10 percent, respectively. While cereal output increased in Botswana, Mozambique, Namibia, Zambia and Zimbabwe, in South Africa it fell by about 2.5 percent after contracting by 24 percent in 1998. Southern African harvests were generally good in 2000, despite severe floods in some parts. Cereal production in the subregion was 19 percent higher than in 1999. Overall agricultural output is estimated to be up by 5 percent in South Africa, which signifies the second consecutive year of strong expansion. Namibia, Zambia and Zimbabwe are forecast to experience growth in agricultural output at a rate of 5, 10 and 14 percent, respectively. Cereal production in all four countries is estimated to have expanded very strongly, with rates exceeding 25 percent. In Zimbabwe, the overall food supply is expected to remain satisfactory, although the continuous devaluation of the national currency has increased prices for many basic commodities and agricultural inputs. In Mozambique, agricultural production contracted by an estimated 19 percent in 2000, and Madagascar also experienced lower harvests compared with 1999.

Agricultural commodity prices

Many African countries rely on a few commodities to generate their foreign exchange earnings. Coffee, for example, accounts for 60 percent of Ethiopia's and 70 percent of Burundi's total exports of goods and services. As a consequence, many economies in sub-Saharan Africa are particularly vulnerable to

Table 8
**EXPORT DEPENDENCY AND TERMS OF TRADE OF SELECTED COUNTRIES IN
 SUB-SAHARAN AFRICA**

Commodity/country	Exports in 1998		Percentage share in total exports ¹	Change in terms of trade ²	
	Quantity	Value		1999	2000 (first half)
	<i>(Thousand tonnes)</i>	<i>(Million \$)</i>		<i>(Percentage)</i>	
COCOA BEANS					
Côte d'Ivoire	837	1 284	30	-11	-16
Ghana	271	505	24	-14	-22
Sao Tome and Principe	4.5	7	44	-10	-28
Sub-Saharan Africa	1 377	2 178			
COFFEE, GREEN					
Burundi	22	51	70	-20	-33
Central African Republic	6	10	9		
Côte d'Ivoire	315	495	8		
Ethiopia	115	380	60	-19	-32
Madagascar	30	40	22	-6	-15
Rwanda	14	26	45	-11	-25
Uganda	197	314	56	-17	-34
United Rep. of Tanzania	54	115	11	-7	-13
Sub-Saharan Africa	926	1 902			
COTTON LINT					
Benin	77	107	38	-14	-16
Burkina Faso	74	107	39	-16	-25
Central African Republic	15	23	12	-7	-12
Chad	56	77	42	-15	-20
Côte d'Ivoire	68	80	3		
Mali	119	130	46	-23	-28
Sudan	94	106	18	-5	-23
Togo	28	31	20	-9	-14
Uganda	7	7	3		
United Rep. of Tanzania	38	54	10		
Sub-Saharan Africa	794	1 054			
TEA					
Burundi	6	11	8		
Rwanda	4	6	12		
United Rep. of Tanzania	23	32	2		
Sub-Saharan Africa	374	787			

¹ Exports of the specific commodity as a percentage of total exports of goods and services.

² Average weighted percentage price change through June 2000 relative to the 1995-97 period, which may include other key export commodities not listed in this Table.

Source: IMF.

adverse fluctuations in terms of trade which, for most countries, were severe in 1999 and 2000. For example, Côte d'Ivoire saw its terms of trade fall by 11 and 16 percent in 1999 and 2000, respectively, while Burundi, Ethiopia and Uganda, all heavily reliant on coffee, saw their terms of trade fall by 30 percent or more in 2000.

Between 1995-97 and 2000, ten African countries suffered terms of trade losses of more than 20 percent. A further six saw their terms of trade deteriorate by between 10 and 20 percent, and only oil-exporting countries experienced improvements in their terms of trade. Over half of the countries that were worst hit by falling commodity prices are in sub-Saharan Africa.

THE HIV/AIDS EPIDEMIC IN SUB-SAHARAN AFRICA

Introduction

The epidemic of human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is the focus of increasing concern in the sub-Saharan Africa region, not only with regard to the serious health and social implications of the disease, but also because of its negative effect on agricultural performance and food security. In 2000, of the total 36.1 million people estimated to have HIV/AIDS worldwide, 25.3 million, or 70 percent, live in sub-Saharan Africa.² Today, there are 16 countries in the region with more than one-tenth of their adult population infected with HIV.

Table 9

PREVALENCE OF HIV/AIDS IN 2000

Region	Number of adults and children living with HIV/AIDS (Thousands)	Percentage of adults living with HIV/AIDS in 2000
North America	920	0.60
Caribbean	390	2.30
Latin America	1 400	0.50
Western Europe	540	0.24
Eastern Europe and Central Asia	700	0.35
North Africa and the Near East	400	0.20
Sub-Saharan Africa	25 300	8.80
South and Southeast Asia	5 800	0.56
East Asia and the Pacific	640	0.07
Australia and New Zealand	15	0.13
World	36 100	1.10

Source:UNAIDS.



FAO/1737/K. DUNN

AIDS has created several million orphans in sub-Saharan Africa

An 18-year-old orphan looks after his eight siblings

In 2000, 3.8 million adults and children in sub-Saharan Africa became infected with HIV, slightly fewer than the 4 million infections recorded in 1999. The rate of infection is stabilizing in this region, as the disease has already reached large numbers of people and because some countries are achieving effective prevention. Infections in the southern cone of Africa are still rising, however, and the overall trend will depend on how the epidemic develops in Nigeria. Deaths from AIDS in the region totalled 2.4 million in 2000, compared with 2.2 million in 1999. Tragically, the epidemic has already created 12.1 million orphans in sub-Saharan Africa. Before the emergence of AIDS, about 2 percent of all children in developing countries were orphans; by 1997, the figure was 7 percent in many African countries and, in some, it had reached 11 percent.

The population groups most at risk are those situated along truck routes to rural areas, i.e. people who live in areas such as rural market towns and have greater contact with urban centres. Rural zones that are sources of migrant labour and large infrastructure projects have also been identified as areas of high HIV prevalence. For example, HIV prevalence among pregnant women in Agomanya, the administrative centre of the district

Table 10

PREVALENCE OF HIV/AIDS IN SUB-SAHARAN AFRICAN COUNTRIES, IN ASCENDING ORDER, 1999

Country	Number of adults infected (15-49 years)	Percentage of adult population	Country	Number of adults infected (15-49 years)	Percentage of adult population
	(Thousands)			(Thousands)	
Sub-Saharan Africa	23 400	5.57			
1. Mauritius	0.5	0.08	23. Congo	82	6.43
2. Comoros	0.4	0.12	24. Burkina Faso	330	6.44
3. Madagascar	10	0.15	25. Cameroon	520	7.73
4. Equatorial Guinea	1	0.51	26. United Rep. of Tanzania	1 200	8.09
5. Mauritania	6.3	0.52	27. Uganda	770	8.30
6. Niger	61	1.35	28. Ethiopia	2 900	10.63
7. Guinea	52	1.54	29. Côte d'Ivoire	730	10.76
8. Senegal	76	1.77	30. Rwanda	370	11.21
9. Gambia	12	1.95	31. Burundi	340	11.32
10. Mali	97	2.03	32. Djibouti	35	11.75
11. Benin	67	2.45	33. Mozambique	1 100	13.22
12. Guinea-Bissau	13	2.50	34. Central African Republic	230	13.84
13. Chad	88	2.69	35. Kenya	2 000	13.95
14. Angola	150	2.78	36. Malawi	760	15.96
15. Liberia	37	2.80	37. Namibia	150	19.54
16. Eritrea	49	2.87	38. South Africa	4 100	19.94
17. Sierra Leone	65	2.99	39. Zambia	830	19.95
18. Ghana	330	3.60	40. Lesotho	240	23.57
19. Gabon	22	4.16	41. Zimbabwe	1 400	25.06
20. Nigeria	2 600	5.06	42. Swaziland	120	25.25
21. Dem. Rep. of the Congo	1 100	5.07	43. Botswana	280	35.80
22. Togo	120	5.98			

Source:UNAIDS.

that abuts on Ghana's Volta dam, is five to ten times higher than in the rest of the country.³

While, in terms of absolute numbers, prevalence rates may be higher in urban centres, most of the people infected with HIV are rural dwellers. Women are also relatively worse affected. For every ten African men infected, there are between 12 and 13 African women infected, and the average rates among adolescent girls are three to five times higher than those among boys in the same age group.

Some countries, such as Senegal and Uganda, have been successful in containing the prevalence rate by implementing strong prevention programmes as well as by generally recognizing that the problem exists and ensuring strong political leadership. Senegal has managed to contain the HIV/AIDS prevalence rate at low levels, while Uganda has brought its estimated prevalence rate down to about 8 percent from a peak of nearly 14 percent in the early 1990s.

The economic and social impact of HIV/AIDS

The HIV/AIDS epidemic will undermine development through its negative impact on life expectancy. An average of 17 years of life expectancy has been lost in countries where the adult HIV/AIDS prevalence rate exceeds 10 percent.⁴ What is unique to HIV/AIDS is that it mainly affects the most productive age group – people aged between 15 and 49. The median time between infection and death is between eight and ten years, and it is with the gradual onset of AIDS in the last two of those years that declining labour productivity and health care costs are felt. Companies lose their workers and hours are lost to illness, death, overwork, stress, funeral attendance and home care.

The epidemic also affects economic growth indirectly, as private and public spending on education and infrastructure decrease owing to the increased demands from the health sector. In urban areas of Côte d'Ivoire, household expenditure on schooling has been found to fall by 50 percent when someone in the family dies from AIDS. Food consumption drops by 41 percent per capita, while spending on health care increases more than fourfold.⁵ AIDS not only lowers the demand for schooling but also affects the supply side; a shortage of teachers is therefore a threat in many African countries. In the Central African Republic, for example, there were an equal number of teachers who died as there were retirees over the 1996-98 period, and 85 percent of these deceased were HIV-positive.⁶

HIV/AIDS is now the leading cause of death and one of the main factors in calculating disability-adjusted life years (DALYs)⁷ in sub-Saharan Africa. The epidemic is also linked with other infectious diseases, such as tuberculosis. Hospital

Table 11

THE COST OF AIDS IN SELECTED SUB-SAHARAN AFRICAN COUNTRIES

Country	Direct cost of AIDS per case	GDP per capita
		(\$)
Kenya (1992)	938	333
Malawi (1989)	210	203
Rwanda (1989-90)	358	269
United Rep. of Tanzania (1990)	290	204
Zimbabwe (1991)	614	648

Source: M. Ainsworth and M. Over. 1994. AIDS and African development. *The World Bank Research Observer*, 9(2): 203-240.

records indicate that up to 40 percent of HIV-infected patients have tuberculosis.⁸ Treatment costs of HIV/AIDS patients are very high and the epidemic will lead to increased government expenditure in the health sector, thereby diverting funds from productive investments. The cost of treatment of AIDS and related infections is expected to exceed 30 percent of the budget for the Ministry of Health in Ethiopia by 2014, and 50 and 60 percent in Kenya and Zimbabwe, respectively, by 2005.⁹

Despite the harrowing statistics, the macroeconomic impact of the HIV/AIDS epidemic has been difficult to assess. Estimates are sensitive to assumptions regarding how AIDS affects savings and investment rates and whether or not better skilled and more educated people are more at risk. Moreover, in many African countries that have a labour surplus in their formal sectors, deaths from AIDS do not necessarily result in a proportional loss of productivity. Indeed, many authors point out that GDP per capita may be an inappropriate yardstick to use because it does not accurately capture the serious setback in development suffered by some countries. United Nations Development Programme (UNDP) estimates for South Africa suggest that the Human Development Index might be 15 percent lower in 2010 as a result of the HIV/AIDS epidemic.

The impact of HIV/AIDS on the agriculture sector

HIV/AIDS affects the most productive age group. Furthermore, HIV-infected urban dwellers often return to their village, and rural households provide most of the care for AIDS patients. FAO has estimated that in the 25 most affected African countries, 7 million agricultural workers have died from AIDS since 1985; 16 million more could die within the next 20 years. FAO expects the HIV/AIDS epidemic to exacerbate food insecurity. According to recent FAO and UNAIDS studies, agricultural output of small farmers in some parts of Zimbabwe may have fallen by as much as 50 percent over the past five years, mainly as a result of AIDS.

Labour shortages are particularly serious in agriculture, since production is seasonal and timing is generally crucial. Areas with less developed labour markets and a higher reliance on household labour are also likely to be relatively worse affected. The shortfall in household labour means that some land remains fallow and the household's output declines. An FAO study of several farming areas has shown decreasing yields per area owing to: a decline in soil fertility; an increase in pests and diseases; changes and delays in cropping practices; and less use

Table 12

**ESTIMATED LOSS IN AGRICULTURAL LABOUR
FORCE THROUGH AIDS IN WORST-AFFECTED
SUB-SAHARAN AFRICAN COUNTRIES**

Country	Percentage loss, 1985-2000
Namibia	-26
Botswana	-23
Zimbabwe	-23
Mozambique	-20
South Africa	-20
Kenya	-17
Malawi	-14
Uganda	-14
United Rep. of Tanzania	-13

Source:FAO.

of external production inputs. The shortage of labour may lead to less time being dedicated to weeding, mulching, pruning and the clearing of land. Moreover, farmers may switch to less labour-intensive crops. The decline in soil fertility is partly due to farmers not implementing soil conservation measures that may be labour-intensive and long-term in nature.¹⁰

The epidemic also has grave consequences for agricultural estates. Evidence from one sugar estate in Kenya suggests that the epidemic adds substantially to costs. Profitability has been undermined by increased absenteeism owing to sickness, substantially reduced productivity and higher overtime costs as other workers replace their sick colleagues. Over an eight-year period in the 1990s, spending on funerals and health costs rose fivefold and tenfold, respectively. The company has estimated that about three-quarters of all illness among employees was related to HIV infection.¹¹

The impact on the livestock sector is also severe. Evidence from Namibia and Uganda indicates that livestock is often sold to support the sick and to pay for funeral expenses.¹² Selling livestock eats into a household's savings, making them more vulnerable to new shocks. The drop in livestock numbers means a reduced availability of organic material and hence increased pressure on soil fertility.

HIV/AIDS creates a tremendous burden for households, and the medical and funeral expenses force many of the poorer households into debt. A World Bank study on Kagera district in the United Republic of Tanzania revealed that about 60 percent of the cost associated with an AIDS victim is used to cover

funeral costs. The total cost of about \$60 is probably close to the annual per capita income in Kagera.¹³ Recent evidence from the United Republic of Tanzania suggests that food expenditure by poor households can drop by nearly one-third during the six months after the death of a young adult.¹⁴

Finally, the epidemic also affects agricultural extension work. There may be a shortage of staff in this area, too, and extension programmes may need to be adapted to take into account the effect of the epidemic. A Ugandan extension officer noted that between 20 and 50 percent of all person-hours among extension staff was lost as a result of the disease.¹⁵

Africa accounts for about one-tenth of the world's population but for nine out of ten new cases of HIV infection. Eighty-three percent of all AIDS deaths are in Africa. The impact of AIDS on farming communities differs from village to village and from country to country. Nevertheless, it is clear that the epidemic is undermining the progress made in agricultural and rural development over the last 40 years. This presents governments, non-governmental organizations (NGOs) and the international community with an enormous challenge. The disease is no longer simply a health problem, it has become a major development issue.

ETHIOPIA

Introduction

Following the civil war and the subsequent change of government in 1991, political stability, prudent macroeconomic policies and reforms aimed at liberalizing Ethiopia's economy contributed to high rates of economic growth. The Government of Ethiopia is pursuing a multifaceted programme of economic development centred on the transformation of the agriculture sector. Although considerable progress has been achieved in many areas since the early 1990s, Ethiopia has very high levels of poverty and food insecurity and the country continues to rank among the poorest in the world.

Background

Ethiopia covers 1 098 000 km² and has 62.8 million inhabitants,¹⁶ 85 percent of whom live in rural areas. The highlands, which extend over 40 percent of the land mass, are home to 80 percent of the human population and 75 percent of the country's livestock. A major feature of the climate is the unreliable nature of the rainfall. Ethiopia has suffered two large-scale, drought-induced famines in recent times (1973/74 and

1983/84), which claimed hundreds of thousands of lives. The situation is not uniform throughout Ethiopia: three-quarters of the drought-affected population are to be found in just three regions: Tigray, Wollo and Hararghe.¹⁷ Although Ethiopia imported food for the first time in 1959, very large inflows of food aid have been a feature since the late-1980s.

Following the defeat of the military regime in 1991,¹⁸ the Transitional Government of Ethiopia was formed and a programme of economic reform and regional devolution initiated. The nine regional states were formed largely on the basis of language. Federal and regional elections were held in 1995 and the Federal Democratic Republic of Ethiopia was created in that year. Under the new constitution, regional authorities have wide-ranging economic powers. Nevertheless, the impact of the regionalization policy is limited, as the central government raises 85 percent of domestic revenue and the regions, which are responsible for more than 40 percent of expenditure, rely on central government subsidies.¹⁹

Undernourishment and food insecurity

FAO estimates that 49 percent of Ethiopia's population is undernourished.²⁰ Daily per capita food availability is about 1 410 kilocalories (kcal) for the undernourished, which implies a daily deficit of 340 kcal per capita.²¹ A 1993 National Nutrition Survey²² found that 64 percent of children under the age of five suffer from chronic malnutrition (stunting), among the highest levels in the world, and that about 47 percent are underweight.²³ Also of serious concern are the current levels of iodine and vitamin A deficiency among children under the age of six.

Health and education²⁴

Current levels of health are very low. Infant and under five mortality stands at 118 and 176 per 1 000, respectively. Overall access to health care is severely limited and biased towards hospital-based curative services in urban areas. The fact that only 24 percent of the population has access to safe water exacerbates the problem.

The adult literacy rate in Ethiopia is only 35 percent. Gross school enrolment ratios are 29 percent at primary level (less than half the sub-Saharan average of 72 percent), 19 percent at junior secondary level, 9 percent at senior secondary level and less than 1 percent at tertiary level. Significant rural-urban differences exist, with Addis Ababa and other urban centres enjoying almost universal primary education while rural areas have an enrolment rate of 18 percent.

Spending on health and education has increased from 2.8 and 7 percent of the government budget in 1989 to 6.5 and 14 percent in 1998, respectively. Reforms in the fields of health and education are aimed at raising the level of service and coverage and at addressing rural-urban and regional disparities.

Macroeconomic conditions and policies²⁵

Ethiopia's GDP per capita is approximately \$106. After relatively poor macroeconomic performances during the 1970s and 1980s, when average real GDP growth rates were 2.6 and 2.3 percent, respectively, economic growth averaged 5.9 percent during the period 1993-1999 (Table 13). The recovery largely resulted from the economic reform programme launched in 1992 (outlined below) as well as from favourable weather and harvests. However, negative growth was recorded in 1998, largely owing to drought caused by the El Niño phenomenon. In 1999, GDP growth rebounded to 6.3 percent, although the forecast for 2000 was a more modest 2 percent, largely reflecting a weaker expected agricultural output. Rapid growth was accompanied by a low average level of inflation of 3.9 percent over the 1993-1999 period.

Ethiopia's main economic sector is agriculture, which provides employment for about 90 percent of the population and accounts for about 46 percent of GDP. Growth in services, which contributes 30 percent of GDP, has occurred mainly in transport and tourism. Manufacturing contributes 12 percent of GDP, with industry accounting for 5 percent. Finally, public administration and defence account for about 13 percent of

Table 13

REAL GDP GROWTH AND CONSUMER PRICE INFLATION IN ETHIOPIA

Year	Real GDP growth	Annual inflation rate
		<i>(Percentage)</i>
1993	12.0	10.0
1994	1.6	1.2
1995	6.2	13.4
1996	10.6	0.9
1997	5.2	-6.4
1998	-0.5	3.7
1999	6.3	4.2
2000 ¹	2.0	5.0

¹EIU estimate.

Source: IMF, *World Economic Outlook*, September 2000, Washington, DC.

GDP.²⁶ External debt is estimated to be about \$9.3 billion, or 142 percent of GDP.²⁷

From 1992 onwards, there has been a reorientation of economic policy. As part of the reform programme, the Ethiopian currency – the birr – was devalued by 60 percent in October 1992 and fortnightly foreign exchange auctions started in 1993. A medium-term adjustment programme, supported by the International Monetary Fund (IMF), was introduced in 1996 for the period 1996/97-1998/99. Further exchange market liberalization followed in August 1998. Trade has been liberalized by reducing import tariffs and by removing restrictions on external account transactions. The maximum tariff is now 40 percent and the average is still quite high at 19.5.²⁸ One important achievement has been the markedly improved revenue collection, with tax receipts up from 2.2 billion to 5.3 billion Ethiopian birr between 1992/93 and 1997/98.²⁹

The first privatizations were conducted in 1995. As is the case for the reform process in general, the speed of the privatization of state assets has been very gradual. The government has sought the assistance of the World Bank to accelerate the programme for privatizing the remaining 115 large enterprises and state farms by the end of 2000/01.

The investment code has been liberalized and, between 1993 and 1998, 21 foreign direct investment (FDI) projects were approved for a value of 8.3 billion birr.³⁰ However, the implementation process is slow; foreign investment remains low and the government is now actively encouraging “foreign” investment by Ethiopians living abroad.

The government has now moved towards implementing sectoral investment programmes (SIPs) in the key sectors of agriculture and food security, health, education and transport, which are meant to foster the country’s medium- to long-term development. Increased government expenditure (Table 14) has been made possible by the reduction in defence expenditure since the change in government in 1991. Defence spending fell from 24 percent of government expenditure in 1989 to 7 percent in 1995.³¹ Although the recent armed conflict with Eritrea (1998-2000) resulted in increased defence expenditures and a larger fiscal deficit, a drastic cut in expenditure for the SIPs is not expected. With the end of the war, renewed donor support is very likely. IMF’s projection of external financing requirements for the period 1998/99-2000/01 is \$8.6 billion (or 131 percent of the country’s GDP in 1998), part of which has already been pledged.³²

The liberalization and restructuring of the economy, together

Table 14
**GOVERNMENT EXPENDITURE ON DEFENCE,
 EDUCATION, HEALTH AND CAPITAL IN ETHIOPIA**

Year	Expenditure by sector				Total expenditure for all sectors
	Defence	Education ¹	Health ¹	Capital	
	<i>(Billion birr)</i>				
1994/95	0.74	1.13	0.43	3.16	8.41
1995/96	0.77	1.38	0.48	3.56	9.21
1996/97	0.84	1.46	0.60	4.30	10.08
1997/98	2.09	1.60	0.74	4.27	11.41

¹ Includes current and capital expenditure.

Source: IMF.

Table 15
**NET OFFICIAL DEVELOPMENT ASSISTANCE TO
 ETHIOPIA**

Year	Total net ODA	
	Million \$	Percentage of GDP
1994	1 071	19.3
1995	883	15.3
1996	817	13.6
1997	572	9.0
1998	648	9.9
1999	633	9.7

Source: OECD and IMF.

with the implementation of the SIPs, is a challenge for the public sector. Regional institutions, which are responsible for a wide range of development programmes and projects, lack technical capacity and need to be strengthened. Realizing the public administration's limitations, the government has nearly completed a broad civil service reform, encompassing judicial, legal and financial management reforms.

Agricultural situation

As noted earlier, agriculture is Ethiopia's main economic activity. More than 95 percent of the country's agricultural output is generated by subsistence farmers, using traditional methods. Eighty-four percent of crop area in 1998/99 was planted to cereal crops, such as teff,³³ wheat, barley, maize, sorghum and millet.³⁴ Ethiopia also has the largest livestock herd in sub-

Saharan Africa, with 17 percent of the continent's cattle and 14 percent of its ruminants (cattle, sheep, goats) supported by 3 percent of its permanent pasture.³⁵ Cattle stocks expanded at an average rate of 1.1 percent over the period 1970-95,³⁶ as productivity was limited by a high incidence of disease and poor nutrition.

The agricultural export sector is highly concentrated on a few commodities. Two-thirds of export revenues are generated by coffee alone. Coffee, hides and skins, qat,³⁷ pulses and oilseeds generate more than 80 percent of the country's export earnings (Table 16). A fall in the value of hide and skin exports in 1998 is attributed to the Asian and Russian financial crises.

Ethiopian agriculture is dependent on an unreliable rainfall. Irrigated land accounts for less than 1 percent of total cropland³⁸ and agricultural production may fall by up to 20 percent in years of drought. Untimely and/or excessive rainfall in many areas can also affect grain production negatively.

Despite the importance of agriculture in its economy, Ethiopia has been a food-deficit country for several decades, with cereal food aid averaging 14 percent of total cereal production in the period 1984-99.³⁹ With a growth rate of 3 percent per year, the country's population will double in less than 25 years. Unless action is taken urgently, therefore, the gap between food supply and demand will widen further and food insecurity will become even more pervasive.

Increasing human and livestock population pressures have contributed to extensive soil degradation in Ethiopia. According to an FAO study,⁴⁰ out of 54 million ha (including Eritrea) in

Table 16

ETHIOPIA'S MAIN EXPORTS AND IMPORTS

Year	Exports					Imports		Trade balance
	Coffee ¹	Hides and skins	Pulses and oilseeds	Qat	Total	Cereals	Total	
	<i>(Million \$)</i>							
1993	125.8 (57)	31.5	1.3	15.4	222.4	-82	-1 051.8	-829.4
1994	158.3 (57)	35.1	12.4	18.7	279.6	-245	-914.6	-635
1995	287.8 (64)	59.8	24.5	27.6	453.6	-164	-1 063.0	-609.4
1996	272.9 (67)	50.8	18.8	27.6	410.2	-110	-1 412.9	-1 002.7
1997	355.0 (59)	57.3	23.3	33.5	598.7	-57	-1 403.1	-804.4
1998	420.0 (70)	50.5	60.7	39.6	602.1	-113	-1 518.8	-916.7

¹ Numbers in parentheses refer to the percentage of total exports.

Source: IMF.

the highlands: 14 million ha had experienced serious degradation, 13 million ha had experienced moderate degradation and 2 million ha had too shallow a soil cover to cultivate crops. The degradation has continued, and between 1.5 billion and 2 billion tonnes of topsoil⁴¹ are lost every year. At the root of Ethiopia's large food deficit is its low agricultural productivity. Cereal yields stagnated at around 1.2 tonnes per hectare between 1980 and 1997.⁴² The decreasing size of farms has led to shorter fallow periods and even continuous cropping, and limited efforts to recycle crop residues or other organic matter into the soil have resulted in farmers having to invest in chemical fertilizer to produce enough for their subsistence requirements. With little room for further significant increases in the area under cultivation, the solution to the country's food supply problem hinges on raising yields, which in turn are determined by sustainable growth in the use of external inputs, particularly fertilizer and improved seeds.

The use of fertilizer in Ethiopia has been suboptimal for a number of reasons,⁴³ including a lack of complementary external inputs. For example, fertilizer efficiency is negatively affected by competition from weeds, insect attack and disease infestation but, in 1997/98, only 12 percent of the area planted to cereal was treated with pesticides (mainly insecticides) and herbicides.⁴⁴ Improved seeds have been lacking: while 39 percent of the area under cereals was fertilized in 1996/97, only 2.4 percent of this area was planted with improved seeds.⁴⁵ The quality of improved seeds is also low in many instances. For example, most of the improved wheat varieties used were found to be susceptible to rust during the 1998/99 cropping season.⁴⁶ The seed industry, dominated by the parastatal Ethiopian Seed Enterprise, is unable to multiply and distribute sufficient quantities of hybrid maize, which is very popular in areas of high rainfall. Greater attention, therefore, needs to be paid to location-specific agricultural research and to the seed industry.

Since 1992, the government has taken several measures aimed at improving smallholders' productivity, removing government monopolies and restrictions on private trading and encouraging private sector participation in the agricultural input market.

The Participatory Demonstration and Training Extension System (PADETES) was launched in 1994/95, mainly to increase farmers' use of fertilizers. Supported by World Bank funding, PADETES is based on an extension package developed by Sasakawa-Global 2000 and the Ministry of Agriculture's Extension Department. From 35 000 farmer-managed

demonstration plots in 1995, the programme grew to include nearly 4 million plots (measuring 0.25 to 0.5 ha) in 1999.⁴⁷ Substantial resources for expanding credit were also made available.⁴⁸

Agricultural input as well as output markets have been liberalized, and in 1998 price controls and input subsidies were abolished in an effort to remove market distortions.

With the new policy in force, fertilizer consumption increased from 153 000 tonnes in 1992 to 286 000 tonnes by August 1999.⁴⁹ Farmers participating in the PADETES programme, and who adopted the complete package of improved seeds and fertilizer together with the recommended agronomic practices, reportedly achieved high yields – particularly in the case of maize.⁵⁰

Nevertheless, the transition from public to private sector participation has been slow and cereal yields have remained low. With the exception of Oromia region,⁵¹ where relatively competitive market conditions prevail, regional fertilizer markets are dominated by public companies or firms affiliated with regional governments. At the national level, the impact of PADETES is more positive, but still limited. It is clear that much remains to be done, although recent trends give cause for positive expectations. A very positive trend in agricultural output was recorded between 1994 and 1997, mainly as a result of favourable weather from 1995 to 1997 and the increase in area under cultivation (Table 17).

Among the major constraints to low-cost input supplies and distribution in Ethiopia are perceived policy uncertainties, inadequate institutional capacity in implementing reform, a lack

Table 17

CEREAL SUPPLY IN ETHIOPIA

Year	Area under cereals	Average yield for cereals	Total cereal production	Cereal imports	Cereal food aid
	<i>(Thousandha)</i>	<i>(Tonnes/ha)</i>		<i>(Thousand tonnes)</i>	
1993	4 034	1.31	5 295	450	652
1994	5 387	0.97	5 245	1 023	787
1995	6 527	1.03	6 740	647	525
1996	7 731	1.21	9 379	399	298
1997	7 498	1.26	9 473	256	653
1998	6 313	1.14	7 197	585	626
1999	7 426	1.13	8 407	656	1 205
2000	6 817	1.15	7 845	n.a.	n.a.

n.a. = data not available.

Source: FAO.

of effective credit and saving groups and poor market information. Two major barriers are the country's weak extension service and inadequate physical infrastructure:

Agricultural extension in Ethiopia is entirely in the hands of the public sector and farmers' participation is limited. Under the new extension approach, 15 000 development agents are expected to transfer technology packages, designed by Ministry of Agriculture experts. An agent is basically a supervisor, whose main task is to ensure that farmers selected for demonstration are applying the package according to blanket recommendations issued by the authorities. With only a few months' training, agents often lack the capacity to modify recommendations to local conditions. Since the extension system does not encompass adaptive research, farmers are often required to adopt technologies of unknown profitability and adaptability.

Agricultural marketing in Ethiopia is also hampered by a number of obstacles, one of which is infrastructure. The average road density is only 21 km per 1 000 km² or 0.44 km per 1 000 people, one of the lowest rates in Africa.⁵² Grain marketing is largely handled by small-scale traders with limited storage capacity. Low prices after harvest and high seasonal price fluctuations have discouraged investment in vital inputs such as fertilizers and improved seeds. A Road Sector Development Programme was recently introduced to increase the accessibility of all-weather roads. The aim is to reduce the proportion of farms that are more than half a day's walk from the nearest all-weather road from 75 to 25 percent within ten years. Substantial government resources, more than 20 percent of the capital budget, are allocated for road construction and maintenance.⁵³

Policies and programmes for agricultural development and food security

It is the Ethiopian Government's priority to fight widespread poverty and food insecurity, and it is a tribute to the administration's commitment that there have been no repeats of the 1983/84 famine, even though droughts occurred in 1991/92 and 1993/94. Another major crisis emerged in 1999 and 2000, as the less abundant *Belg*⁵⁴ (February-April) rains failed in both years and the rainfall pattern for the *Meher* (May/September) season continued to be abnormal. An estimated 10.2 million people were in need of assistance in mid-2000, requiring an estimated 1.3 million tonnes of emergency food aid.⁵⁵ However, early warning efforts, supplies from the Emergency Food Security Reserve (EFSR)⁵⁶ and

substantial assistance from the World Food Programme (WFP) as well as other agencies and donors have made it possible to prevent widespread famine.

The severe crisis highlights how much Ethiopia is still at the mercy of the weather. In the light of the large number of people affected, food aid may not have been targeted broadly enough. Many households that do not qualify for assistance, but that may nevertheless be drawing on their assets to make up their deficits each year, are very vulnerable in times of drought. WFP's Vulnerability Analysis Mapping, which provides information pertaining to food security, is seen as a valuable effort towards the improved targeting of aid.

The overarching, long-term strategy is that of agricultural development-led industrialization (ADLI), which views agriculture as the main engine of growth. As mentioned earlier, a more comprehensive SIP is currently being implemented for the agriculture and food security sector. The programme focuses on:

- extension, inputs, credit, small-scale irrigation and land policies;
- road infrastructure;
- diversification;
- targeting in support of the very poor and vulnerable; and
- strengthening early warning as well as aid distribution capabilities.

The programme is accompanied by a population policy aimed at reducing fertility from a rate of 7.7 to 4 children per woman by 2025.

Land tenure is a politically-sensitive issue. Currently, all land is public and will remain so for the foreseeable future. The transfer of land through long-term lease or sales has been forbidden and redistribution has been carried out regularly. Smallholder farmers perceive their tenancy rights to be insecure, and this has a negative impact on investment in land improvements. The land policy has reinforced fragmentation and reduced the average farm size to less than 1 ha in many areas. Land policy reform would encourage the formation of viable farms and enhance agricultural transformation in Ethiopia.

The government is also focusing on soil and water conservation and reforestation programmes. It has established an Environmental Protection Agency and initiated a National Conservation Action Plan that includes measures for selective reforestation. Much more needs to be done, however, to guarantee the sustainability of rural communities in many parts of the country.

The high instability of coffee prices has made the diversification of exports a priority, and the government has set up an Export Promotion Agency for this purpose. Nevertheless conditions are far from ideal. The uncompetitive nature of the domestic service sector adds to the cost of exporting, and inadequate infrastructure is a further constraint.

An important area that has been neglected in the past is the livestock sector. Given the size of this sector, not to mention its substantial forward and backward linkages at all levels of the economy, the scope for developing livestock resources is considerable, as are the multiplier effects that can be expected. A Leather Technology Institute and a Livestock Marketing Authority are now being established to promote the export of livestock and livestock products.

Conclusion

Ethiopia is one of the poorest countries of the world. The end of many years of civil war has brought to office a government that is at once focused on agriculture and dedicated to fighting poverty and food insecurity. Achievements to date have been impressive, particularly with regard to macroeconomic performance and famine prevention. However, continued building and strengthening of the country's institutions is needed to ensure the efficient, transparent and accountable public administration required for the successful implementation of reform and investment programmes. With more than 2 million chronically food-insecure people, the challenge for Ethiopia is still daunting.

II. Asia and the Pacific

REGIONAL OVERVIEW

General economic performance

In 1997 and 1998, the Asian financial crisis reduced wealth and incomes, increased unemployment and inflation and heightened food insecurity in the worst affected countries of the region. By the first quarter of 1999, most of the economies of the affected countries were recovering, and this recovery process was consolidated during 2000. According to IMF,⁵⁷ real GDP growth in developing Asian countries had increased to 5.9 percent in 1999, up from 4.1 percent in 1998. For both 2000 and 2001, IMF projected GDP growth rates of slightly above 6.5 percent.

China's extraordinary economic growth tapered off in the late 1990s to settle at about 7 percent in 1999. However, economic growth is forecast to rise to 7.5 percent in 2000, owing both to stronger domestic demand and increased exports following the recovery of Asian economies. If growth is to continue at a stable rate, however, an important challenge is to achieve structural reforms in the state-owned enterprise and financial sectors and to develop a legal and regulatory framework necessary for a market economy.

Table 18

ANNUAL REAL GDP GROWTH RATES IN SELECTED COUNTRIES OF DEVELOPING ASIA

Country/region	1996	1997	1998	1999	2000 ¹	2001 ¹
	<i>(Percentage)</i>					
Bangladesh	5.0	5.3	5.0	5.2	5.0	4.5
China ²	9.6	8.8	7.8	7.1	7.5	7.3
India	7.1	4.7	6.3	6.4	6.7	6.5
Indonesia	8.0	4.5	-13.0	0.3	4.0	5.0
Malaysia	10.0	7.3	-7.4	5.6	6.0	6.0
Pakistan	4.9	1.0	2.6	2.7	5.6	5.3
Philippines	5.8	5.2	-0.6	3.3	4.0	4.5
Thailand	5.9	-1.7	-10.2	4.2	5.0	5.0
Republic of Korea	6.8	5.0	-6.7	10.7	8.8	6.5
Viet Nam	9.3	8.2	3.5	4.2	4.5	5.4
Asia³	8.3	6.5	4.1	5.9	6.7	6.6

¹ Projections.

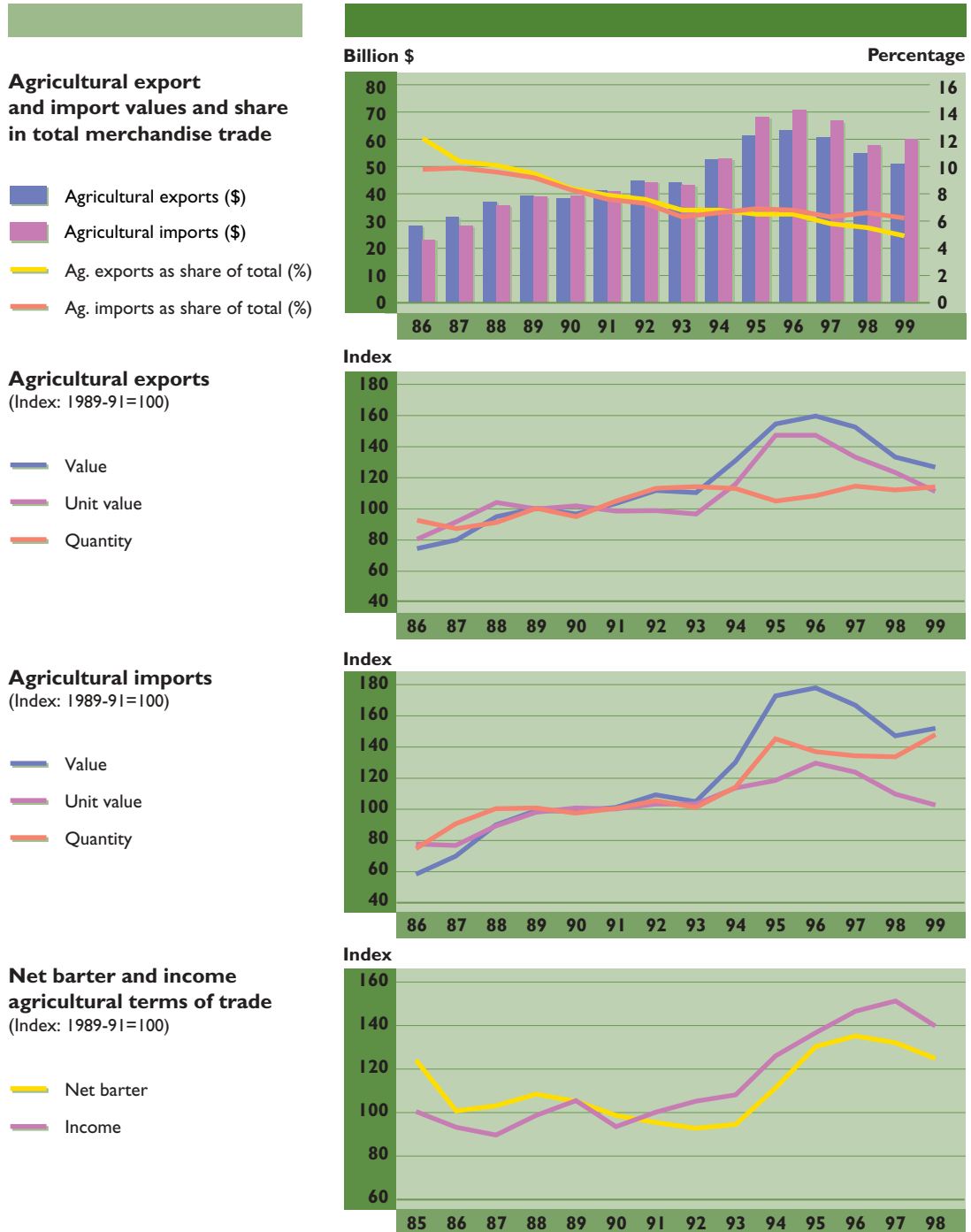
² China, excluding Hong Kong Special Administrative Region and Taiwan Province.

³ IMF regional classification (excluding the Republic of Korea, the Lao People's Democratic Republic, Mongolia, Singapore and Taiwan Province of China).

Source: IMF.

Figure 17

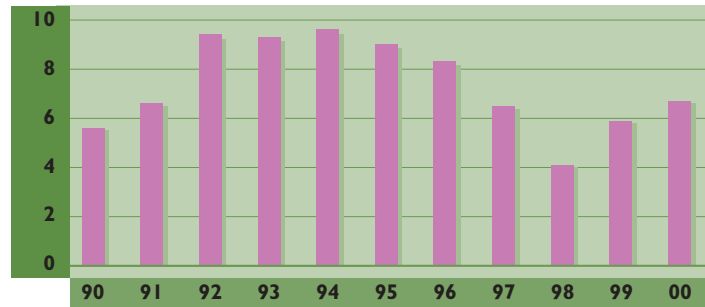
ASIA AND THE PACIFIC: SELECTED INDICATORS



ASIA AND THE PACIFIC: SELECTED INDICATORS

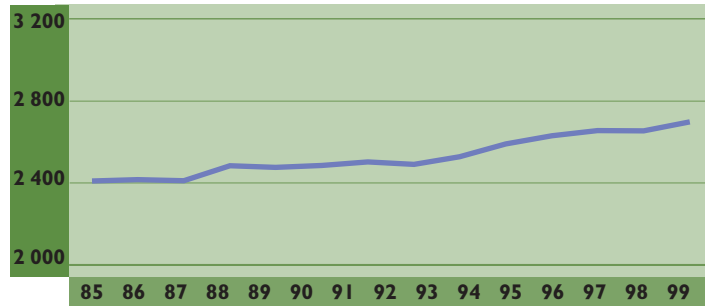
Real GDP
(Percentage change from preceding year)

Percentage



Dietary energy supplies
(kcal per capita per day)

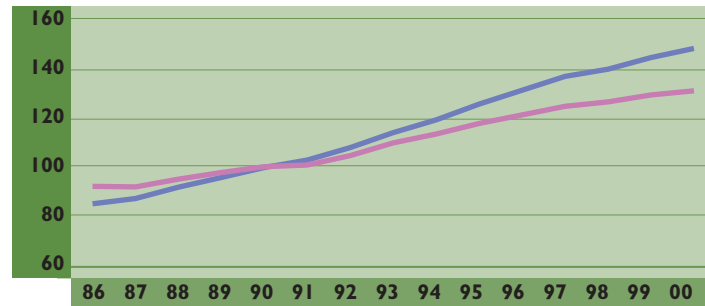
kcal



Agricultural production
(Index: 1989-91=100)

Index

— Total agricultural production
— Per capita food production



Source: FAO and IMF

Of the countries that were most severely affected by the region's financial crisis, the Republic of Korea has achieved the sharpest recovery. After a 7 percent contraction in 1998, its economic growth rate was 10 to 11 percent in 1999, with nearly 9 percent projected for 2000 before a fall to 6.5 percent in 2001.

In Southeast Asia, recovery from the region's financial crisis has been more rapid than generally expected, except in Indonesia. After a 13 percent decline in GDP and food price riots in 1998, the Indonesian economy stagnated in 1999, recording GDP growth of less than 0.5 percent. Economic recovery only commenced in 2000, for which GDP growth was projected to be 4 percent, accelerating to 5 percent in 2001. In Malaysia, after a 7 percent contraction in GDP in 1998, recovery commenced in 1999, with an expansion in GDP of an estimated 5.7 percent and a projected rate of 6 percent for 2000. A similar rate is projected for 2001. In the Philippines, the economic downturn in 1998 was less pronounced than in the most affected countries, as GDP contracted by less than 1 percent. On the other hand, the recovery has also been relatively slower, with GDP growing by 3.3 percent in 1999 and by a projected 4 percent in 2000.

After Indonesia, Thailand was the country to have suffered the sharpest economic setback from the financial crisis, with its GDP dropping by 10 percent in 1998. Recovery began in 1999, when the economy grew by about 4 percent, and this rate is projected to rise to 5 percent in 2000. In Viet Nam, the regional financial crisis only induced a slowdown in the rapid GDP growth experienced in the preceding years, and a limited acceleration in growth occurred in 1999 and 2000.

In South Asia, real GDP in India has been growing by between 6 and 7 percent each year since 1997. Current IMF projections point to GDP growth rates of about 6.5 percent in both 2000 and 2001 (6.7 percent in 2000, falling to 6.5 percent in 2001). However, the country's large fiscal deficit and resultant government borrowing requirements could present risks for the economy unless corrective action is taken.

In Bangladesh, where agricultural output remains a driving factor behind overall economic performance, GDP growth has remained close to 5 percent since 1995. In Pakistan, macroeconomic imbalances stifled economic growth in 1998 and 1999 but recovery appeared to be under way in 2000, with a projected GDP growth rate of 5 to 6 percent.

Agricultural performance

The rate of overall agricultural production growth in the Asia and Pacific region has declined in the past few years. The average annual rate of production growth for the period 1996-00 amounted to 3.2 percent compared with the average rate of 4.6 percent attained during the preceding five-year period. After having grown at a rate of more than 4 percent in four out of five years in the period 1991-1995, rates of expansion in output remained at 4.4 and 4.3 percent in 1996 and 1997, respectively, but dropped to 2.1 percent in 1998 and 3.4 percent in 1999. Provisional estimates of agricultural production in 2000 suggest an expansion in production of just 1 to 2 percent.

Recent poor agricultural performances and weather-related production shortfalls in various countries of the region have contributed to the lower agricultural output growth recorded over the last years. However, the slowdown in China's production growth is the single most important factor behind the trend. After maintaining high rates of growth throughout most of the 1990s, with an average annual rate of production increase of 6.3 percent for 1991-97, Chinese agricultural production growth has decelerated markedly to an estimated 4 percent in 1998 and 2.9 percent in 1999. Provisional estimates for 2000 point to an increase of about the same magnitude, i.e. about 3 percent. In particular, cereal production appears to have declined sharply in 2000, partly because of natural disasters but also because of a major contraction in harvested area in response to reductions in the prices and volumes of state purchases of lower-quality grains. This measure

Table 19

NET PRODUCTION GROWTH RATES IN DEVELOPING ASIA AND THE PACIFIC

Year	Agriculture	Cereals	Crops	Food	Livestock	Non-food
	<i>(Percentage)</i>					
1991-95	4.6	1.2	3.4	4.8	8.0	1.9
1996	4.4	5.9	5.2	4.5	3.7	2.5
1997	4.3	0.6	1.8	4.2	7.3	4.3
1998	2.1	1.5	1.2	2.8	5.3	-8.1
1999	3.4	2.5	2.8	3.6	3.7	-0.9
2000 ¹	1.6	-3.2	0.5	1.8	2.0	-1.3

¹ Estimates.
Source: FAO.

is aimed at encouraging grain farmers to adopt more market-oriented production practices and sell to satisfy local demand rather than depending on government procurement.

In India, agricultural output has been increasing at fairly stable rates throughout the 1990s, with an average annual rate of about 2.5 percent. After stagnating in 1998 when output was negatively affected by damaging floods in the north of the country, agricultural production recorded a 3.7 percent growth rate in 1999, with a bumper production in foodgrains, and wheat in particular, thanks to favourable weather conditions during the winter crop sowing period. Preliminary estimates for 2000 point to a minor decline in production of less than 1 percent. A further increase in crop production, particularly cereals, appears to have been counterbalanced by a decline in livestock production.

Bangladesh, where floods are a constant threat, has seen strong but uneven agricultural production growth over the second half of the past five years. Bumper harvests in 1998 and 1999 fuelled increases in overall agricultural output, estimated to be 3.1 and 8.4 percent, respectively. Floods in 2000 implied significant crop losses in the areas affected, and agricultural output is estimated to have increased by less than 2 percent.

In 1998 and 1999, Pakistan experienced two consecutive years of agricultural output growth in the range of 4 to 4.5 percent. Wheat and cotton traditionally account for more than half of the output of major crops. In 1998, while the cotton crop suffered a decline as the combined result of bad weather and a leaf curl virus attack, cereal output expanded strongly. In 1999, cotton output expanded strongly and the previous year's high levels of cereal output were maintained. Estimates for 2000 point to a small increase in agricultural production, not exceeding 1 percent.

Agricultural production in Indonesia has shown a relatively poor performance over the past three to four years. In 1998, for the second consecutive year, overall output declined – by 1.5 percent – largely as a result of El Niño-induced drought conditions but also owing to the effects of the economic crisis. The subsequent recovery in production has nevertheless been slow; overall agricultural output increased by only 1.6 percent in 1999 and the preliminary estimates for 2000 show output to be almost stagnant.

After prolonged drought related to the El Niño phenomenon, which contributed to a contraction of more than 7 percent of agricultural production in 1998, the 1999 monsoon arrived in the Philippines about two months earlier than usual, boosting

that year's agricultural growth to almost 9 percent. Rice and maize production gained in particular, following a sharp contraction the preceding year. An expansion in output of between 1 and 2 percent is the provisional estimate for 2000.

In Thailand also, agricultural production in 1998 suffered severely from El Niño-related weather effects and reduced import demand in other Southeast Asian nations. Overall agricultural production in 1998 declined by 3.5 percent. Recovery has since been only modest, with production increasing by about 1.5 percent in 1999 and probably by less than 1 percent in 2000.

In Malaysia, too, agricultural production in 1998 suffered from the negative effects of adverse weather as well as labour shortages caused by the departure of foreign workers. However, at 1.5 percent, the overall decline in production was more modest than in the Philippines and Thailand. Production rebounded by more than 5 percent in 1999, mainly owing to a strong expansion in oil crops, while rubber production continued to follow a downward trend. Overall agricultural production in 2000 appears to have remained almost unchanged from the level of 1999.

Viet Nam continued the strong rate of agricultural production growth that characterized the 1990s, recording an expansion in agricultural production of 7 percent in 1999, the highest rate since 1992. The country's exceptional output performance in 1999 seems to have been followed by more modest growth in 2000, as preliminary estimates suggest an increase in overall agricultural production of about 2 percent (for an overview of Viet Nam's agriculture sector, see p. 116).

The Asian economic crisis and its implications for the agriculture sector

The financial crisis in Asia is an illustrative example of the instabilities that may confront the agriculture and rural sector, particularly given its growing intersectoral and world market linkages. Problems related to the financial crisis in Southeast Asia were compounded by drought conditions resulting from the El Niño phenomenon.

Social impact. The social impact of the crisis has been significant but less severe than was feared at the height of the crisis. This is partly because the recovery has been faster than anticipated and partly because of the public transfer mechanisms that were set up in some of the countries affected. Furthermore, the absorption of unemployed urban dwellers into

Table 20

INDICATORS OF THE SOCIAL IMPACT OF THE ASIAN CRISIS

Indicator	China	Indonesia	Malaysia	Philippines	Rep. of Korea	Thailand
	<i>(Percentage)</i>					
Annual growth in private consumption per capita						
1990-96	8.3	6.8	5.4	1.0	6.5	6.4
1998	5.5	-4.7	-12.6	1.3	-10.2	-15.1
Poverty incidence¹						
1996	4.7	11.3	8.2	37.5	9.6	11.4
1998	3.4	20.3	19.2	13.0
Unemployment rate						
1996	5.6	4.9	2.5	8.6	2.0	1.8
1998	9.1	5.5	3.2	10.1	6.8	4.5

¹ Based on national poverty lines.

Source: World Bank. 2000. *East Asia. Recovery and beyond*. Washington, DC.

the agriculture sector and the existence of other informal safety nets have mitigated the impact. However, the Asian Development Bank (AsDB) reports that the social recovery is still slow and that it is causing a lag in the overall economic recovery.⁵⁸

Poverty indicators deteriorated significantly in all the countries affected by the crisis.⁵⁹ Indonesia, where the contraction in GDP was sharpest, experienced the greatest increase in poverty. It was estimated⁶⁰ that a 12 percent contraction of GDP in 1998 would be accompanied by an increase in the poverty rate from 11.3 percent in January 1996 to 14.1 percent in March 1999, with the increase being relatively larger in urban areas. Real wages in Indonesia are estimated to have fallen by 41 percent in 1998. It is notable that the incidence of poverty increased more sharply in urban than in rural areas, although the largest absolute increase in the number of poor was in rural areas. In Thailand, the opposite pattern was discernible: rural poverty increased, while the percentage of poor in the urban areas remained unchanged. In countries where a sizeable share of the population is close to the poverty threshold, such as Indonesia and the Philippines, declining levels of income and consumption per capita lead to more immediate increases in the incidence and intensity of poverty. In these areas, the speed or slowness of recovery can make a crucial difference to the livelihood of many people.

The largest impact on labour markets occurred in Indonesia, the Republic of Korea and Thailand. The impact on employment was less pronounced in the Philippines, which had also experienced lower rates of growth prior to the crisis. In Malaysia, the group that was most affected was the foreign labour force.⁶¹ Youth unemployment rates generally rose faster than those for adults. In addition to increased unemployment rates, households were also affected by declining real wages. Indeed, most of the labour market adjustment affected earnings rather than creating open unemployment. In addition, there was a shift from formal to informal employment.

The crisis strongly affected the food security of the most vulnerable groups of society. Currency devaluations and rising food prices shifted internal terms of trade to the advantage of farmers with marketable surpluses. But the same higher prices put many staple foods out of the reach of low-income groups, thereby reducing food security. Changes in the prices of basic goods are very disruptive, especially for the poor. Even modest increases in food prices adversely affect people's nutritional status, particularly in the case of pregnant and lactating mothers, infants and pre-schoolchildren. The increase in agricultural prices during the Asian crisis negatively affected the welfare of the urban poor, as they use a large proportion of their income to buy food. In rural areas, where the poorest tend to be net buyers of food staples and access to safety net programmes is usually limited, if not absent, rising food prices likewise had adverse effects. In Indonesia, for instance, the amount of rice that could be purchased with the daily minimum wage fell by more than two-thirds between January 1997 and October 1998. FAO calculated that the number of undernourished in Indonesia certainly almost doubled from 6 percent of the population in 1995-97 to about 12 percent in 1999.⁶²

Response to the crisis. The response to the crisis took a variety of forms. At the household level, various coping mechanisms have been observed, including adjustments in consumption, dissaving and use of family labour. On the consumption side, households reduced their food expenditure and substituted cheaper, lower-quality sources of calories, which has had a negative impact on the agriculture sector. Household savings that had been accumulated during the successive high-growth years helped many of the families who encountered unemployment or sharp cuts in wages.

Migration was also an important coping mechanism during the crisis.⁶³ In the worst-affected countries, there was an unusual

reverse migration from urban to rural areas. In Thailand, the government estimated that 188 000 urban unemployed left Bangkok in search of better prospects in the countryside. Significant shifts in employment from the non-farm to the farm sector were also observed in Indonesia and the Republic of Korea. At the same time, the higher degree of urban unemployment hurt rural families who depended on remittances from urban relatives.

Governments responded through existing and new or expanded social safety nets. The instruments used differed among the countries. Indonesia launched a new programme of targeted cheap rice distribution in July 1998. The programme was planned to ensure 20 kg of rice at subsidized prices to households selected according to specified criteria and, by January 2000, it was reaching 10 million households. Indonesia, the Republic of Korea and Thailand introduced, expanded or redesigned public workfare schemes. In the Republic of Korea, the unemployment insurance scheme was expanded, while severance pay was increased in Thailand. Both Indonesia and Thailand relied on schemes to promote school enrolment (with scholarships and school fee waivers, etc.). Thailand expanded school lunch programmes. Active labour market policies were also important, particularly vocational training or job retraining (in Malaysia, the Philippines, the Republic of Korea and Thailand) and job placement programmes (in the Philippines and the Republic of Korea). Other instruments included subsidized health care (in Thailand) or essential drugs (in Indonesia), community-based social programmes (in Indonesia and Thailand) and various social- or income-support programmes (e.g. in the Republic of Korea and Thailand).

Challenges to the agriculture sector. The Asian economic crisis posed a number of challenges to the agriculture sector. More than ever, it was left to absorb displaced labour, contribute foreign exchange revenues, increase domestic food supply and generate resources for domestic investment.

The drastic currency depreciations that took place⁶⁴ had a mixed impact on agriculture. They tended to correct the overvaluation of national currencies and enhance the relative prices of tradable agricultural goods, creating incentives for increased farm production and revenues. Export commodity production was encouraged while food and feed imports were depressed. To some extent, however, this positive effect was counterbalanced by the adverse effect of higher prices for

imported inputs, such as fertilizer and fuel. The actual realization of potential increases in farm production was slow because structural rigidities and capital availability in poor areas often hampered the capacity of farm households to respond to price changes.

Restraints on government spending also reduced, at least in the initial stages of the crisis, the resources available for the provision of public goods to farmers. Cuts in government investment in rural areas were particularly severe in the worst-affected countries. Since investments in agricultural infrastructure and research often have long lead times, the effects of these cuts could be long-lasting and may also take time to become fully apparent.

The agricultural supply response was also restricted by high interest rates and the credit squeeze on operating capital, especially for essential inputs (e.g. seeds and fertilizer) and the marketing and distribution of agricultural produce, including export and import activities. With a sluggish supply response, food prices rose in the wake of currency devaluation. The increase in food prices was particularly sharp in Indonesia, where the monthly average market price for rice rose from about 1 500 rupiah per kg in March 1998 to 3 000 rupiah in September of the same year.

The effects on farm households through the employment channel were mostly negative. Urban demand fell, particularly for agricultural products with a high income elasticity such as livestock and horticultural products. Rural non-farm employment and remittances from family members in non-agriculture sectors declined. The reverse urban-rural labour migration triggered by the crisis depressed rural wage rates and partially offset any income gains through the exchange rate channel.

Lessons from the crisis. Many impacts of the Asian financial crisis will only be fully revealed with time. What is evident from the Asian crisis, however, is the capacity of society to protect consumption and welfare levels during transitory shocks in cases where increases in incomes have been sustained by economic growth during the preceding decades. Asia's past achievements in economic growth and poverty reduction have no parallel in recent history and have prevented many families from reverting to absolute poverty. At the same time, the special role of targeted employment and social sector programmes was amply demonstrated in alleviating the transitory hardships faced by the poor in a recessionary situation.

Agriculture is the most critical sector in poverty alleviation, since the poor are mainly to be found in rural areas and are predominantly employed in, or otherwise dependent on, agriculture. Although the sector has encountered difficulties in the wake of the crisis, for example in the form of higher input costs, reduced investment and lower domestic demand for high-value products, it demonstrated considerable resilience against the shocks of the crisis.

The long-term effects of the crisis on the agriculture sectors of affected countries are still uncertain. With the currency depreciations, the implicit taxation of agriculture was either reduced or eliminated, and economic recovery has begun in most parts of the crisis-stricken countries. This implies new opportunities for the agriculture and rural sector to contribute to economic growth and poverty alleviation. However, to allow the sector to reap the benefits of the improved incentives, its capacity to respond to changes should be further enhanced. The role of the public sector in improving marketing conditions, infrastructure, research and extension activities is fundamental in this regard.

VIET NAM

The setting

Viet Nam covers a total land area of approximately 33 million ha. Three-quarters of the country is made up of mountains and hills, while the remainder consists of fertile river plains, the main ones being the Red River delta in the north and the Mekong River delta in the south.

Viet Nam is one of the poorest countries in the world. With a per capita GNP of only \$350 in 1998, the country ranks 173rd on the World Bank's classification list.⁶⁵ In spite of this, it compares very favourably with other developing countries when judged by a number of social indicators. Life expectancy at birth is 68 years, compared with an average of 60 years for the low-income countries (and 70 years for the middle-income countries), while the infant mortality rate is 34 per 1 000 live births, compared with the average of 68 for the low-income countries overall and 31 for the middle-income countries. Adult literacy rates are likewise much higher than usual for low-income countries. Thus, the youth illiteracy rate (for the age group of 15 to 24 years) is only 3 percent for both males and females.⁶⁶

Agricultural land amounts to 7.9 million ha, 3 million of which are irrigated.⁶⁷ The forest cover is estimated to be approximately 9.3 million ha.⁶⁸ Most of the lowlands are under rice cultivation, while the uplands are planted to other annual

crops (sweet potato, cassava, maize, groundnut, soybean, sugar cane and tobacco) or permanent crops (coffee, tea, rubber, mulberry, coconut and pepper).

Viet Nam has a population of 79 million, 80 percent of whom live in rural areas. Rural population densities are quite high, with a national average of 194 people per km². Regional differences in population densities are, however, significant. The most heavily populated area is the Red River delta, where densities range from about 890 to 1 090 people per km².⁶⁹

Agriculture (including fisheries and forestry) is by far the most important sector in terms of its contribution to the population's livelihood. The total agricultural population amounts to 53 million people⁷⁰ and the sector employs nearly 70 percent (68 percent in 1999) of the country's economically active population, although its contribution to GDP amounts to a more modest 26 percent.⁷¹

Economic reforms and performance

Viet Nam, which was formerly a centrally planned economy, has undertaken very significant economic reforms over the past decade in the direction of a market economy. Gradual economic reforms had in fact been initiated earlier;⁷² the first steps were taken in 1981, with the introduction of a contract system in agriculture as well as increased autonomy for state-owned enterprises.

A major impetus to the reform process came in 1986, when the Sixth National Congress of the Vietnamese Communist Party endorsed a comprehensive policy shift towards a market economy, based on the coexistence of a government sector and a private sector. The new policy direction was referred to as *doi moi* (renewal). Four major policy reforms were subsequently implemented as a result of the decisions made in 1986:⁷³

- in agriculture, farmers were allowed to lease land for long periods;
- the establishment of non-agricultural private enterprises was allowed and planned targets for state-owned enterprises were reduced;
- a new Foreign Investment Law opened the door for FDI;
- a reform of the banking system introduced a two-tier system consisting of a central bank and second layer of commercial banks.

In the face of a rapidly widening government deficit and the emergence of hyperinflation, in 1989 the Vietnamese Government embarked on a macroeconomic stabilization programme, which was modelled on traditional IMF-supported

programmes but did not receive IMF financial support.⁷⁴ The cornerstone of the programme was the liberalization of domestic markets, with almost all prices decontrolled (including those of rice), along with an exchange rate reform which led to a unification of the official and parallel exchange rates in 1982. At the same time, foreign trade was eased through, *inter alia*, easier access to foreign exchange, and positive real interest rates were introduced. A serious effort was also made to reduce the large budget deficit, for example by eliminating the previous direct subsidies to state-owned enterprises. A final important element in the macroeconomic reform was an overhaul of the tax system. This involved the introduction of a range of new taxes and equality of treatment for private and state-owned enterprises. Furthermore, the previous system of contributions from state enterprises to the budget was abolished in favour of regular taxation.

The following period, the 1990s, saw a consolidation of the reforms initiated in the 1980s. A fundamental component of those reforms has been Viet Nam's increased integration into the world economy. An important step was the country's accession to the Association of Southeast Asian Nations (ASEAN) in 1995 and to the ASEAN Free Trade Area (AFTA) in 1996, whereby it took on the commitment to abolish almost all quantitative trade restrictions and reduce tariffs imposed on other ASEAN members by 2006. In addition, a comprehensive trade agreement with the United States was signed in July 2000.

The response of the Vietnamese economy to economic reforms has been rapid and impressive (see Table 21). Real GDP growth averaged 7.9 percent per year in 1989-97, while inflation rates have been reduced and foreign trade has likewise expanded rapidly (Figure 18). A particularly important role in the development of the Vietnamese economy has been played by FDI (Table 22).

After a number of years of very high growth, the Vietnamese economy slowed down significantly in 1998, as the country was hit by the financial crisis in Southeast Asia and flows of FDI also fell. In contrast with the situation in other countries of the region, this translated only into a slowdown in economic growth, to 3.5 percent in 1998, rather than an actual decline in GDP. Economic recovery commenced in mid-1999, with the GDP growth rate rising to an estimated 4.2 percent in 1999 and a projected 4.5 percent in 2000. These are still well below the rates experienced in the years preceding the slowdown, however.

Rapid economic growth, combined with a relatively equitable distribution of assets and services such as health care and

education, has enabled a significant reduction in poverty. Surveys of living standards, conducted in 1992/93 and 1997/98 by the General Statistical Office with technical assistance from the World Bank, revealed a significant reduction in poverty levels over the five-year period. Based on a food poverty line (set at the income level required for purchasing

Table 21

REAL GDP GROWTH AND CONSUMER PRICE INFLATION IN VIET NAM

Year	Real GDP growth	Annual inflation rate
	<i>(Percentage)</i>	
1979-88	4.9	118.4
1989	7.8	35
1990	4.9	67
1991	6.0	68.1
1992	8.6	18.2
1993	8.1	8.4
1994	8.8	9.4
1995	9.5	16.9
1996	9.3	5.6
1997	8.2	3.1
1998	3.5	7.9
1999	4.2	4.1
2000 ¹	4.5	0.5

¹Projections.

Source: IMF. Staff Country Report No. 00/16, Statistical Appendix and Background Notes. September 2000.

Table 22

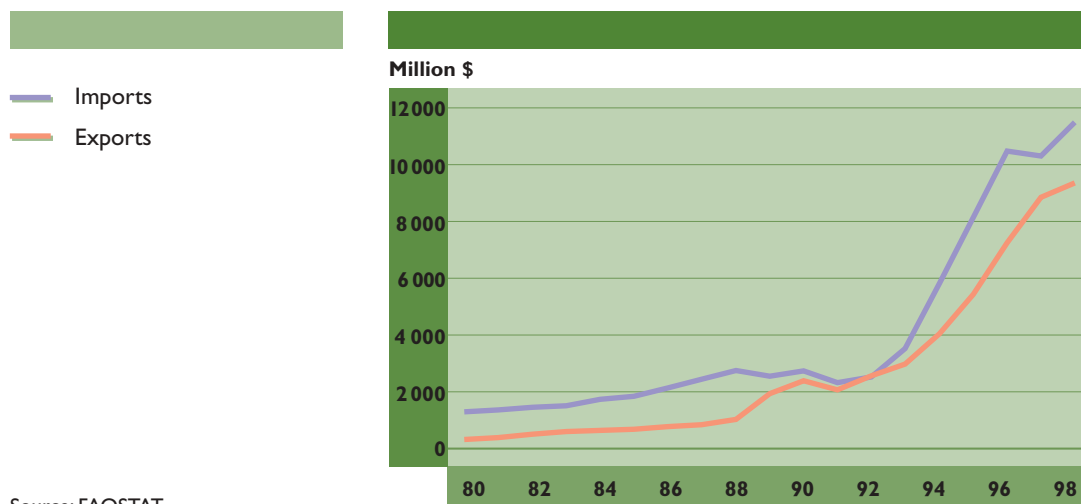
DISBURSEMENTS OF FOREIGN DIRECT INVESTMENT TO VIET NAM

Year	Value (Million \$)	Percentage of GDP
1988-91	168	2.0
1992	316	3.9
1993	922	7.8
1994	1 636	11.2
1995	2 276	14.2
1996	1 813	12.3
1997	2 074	8.7
1998	800	6.7
1999 ¹	700	5.2

¹Preliminary estimates.

Source: IMF. Staff Country Report No. 00/16, Statistical Appendix and Background Notes. September 2000.

Figure 18

VIET NAM: MERCHANDISE TRADE

Source: FAOSTAT

enough food to provide 2 100 calories per capita per day) the survey results show a decline in the incidence of poverty from 24.9 percent in 1992 to 15 percent in 1997/98.⁷⁵ Based on a broader general poverty indicator, which combines the food poverty line (representing 70 percent of expenditure level) with a 30 percent non-food expenditure component, the World Bank estimates the incidence of poverty to have declined from 58.1 percent in 1992/93 to 37.4 percent in 1997/98.

Reductions in poverty levels have been evident in both rural and urban areas. However, poverty in rural areas – where 94 percent of the poor live – remains much more significant and has been reduced at a slower rate than urban poverty (see Table 23).

The gains in per capita income, along with booming performances by the agriculture sector since the beginning of the economic reform process (discussed in the following section), enabled significant progress to be made in food security. After having declined in the latter part of the 1980s, per capita food supplies increased from 2 200 kcal per day in 1990 to more than 2 400 in 1998. The prevalence of undernourishment has likewise been significantly reduced, as a result of the reduction in the incidence of poverty. The estimated percentage of undernourished in the total population fell from 33 percent in 1979-81 to 28 percent in 1990-92 and 22 percent in 1996-98.

Table 23
**INCIDENCE OF RURAL AND URBAN POVERTY
 IN VIET NAM**

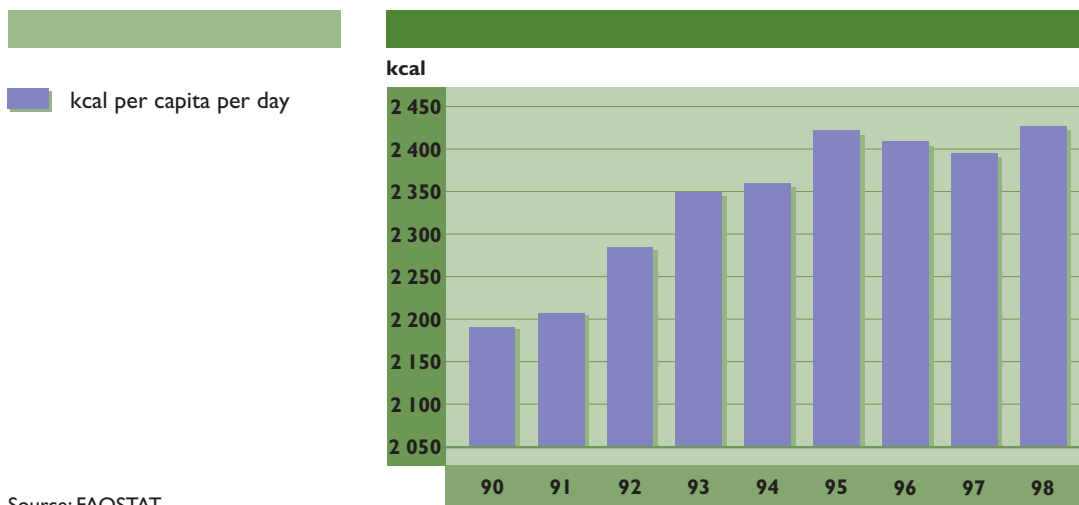
Population group	1992/93	1997/98
	(Percentage)	
Urban poverty incidence	25.1	9.0
Rural poverty incidence	66.4	44.9
Rural poor as share of total poor	91.0	94.0
Rural population as share of total population	80.0	76.5

Source: Vietnamese General Statistical Office and World Bank.

Agriculture in the economic reform process

The agriculture sector is central to the Vietnamese economy and hence to the country’s reform efforts. Prior to the beginning of the *doi moi* reforms, the sector was characterized by a pronounced geographical dichotomy in its organization. In the northern part of the country, the collectivization of agriculture had been introduced after independence in 1954.⁷⁶ A drive for full-scale collectivization of agriculture commenced in the north in 1958. By 1960, more than 40 000 production cooperatives had already been established, covering 85 percent of the farm population.⁷⁷ Despite the relative failure of the cooperatives, which resulted in decreasing farm incomes and per capita food availability, the collectivization was still pushed

Figure 19
VIET NAM: PER CAPITA FOOD SUPPLY



Source: FAOSTAT

further in the direction of larger units and more specialized organization of production.

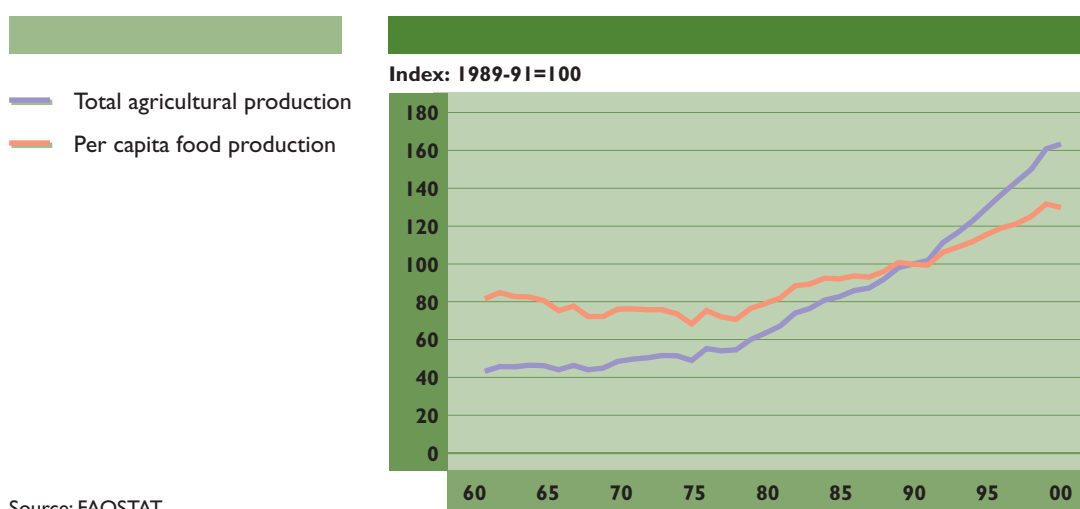
With reunification in 1975, the collectivization process was extended to the southern part of the country, where it faced problems and major resistance that prevented it from functioning effectively, and a large number of cooperatives were merely nominal. Poor production performances and stagnating per capita food production continued to characterize the agriculture sector.

The failure of collectivization was among the driving forces behind the subsequent reform efforts. As mentioned earlier, the first efforts to carry out reform in agriculture were made in 1981 but more profound reform was only introduced in 1988. For the agriculture sector, the reforms implied first and foremost a departure from the collective organization of production and a return to the farm household as the basic unit of production. Farmers were allowed to own farm machinery, instruments and animals and were granted the right to farm land that was contracted from the cooperatives. The marketing of agricultural products was likewise liberalized; producers were allowed to market their produce freely and state procurement was abolished.

A strengthening of the reforms was initiated in 1993, following the adoption of Resolution 5 at the Seventh Party Congress. The decisions made under the Resolution called for: the promotion of rural development in general, with recognition

Figure 20

VIET NAM: AGRICULTURAL AND PER CAPITA FOOD PRODUCTION



Source: FAOSTAT

and encouragement of the private sector's role in the rural economy; and for the renovation of cooperatives and state-owned enterprises, emphasizing their self-government.

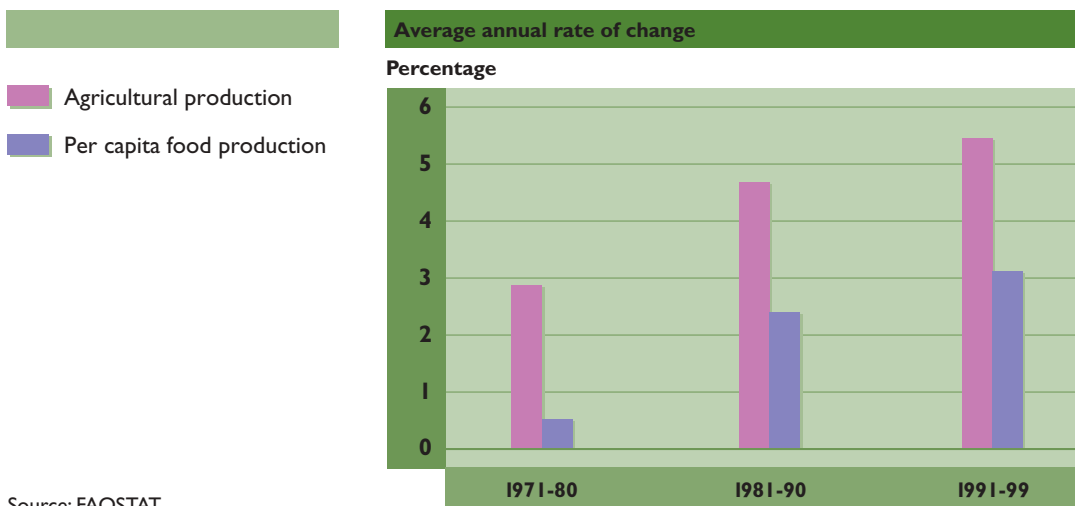
With the revised Land Law of 1993, farmers were granted long-term land use rights (20 years for annual crops and 50 years for perennial crops), together with the right to transfer, exchange and inherit land and to use land as collateral. Through a revision of the Land Law in 1998, land use rights were further expanded, with an extension of lease rights and the possibility of granting land use rights to people other than farmers. On the basis of the new land legislation, land has been distributed and land use certificates issued. The distribution has been based on principles of equitable distribution within localities. By late 1999, the process of distribution was basically finished in the case of agricultural land, and 60 percent of the land use certificates applied for had been awarded.⁷⁸

A further important reform element was that of agricultural taxation based on land use. Six different tax rates for paddy were established according to soil fertility and converted into monetary terms at the market price of paddy at the time of payment. Under the reform of credit policy, lending to farm households by the commercial banking sector has been introduced, notably by the Viet Nam Bank for Agriculture.

The reform process has implied the transformation of cooperatives from units for the organization of production into units for the provision of services to farmers. The new role envisaged is embodied in the new law on cooperatives, which was enacted in January 1997 and is in the process of being implemented. The law requires the traditional cooperatives to restructure and to elect new managers. In spite of some difficulties, in late 1999 government officials estimated that about 60 percent of the 10 000 or so cooperatives had conformed to these requirements, and approximately 100 new cooperatives had been created by July 1997. While the cooperatives are prevalent mainly in the Red River delta and the central coastal area, other types of farmers' associations (of which there are an estimated 10 000) are prevalent in the Mekong River delta.

Vietnamese agriculture has responded dynamically to the policy reforms (see Figure 21). Overall agricultural production expanded at an average annual rate of 5.4 percent over the ten-year period 1991-99, with per capita food production increasing by an annual 3.1 percent over the same period. Most important has been the rapid expansion in rice production, the main staple crop, since the late 1980s. This has allowed Viet

Figure 21

VIET NAM: RATES OF CHANGE IN AGRICULTURAL AND PER CAPITA FOOD PRODUCTION

Source: FAOSTAT

Nam not only to turn from a small net importer to a large net exporter of rice from 1989 onwards (see Table 24), but to become the world's third largest rice exporter in terms of volume after Thailand and India, and the fourth largest in value terms after Thailand, India and the United States. In 1998,

Table 24

VIET NAM'S NET RICE IMPORTS AND EXPORTS

	Imports	Exports	Net exports
	<i>(Thousand tonnes)</i>		
1985	336	59	-277
1986	483	132	-351
1987	323	120	-202
1988	200	91	-108
1989	55	1 420	1 365
1990	2	1 624	1 622
1991	6	1 033	1 027
1992	2	1 946	1 944
1993	1	1 722	1 721
1994	0	1 983	1 983
1995	11	1 988	1 977
1996	0	3 500	3 500
1997	0	3 575	3 575
1998	0	3 800	3 800

Source: FAOSTAT.

Table 25
PRODUCTION OF SELECTED CROPS IN VIET NAM

Crop	1989	1998	Percentage change
	<i>(Thousand tonnes)</i>		
Rice, paddy	18 996	29 142	53.4
Maize	838	1 612	92.4
Coffee, green	41	409	903.2
Tea	30	51	68.8
Natural rubber	51	226	346.0
Total fruit ¹	3 124	3 886	24.4
Bananas	1 227	1 315	7.2
Oranges	101	379	275.2
Vegetable, primary	3 384	4 575	35.2
Groundnuts, in shell	206	386	87.6
Coconuts	922	1 271	37.9

¹ Excluding melons.
Source: FAOSTAT.

Table 26
AGRICULTURAL EXPORTS FROM VIET NAM

Export product	1988	1993	1998
	<i>(Million \$)</i>		
Total merchandise trade	1 038	2 985	9 361
Total agricultural products	332	731	2 281
Rice	27	310	1 024
Coffee, green	58	91	594
Fruit and vegetables	51	53	155
Natural rubber	32	77	127
Cashew nuts	7	30	117
Pepper, white/long/black	7	9	64
Groundnuts, shelled	36	46	42
Maize	6	9	40

Source: FAOSTAT.

Vietnamese rice exports represented 13 percent of the world total in volume terms and 10 percent in value terms. The lower share in value terms is due to the generally lower quality of Vietnamese rice, a result of inadequacies in the processing phase.

Production has also expanded impressively for a range of other crops, leading to an increased diversification of Vietnamese agriculture (see Table 25).

Export earnings from agriculture have increased dramatically since the late 1980s (see Table 26), with rice remaining the most dynamic and important agricultural export product

throughout the period. Coffee exports expanded rapidly in the course of the 1990s, becoming the second most important agricultural export product. As evidenced in Table 26, several other products have also shown a dynamic export performance over the last decade.

Current policy emphases in agriculture and rural development

Government policies currently emphasize the improvement of agricultural market linkages and the promotion of rural development. Improving market linkages in agriculture implies, among other measures, a shift away from the traditional emphasis on rice production for food security towards more commercial agricultural production, in particular for exports.

Rural development is the other cornerstone of current government policies. Rural poverty remains pervasive and rural-urban income gaps have been increasing. There is a need to generate off-farm income and employment opportunities as well as to further the process of rural industrialization. This, however, requires rural development based on diversification within agriculture, in order to make agricultural production more responsive to market forces, as well as diversification to other economic activities.

Probably the most serious constraint to rural development in Viet Nam is the underdevelopment of rural infrastructure, including roads, irrigation, drainage, flood control facilities, clean drinking-water, permanent marketplaces and electricity. In particular, the paucity of good transport networks seriously limits the rural population's access to markets. Infrastructure is particularly inadequate in the poorest and most isolated regions.

The government has begun to increase investment in rural infrastructure and services, and one of the instruments it is using is the Poor Communes programme, launched in 1998. Under this programme, funding in the order of 400 million dong (approximately US\$30 000) per commune is to be provided for infrastructure projects (irrigation, bridges, roads, schools, health clinics, marketplaces) at the choice of the recipient communes. The programme was originally planned to reach more than 1 700 poor communes, but the target has since been reduced to between 850 and 900 communes.

Policy-related constraints to rural development

There are a number of policy-related constraints to Viet Nam's economic development and, above all, rural development. Many of these constraints are related to the country's transition from a



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Rural labourers engaged in rice cultivation

Current policies encourage a shift away from food production towards export-oriented agricultural production

centrally planned to a market economy and, in particular, to the still incomplete nature of the economic reform process. Some are of a macroeconomic nature or are general to the overall economy; others are specific to agriculture or rural areas.⁷⁹

Constraints in the macroeconomic sphere. Although important steps have been taken in the liberalization of foreign trade, Viet Nam's trade regime remains quite restrictive.⁸⁰ In 1999, based on its own index of trade restrictiveness,⁸¹ IMF rated Viet Nam ninth on a scale of one to ten (where ten is the most restrictive).

Protection takes numerous forms, such as restrictions on foreign trading rights, quotas and licence requirements, relatively high tariffs and restricted access to foreign exchange for imports of products that compete with domestic production. Such protection has imposed heavy penalties on the rest of the economy. The effect on the agriculture sector has been to raise the cost of protected inputs. Furthermore, restrictions and government control of rice and other agricultural exports have resulted in reduced prices for primary producers and/or restricted export potential.

A further vestige of the centrally planned economy is the still

predominant position of state-owned enterprises, which account for about 30 percent of GDP and 15 percent of non-agricultural employment.⁸² Preferential treatment and advantages enjoyed by state enterprises tend to incur costs on other sectors of the economy. The restrictive trade regime is geared towards protecting the state enterprise sector, which also absorbs 68 percent (as at end-1998) of total non-government credit. Policies favouring the country's state enterprises have tended to promote capital-intensive and urban industrial development to the detriment of more labour-intensive and rural-based economic activities.

Another cause for concern is the poor economic performance of the state enterprise sector, as this threatens the stability of the banking system as well as the macroeconomic situation. Reform of the sector would appear to be crucial for improved economic performance but has so far been limited.⁸³ It is accelerating, however, and received a special stimulus in December 1999 when an AsDB loan totalling \$100 million was approved for the State-owned Enterprise Reform and Corporate Governance Programme.

Sector-specific constraints to agricultural and rural development. Although significant progress has been made, Viet Nam's agriculture sector is still being constrained by insufficiently competitive markets – a situation caused by remaining market and trade controls and inadequate private sector participation in marketing and trade. Thus, the most important subsector, rice, has traditionally been subject to export controls, which have been justified on the basis of food security considerations. Export quotas, while still in place, have however been gradually increased, so they do not constitute an effective limitation to exports at present.

What may be more serious is the still pervasive role of state-owned enterprises in rice marketing and exports, for which the granting of trading rights is required. The number of companies allowed to export rice nevertheless increased from 17 in 1995 to 47 in 1999, including four private exporters. In June 2000, the Ministries of Trade and Agriculture were charged to revise the system.

Other specific distortions facing the agricultural sector are the high tariffs on sugar, accompanied by occasional import bans, and restrictions on seed and feed imports, which tend to raise the cost of these inputs. Overall, continued liberalization of both domestic trading and international trade, together with more involvement of the private sector in marketing and trade, should

enhance competition to the advantage of farmers and allow them to reap greater benefits from their productive efforts.

Land tenure policies are critical to development of both agriculture and the non-farm rural sector. Although the granting of long-term land use rights was institutionalized with the Land Law of 1993 and its revision in 1998, the implementation of the new rules has been and remains difficult. The process has been hampered by implementation problems at the local level. In addition, a lack of clear guidelines on the implementation of land use rights has created uncertainty, particularly with regard to the transfer and mortgage of land, although the issuing of guidelines in 1999 should have led to an improvement. The lack of a liberalized land market, combined with restrictions on land use, acts as an impediment to efficient land allocation, both within agriculture and between farm and non-farm activities in rural areas.

As a consequence of constraints in the credit system, the rural private sector – both agricultural and non-agricultural – has been facing a situation of inadequate financing. Most credit to the rural areas has been provided by the Viet Nam Bank for Agriculture and Rural Development, supplemented by the Bank for the Poor, which was established in 1995 to provide subsidized credit for the poor. The government has been promoting People's Credit Funds, or local savings and credit cooperatives, and a number of microcredit schemes are run by NGOs. In spite of this, access to formal credit, and in particular medium- and long-term credit, remains problematic.

Conclusion

Viet Nam has been making significant economic progress over the last decade through a process of gradual economic reform, but has recently suffered a slowdown under the impact of the Asian financial crisis. The high rates of economic growth realized have nevertheless allowed the country to take major steps towards reducing the incidence of poverty and undernourishment.

The agriculture sector has made an important contribution to the country's economic progress and has responded strongly to economic liberalization and improved incentives. In spite of the reforms already undertaken, Viet Nam's agriculture and rural sector as well as its economy overall still face a number of structural impediments and inadequacies in the legal and institutional framework necessary for an advanced market economy. Whether Viet Nam will resume the high-growth path

of the last decade, or instead remain on a lower rate of growth, may depend on its ability to continue and deepen the reform process and to eliminate or ease some of these impediments – which are well recognized by the country's officials.

III. Latin America and the Caribbean

REGIONAL OVERVIEW

General economic performance

The year 2000 was one of gradual but uneven economic recovery for the Latin America and Caribbean region after the recession that had affected many countries in 1998 and 1999. While regional GDP growth was close to zero in 1999, forecasts for 2000 point to a resumption of growth to about 4 percent.⁸⁴ Inflation rates are forecast to remain at historical lows, with a regional average of about 10 percent. Current accounts are expected to remain in deficit – representing approximately 17 percent of exports of goods and services. However, deficits should be less than they were in 1998 and, for most countries, capital inflows should be sufficient to compensate.

To a large extent, this general improvement reflected external factors. For example, the region benefited from the recovery of Asian economies as well as from the continued buoyancy of United States markets and the acceleration of economic activity in Europe. The export prices of several commodities of importance to the region tended to strengthen from their deeply depressed levels of 1999.

Nevertheless, the depth of both the crisis and the recovery was uneven among countries. Indeed, 1998 and 1999 were years of recession for most of South America, but a period of still positive, if slower, growth for countries in the Caribbean, Central America and for Mexico, thanks in particular to the sustained pace of the latter countries' exports to the United States. This

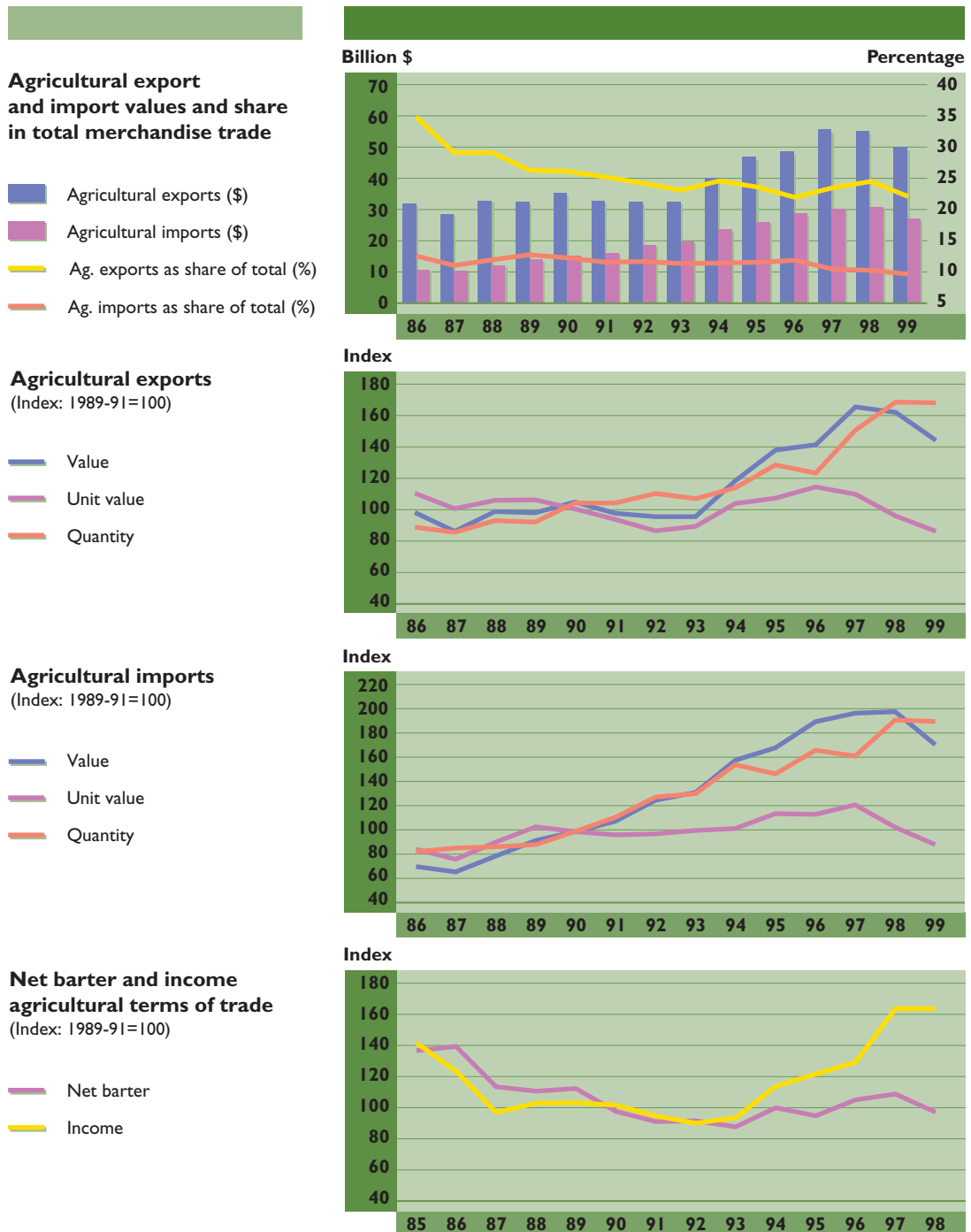
Table 27

ANNUAL REAL GDP GROWTH RATES IN LATIN AMERICA AND THE CARIBBEAN

Country/region	1996	1997	1998	1999	2000 ¹	2001 ¹
	<i>(Percentage)</i>					
Argentina	5.5	8.1	3.9	-3.1	1.7	3.7
Brazil	2.7	3.6	-0.1	1.0	4.0	4.5
Colombia	2.1	3.4	0.5	-4.5	3.0	3.8
Mexico	5.2	6.8	4.9	3.5	6.5	4.8
Latin America and the Caribbean	3.6	5.4	2.2	0.3	4.3	4.5

¹Projections.
Source: IMF.

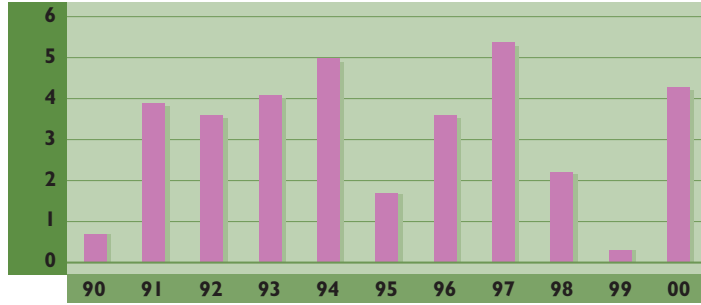
Figure 22
LATIN AMERICA AND THE CARIBBEAN: SELECTED INDICATORS



LATIN AMERICA AND THE CARIBBEAN: SELECTED INDICATORS

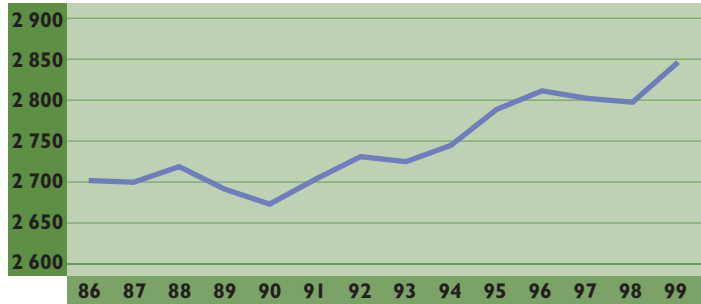
Real GDP
(Percentage change from preceding year)

Percentage



Dietary energy supplies
(kcal per capita per day)

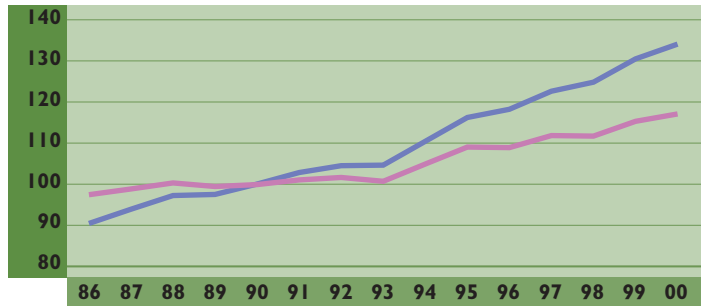
kcal



Agricultural production
(Index: 1989-91=100)

— Total agricultural production
— Per capita food production

Index



Source: FAO and IMF

dichotomy was less marked in 2000, as most countries in the region shared in the recovery.

The policy response to the crisis was varied. Among the larger countries, Brazil was applying severe fiscal adjustment measures to maintain currency stability and control inflation, while the export sector was benefiting from the country's currency devaluation in 1999. Other countries, including Chile, Colombia and Ecuador, also devaluated their currencies although, in the case of Ecuador, this move was followed by strong inflationary pressure. Argentina, on the other hand, was struggling to maintain competitiveness under its fixed nominal exchange rate, and it was facing the need to introduce unpopular fiscal reforms. Several Andean countries were suffering political instability, which impaired the policy environment for stabilization and recovery. For many countries, the crisis and measures to cope with it left a sequel of difficult economic and social problems as well as uncertainties for the future. The slowdown of economic activity in 1998-99 depressed the level of job creation and caused a rise in unemployment, which reached the highest levels of the decade. Stabilization measures inevitably involved financial austerity and short-term recessionary impacts, which penalized the poor disproportionately. Poverty levels and income concentration, which had undergone little reduction even during the high-growth periods, were aggravated by the crisis.

Agricultural performance

The region's agricultural performances in recent years were mixed. Extremely poor climatic conditions and natural disasters resulted in a marked slowdown in agricultural production growth, which reached 1.8 percent in 1998. Two unusually severe natural disasters had an impact on the region that year: the El Niño phenomenon, which affected the Andean region in particular, and Hurricane Mitch, which provoked the worst natural disaster in Central America in more than 50 years.

Agricultural output increased substantially in 1999, as the region's average agricultural growth rate rose to an estimated 4.6 percent. Crop and livestock production expanded at rates exceeding 4 percent, and cereal harvests increased by 4.6 percent after a contraction of nearly 3 percent in the previous year. However, non-food production rose by a mere 0.4 percent.

The strong regional performance was driven by South American output growth of 5.1 percent, which came after the more modest growth rate of 2.1 percent in 1998. In 1999, food and livestock production rose by 5.4 and 5.7 percent,

Table 28

NET PRODUCTION GROWTH RATES IN LATIN AMERICA AND THE CARIBBEAN

Year	Agriculture	Cereals	Crops	Food	Livestock	Non-food
	<i>(Percentage)</i>					
1991-95	3.1	4.8	2.6	3.5	3.7	-3.5
1996	1.8	2.9	0.8	1.6	3.1	5.9
1997	3.7	3.5	3.9	4.3	2.5	-6.3
1998	1.8	-2.7	2.2	1.5	1.5	6.9
1999	4.6	4.6	4.0	4.9	5.8	0.4
2000 ¹	2.0	1.7	1.4	2.0	2.7	2.0

¹ Estimates.
Source: FAO.

respectively, after growth rates of 1.8 and 0.7 percent in 1998. Cereal output, which fell by 4.4 percent in 1998, increased by nearly 7 percent in 1999. For 2000, overall agricultural production is estimated to increase by close to 2 percent, with crops and cereal output anticipated to rise by less than 1 percent. However livestock and non-food production are estimated to increase by about 3 and 4 percent, respectively.

In Argentina, agricultural production rose by only 1.4 percent in 1999, after rising by 7.1 percent in 1998. Large production increases in 1998 were recorded for sorghum, maize and soybean. In 1999, cereal production fell by nearly 10 percent owing to much-reduced maize, sorghum and barley harvests. On the other hand, the 1999 wheat crop, estimated to be 14.2 million tonnes, was a marked improvement on the 1998 below-average crop. Preliminary estimates indicate that, while agricultural production has increased by less than 1 percent, cereal output could rise by nearly 7 percent in 2000. Crop production is estimated to fall by 0.4 percent.

Brazil saw its agricultural production expand at a rate of 7.3 percent in 1999 after recording only 1.7 percent growth in 1998. Ten states in the country's northeastern region suffered prolonged drought in 1998, which severely affected crop production in this area. Overall cereal production fell by about 9.2 percent in 1998 but recovered in 1999, rising by 16.6 percent. Maize, rice and barley output was up by between 5 and 53 percent. In 2000, overall agricultural output is estimated to rise by between 3 and 4 percent while cereal output is estimated to drop by 2 percent. Livestock production is anticipated to increase by about 4 percent.

In Chile, overall agricultural production fell by 1.7 percent in 1999, after recording 1.5 percent growth the previous year. The

1999 wheat, barley, maize and rice crops were adversely affected by drought conditions, and overall cereal production fell by nearly 30 percent. In 2000, agricultural output is expected to drop again, although by less than 1 percent. Crop production is estimated to fall by between 2 and 4 percent, while cereal output is anticipated to rise by 20 percent.

Agricultural production in Colombia remained unchanged in 1999 after growing by 2.5 percent in 1998. A more or less average cereal output brought a recovery from the poor harvest of 1998. Heavy rains and flooding at the end of 1999 caused many human deaths as well as damage to crops, especially coffee. In 2000, growth in agricultural output is expected to be between 1 and 2 percent.

In Venezuela, agricultural production increased by 2 percent in 1999, after contracting by 2.2 percent in 1998. Cereal production fell by 1.7 percent in 1999, following a drop of about 11 percent the previous year. December 1999 brought torrential rains and heavy flooding, leading to the deaths of about 30 thousand people and damage to agriculture. Nevertheless, agricultural output in 2000 is only estimated to contract by less than 1 percent, with crop and cereal production expected to record a decline for the third consecutive year.

In the Andean countries of Peru and Ecuador, agricultural production in 1999 grew strongly, at rates of between 13.5 and 19.4 percent, respectively. In Ecuador, this increase came after the steep fall in output experienced in 1998. In 2000, agricultural production is estimated to fall by about 5 percent in Ecuador, where crop and non-food outputs are set to decline while the cereal harvest is expected to increase slightly from the level of 1999. Agricultural output is expected to increase by about 2 percent in Peru, where an above-average wheat harvest and a bumper maize crop are estimated for 2000.

In Central America, output grew at a rate of 3.4 percent in 1999 after recording only a modest growth of 1.1 percent in 1998. The poor performance in 1998 was due to Mexico's weak growth of 1.1 percent and output contractions in Costa Rica and El Salvador. For 2000, agricultural output growth of 3 percent is estimated. Food and cereal production are expected to increase by about 3.5 and 5 percent, respectively, while non-food items are estimated to fall by about 6 percent.

In Mexico, adverse weather conditions caused wheat production to drop by 5 percent in 1999, after a fall of nearly 12 percent in 1998. At 1.8 million tonnes, maize output remained at an average level while sorghum production fell by about 6.7 percent in 1999. Increased agricultural production of

nearly 3 percent is estimated for 2000, with maize and sorghum production expected to increase by about 2 and 6 percent, respectively.

In 1999, despite heavy rains that delayed planting, average to above-average crop outputs were recorded in Costa Rica, El Salvador and Guatemala. Particularly for the latter two countries, this represents a significant recovery from the crop harvests that had been affected by Hurricane Mitch the previous year. Honduras, by contrast, experienced below-average output, with cereal output down by 2.4 percent in 1999. Nicaraguan output was up by 22 percent in 1999, a marked improvement on the previous year. Tropical storms and Hurricane Keith disrupted agricultural activity in some Central American countries in 2000. Belize was the worst affected, and substantial losses of maize were reported in El Salvador, Honduras and Nicaragua. Aggregate coarse grain production is anticipated to drop to below-average levels.

In the Caribbean subregion, agricultural output declined for most of the 1990s and fell by 1.1 percent in 1999. For 2000, agricultural production is estimated to rise by less than 1 percent in the subregion. Cuban production fell by 0.6 percent in 1999, continuing the mostly negative trend of the 1990s. The Dominican Republic saw its output fall by 5.8 percent in 1999, after an increase of only 1 percent the previous year. Cereal production, however, increased by 13 percent in 1999 after a 6 percent contraction in 1998. For 2000, below-average cereal and bean outputs are anticipated in Haiti owing to a prolonged period of very dry weather. The Dominican Republic and Cuba are expected to record average cereal harvests.

Market-based land reforms

Beyond the exceptionally unfavourable climatic conditions experienced, the relatively poor performances of Latin American and Caribbean agriculture in recent years must be seen in the light of long-term agricultural and general development problems as well as new challenges linked to the current process of market liberalization and globalization.

Foremost among the long-term obstacles to agricultural and broader development in the region are the imbalances and inequities that characterize its societies. In particular, a high concentration of landownership accompanied by inequitable access to land represents perhaps the main single impediment to a rapid reduction of poverty and food insecurity in the region. After 80 years of redistributive “traditional” agrarian reforms,

conducted throughout the region since the Mexican revolution, progress has been uneven and slow. The reforms of agrarian structure accomplished so far have left three tasks uncompleted: providing secure access to the land for the smallest landholders and the landless, ensuring land tenure patterns that are compatible with natural resources conservation and sustainable use, and securing the competitiveness of the land reform beneficiaries and smallholders in general. This section revisits these issues, focusing on a new policy direction that has emerged in recent years, that of market-based land reforms.

In the 1960s, *latifundistas* owned roughly 5 percent of farm units and 80 percent of the land, while *minifundistas* owned 80 percent of farm units but had only 5 percent of the land.⁸⁵ By the end of the 1990s, the concentration of landownership appeared to be less extreme, but still very high: 26 percent of the total number of farms still controlled 90 percent of the total arable land, while at the other extreme, 50 percent of the farm units controlled only 2 percent of the land.⁸⁶ The Lorenz Indices of land property concentration available for the 1990s are still in the range of 0.85 to 0.95 for most countries in the region.⁸⁷

In most countries, property rights remain poorly defined, and land markets – either in property, rental or leasing – are insufficiently developed and generally not accessible by the landless or poor smallholders. Land tenure remains highly insecure; it is estimated that about half of the rural households in Latin America and the Caribbean lack land titles.⁸⁸ These factors all hamper investment in productive activities as well as the adoption of natural resource conservation practices. They constitute a major obstacle to any significant progress in rural poverty alleviation and have also been at the basis of grassroots demands and upsurges – those of Mexico’s Chiapas region and of the Rural Landless Workers’ Movement in Brazil are but recent examples.

In recent years, the widely adopted development paradigm based on market reliance has been extended to encompass land regimes. Market-based land reform, a policy orientation now followed by several governments and supported by development banks, is being introduced as a faster, less costly and less conflictual alternative to traditional land reform.

The objective of this new policy approach is to intervene in the land sales markets to help the rural poor gain access to land. Its basic principles require transfers to be voluntary and based on the identification of desirable lands by the beneficiaries, while negotiations between buyer and seller are to be mediated by the government.⁸⁹

Such policies therefore exclude expropriation and promote progressive land taxes to encourage the owners of idle large estates to sell their properties. They do not involve land redistribution, but rather combine land transfer and financing mechanisms. The approach depends on decentralized decision-making and resource allocation mechanisms and requires significant participation by beneficiaries in financing their land purchases.

This change in orientation has occurred in a context of macroeconomic reform in which certain economic distortions affecting the land market have been reduced; agricultural credit subsidies have been cut drastically, and inflation has been contained and is now at historical lows. The consequent reduction in the financial attractiveness of landholdings for non-productive purposes has had the effect of increasing the supply of land and reducing its price. In Brazil, for example, the price of land has dropped drastically over the past years and large tracts are now available for sale.⁹⁰ In addition to Brazil, two other Latin American countries – Colombia and Guatemala – have now embarked decisively on market-based land policies and reforms.

In *Colombia*, a new land reform law was promulgated in 1994 to promote negotiated land reform. It stipulates a 70 percent direct subsidy on the total value of the land to facilitate land acquisitions. Technical assistance is provided for the negotiation of land purchases, for the financial and economic appraisal of the property to be bought, and for the further cultivation of the land in a productive and efficient manner. The important innovation is that an identified beneficiary group negotiates the land price with a willing seller, a principle that now tends to be adopted by most market-based reform initiatives.⁹¹

The land reform agency, *Instituto Nacional Colombiano de la Reforma Agraria* (INCORA), can also buy or expropriate lands and transfer them to the beneficiaries with the same 70 percent subsidy. By 1996, most transactions were occurring by way of this mechanism. The total number of transfers for 1995 (4 172) was only slightly higher than the annual average in previous years (3 673).⁹² An additional law, promulgated in 1996, has provided vast means for the expropriation and redistribution of huge tracts of land that have been acquired illegally. The new reform has so far had a limited impact, but it has paved the way for its future extension.

In *Guatemala*, two separate institutions have been implementing negotiated land reform programmes: the private

foundation *Fundación Centavo* (FUNDACEN) and the governmental *Instituto Nacional de Transformación Agraria* (INTA). Both aim at opening land markets to low-income farmers and implementing the principle of negotiated land reform.⁹³ To date they have reached a limited but growing number of families (about 1 300 and 1 800, respectively). The FUNDACEN programme provides beneficiaries with financial assistance for purchasing land as well as a package including credit, technical assistance and marketing and social services to enable them to become self-sustaining.

The governmental INTA programme has settled its beneficiaries in a total area of 5 000 ha extending over 11 large properties, providing a flat subsidy of \$1 600 per beneficiary. Its credit component is implemented by the national development bank, *Banco Nacional de Desarrollo Agrícola* (BANDESA). After a 10 percent down payment is made for the land, a provisional land title is issued to each group of peasant families as a whole, and farms are then informally divided into family production units. Overall, INTA's beneficiaries receive less financial support than those of FUNDACEN, yet they seem to achieve a higher degree of independence and sustainability more rapidly.⁹⁴

Land use and land tenure are critically important issues in *Brazil*. A recent FAO study has estimated that about 2.5 million families are potential land reform beneficiaries. In 1985, 44 percent of the country's arable land was insufficiently productive.⁹⁵ Current estimates indicate that more than 50 percent of the farms are smaller than 10 ha and occupy less than 3 percent of the total agricultural land, while 1 percent of the farms account for almost 50 percent of the total agricultural land area. Since the mid-1980s, movements organized by the landless have mobilized approximately 150 000 families to occupy unproductive land and press the government to negotiate for property titles. These issues have been addressed, first with a "traditional" policy based chiefly on the compulsory purchase and redistribution of land, and since 1997 with a complementary market-based approach.

The first national Plan for Agrarian Reform (1985-1989) was adopted with the target of settling 1.4 million landless families in five years. In reality, this process of traditional and redistributive reform was much slower than had been expected. By 1989, the federal government had settled 84 000 families on about 4.7 million ha.⁹⁶ A federal minister for agrarian reform was appointed in 1996 and the land reform budget tripled from \$0.4 billion in 1994 to approximately \$1.5 billion in

1997. The reform process has been accelerating accordingly. In 1997 alone, some 82 000 families benefited from this redistributive reform and 1.8 million ha were expropriated or acquired by the settlement and agrarian reform agency, *Instituto Nacional de Colonização e Reforma Agrária* (INCRA), for redistribution. These efforts were accompanied by other policy instruments. Among these were: a revised rural land tax, which heavily penalizes owners who leave land idle or allow the unsound use of resources; revised legislation on land dispossession; a programme to support family farms, *Programa Nacional de Fortalecimento da Agricultura Familiar* (PRONAF); and an extension service project (LUMIAR).

By 1999, INCRA had redistributed more than 8 million ha to 290 000 families.⁹⁷ In addition, it had supported the colonization of about 1.4 million ha by 75 000 families.⁹⁸ In the meantime, PRONAF had assisted about 600 000 farm units. The total cost of this “traditional” approach is estimated to have averaged approximately \$30 000 per settled family.⁹⁹ The redistribution process is lengthy, as legal procedures normally take between 12 and 24 months and, in the case of highly disputed occupations, even up to 36 months.

Since 1997, with World Bank support, the Brazilian

Land preparation

Redistributive land reform in Brazil has been accompanied by policies such as support to family farms and penalties for land left idle



FAO/14799/A. CONTI

Government has been developing an alternative market-based approach in the country's northeastern states in order to establish cheaper and simpler reform mechanisms wherever feasible. The pilot programme was called *Cédula da Terra* and initially aimed at benefiting 5 000 families in three years. In the first year, it reached 6 000 beneficiaries, which was considered an encouraging accomplishment, and by 1999 the programme had been enlarged to encompass more northeastern states.¹⁰⁰ Preliminary evaluations have revealed some advantages of the new decentralized market-based approach over the traditional programme, for example lower costs per family (with savings of up to 30 percent in installation costs alone) and faster

Box 2

MAJOR CHARACTERISTICS OF BRAZIL'S CÉDULA DA TERRA AND BANCO DA TERRA PROJECTS¹

- The land is selected by community groups and purchased on a “willing seller-willing buyer” basis. This is expected to reduce the cost of land acquisitions to \$3 000 per family because beneficiaries are provided funding in the form of a comprehensive loan for the purpose of financing both land purchases and productive investments. This is also an incentive for the negotiating landowners to reduce the price of their land as much as possible.²
- Landowners are compensated with cash instead of highly discounted government bonds. This is seen as a strong incentive for landowners (including banks, who hold large tracts of land as collateral for non-performing loans) to sell.
- Implementation is decentralized. The government's role is limited to ensuring that there are no problems with the land titles and that the price negotiated is within acceptable limits.
- Beneficiaries are self-selected through participation in the community groups that chose the land, negotiate its acquisition and define the productive projects to be implemented.
- Land is not distributed but is sold, with the provision of credit contracted by the beneficiary

implementation (six months).¹⁰¹ In 1998, the federal government decided to expand the objectives and coverage of the programme to include 13 states under the extensive *Banco da Terra* project, with a value of \$2 billion¹⁰² over four years.

Compared with Colombia's experience, the Brazilian experience is perceived to have the advantage of stimulating beneficiaries to negotiate lower prices for the land and of self-selection of the beneficiaries, which makes the process more participatory and less bureaucratic. However, there is a drawback in that the working capital credit provided to the beneficiaries is subsidized up to 70 percent.¹⁰³ The long-term economic viability of the beneficiaries is thus a potential problem because

associations and the financial agent of the programme. Funds are made available to these associations on a "first come, first served" basis.

- Only associations have access to credit; loan conditions follow market rates and unjustified arrears in loan repayment may lead to loss of the land acquired.
- Beneficiary associations have total autonomy in deciding how to use the financial resources of the loan (e.g. production patterns, distribution of the land among families and designation of common land).
- Technical assistance and extension services are

privatized and paid for by the beneficiaries.

- An association of rural landless and poor peasant farmers³ participates in state council meetings related to the reform process, disseminates information and participates in land purchasing negotiations.

¹Adapted from: K. Deininger. 1998. *Making market-assisted land reform work: initial experiences from Colombia, Brazil and South Africa*. World Bank; and A. Buainain. 1999. *Structural adjustment and financial crisis in Brazil: impacts on agriculture and food security*. FAO Working Paper (in preparation).

² Deininger, *ibid.*

³ Namely the Confederação Nacional dos Trabalhadores na Agricultura (CONTAG). Another body, the Movimento dos Trabalhadores Rurais Sem Terra (MST) is more supportive of the traditional settlement and land occupation approach in areas where there is a high social pressure of land, and has criticized the government for promoting a "fake agrarian reform" by focusing on areas where there are no real land conflicts (*El Norte*, 16 December 1997).

the farm units face difficulties in reaching real efficiency and competitiveness.

This market-based approach is being implemented in the northeastern states, which is where two-thirds of the Brazilian rural poor live, but land tenure problems differ from one state to another. The intensity of land conflicts is much lower in the north, central-western and Amazon parts of the country than in the south, where most MST-led land occupations take place, and in the northeast, where the market-based approach is being promoted.

Despite the expected benefits of the market-based approach in Brazil, its planned extension is so far relatively modest: the programme target in the first phase is to reach 15 000 families over a limited number of years (compared with the traditional settlement targets aimed at reaching about 100 000 families every year). However, the *Banco da Terra* project is expected to provide the government with additional means to replicate the current experiments. The present context of low land prices and coercive taxes for idle land will probably produce a favourable climate for disseminating the approach in the short term. Whatever the merits and potential of the negotiated market-based approach, however, it cannot be realistically seen as a substitute for the traditional redistributive land reform, as implemented by INCRA. The latter will continue to play a major role in providing the landless with access to land even if the 1998/99 financial crisis and related adjustment had the immediate effect of halving its resources.

In conclusion, a market-based approach has many advantages, including lower costs and speedier implementation. The approach has shown considerable initial success in Guatemala and Brazil. However, it still seems to require substantial support from public sectors. To ensure the sustainability of the resulting farm units, the market-based approach requires a series of subsidized supporting services, implying a strong and long-term institutional and financial commitment by the government.

In addition, a major prerequisite for enhanced land markets is the establishment of secure property rights. Much emphasis has to be placed on the development of cadastres and land registries as well as leases and other land use contracts. The establishment of a good legal framework and an effective land information system is undoubtedly important for achieving significant reductions in transaction costs.

As a whole, the potential development of the approach is limited by the boundaries of the land markets themselves. The potential offered by land rental (fixed rental, share cropping or leases) has not yet been seriously explored, in large part owing to

insecure property rights. For the time being, market-based approaches must be seen as just one land policy tool among others; traditional compulsory land purchases may continue to play a major role in most of the highly conflictive areas.

HAITI

Introduction

Haiti has faced considerable political and institutional instability in its past. From 1991 to 1994, the country was subject to an economic embargo imposed by the Organization of American States following a coup that exiled its democratically elected president. Trade and financial sanctions were also imposed by the United Nations Security Council in mid-1993. In 1994, constitutional rule was restored.

The economic and political isolation suffered during the embargo accelerated the economic deterioration that was already under way. Production and employment fell sharply, foreign capital and aid flows slowed considerably, and institutional capacity was diminished. More recently, unresolved political difficulties left the top seats of government vacant from 1997 and impeded development progress until elections were held in 2000.

Physical characteristics and resources

The country covers a total area of 28 000 km² and has a population of 8.1 million, translating into a population density of 289 per km² – among the highest in the Caribbean region. Two-thirds of Haitians live in rural areas and are peasant farmers.

Haiti's climate is tropical and subtropical, its biological diversity is rich and it has some mineral deposits. It is vulnerable to the tropical storms and hurricanes that plague the Caribbean region and has experienced significant destruction from severe weather conditions for the past several years.

Agricultural land represents about 50 percent of total land area; 20 percent is arable land and 12 percent is under permanent crops. The remainder consists of plains and hillsides that have been largely denuded of trees to the extent that the forest cover is now only 5 percent of the total land area. Between mountain ranges, there are several fertile valleys where agricultural production is carried out.

Economic and social development

The country has a very low level of development (see Table 29) and an estimated poverty rate of 60 to 80 percent of the population; Haitians have a life expectancy of 54 years. The

UNDP Human Development Index (HDI) ranks it 150th out of 174 countries. Per capita GDP was about \$410 in 1998 and incomes are very unevenly distributed, with about 44 percent of wealth being held by 1 percent of the population.

Food security in Haiti is a dire issue. FAO's most recent estimates show that 62 percent of the population were undernourished in the 1996-98 period. This figure constitutes a small decline from the early 1990s, but a positive jump from the 48 percent estimated for 1979-81. The primary reason for worsening food insecurity is a decline in food production since 1981, with imports and food aid unable to fill the gap. A food insecurity action plan to assess current conditions is being drawn up by the Ministry of Agriculture, Natural Resources and Rural Development. Under the Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS), FAO has targeted Haiti as one of eight pilot countries requiring accelerated development and evaluation of its food insecurity action plan.

Foreign aid has been a major contributor to Haiti's economy during the post-coup period (Table 30), providing up to 90 percent of government investments in social services in some years.

Some donors have supported social programmes by channelling funds directly to NGOs as a mechanism for delivering services. The extensive system of private services provides a lifeline for poor rural residents, for whom government resources have most often been insufficient or non-existent. It has also created opportunities for partnerships between established NGOs and government ministries. The

Table 29
**COMPARISON OF KEY INDICATORS FOR HAITI
AND LOW-INCOME COUNTRIES, 1998**

Key indicators	Haiti	Average of low-income countries
GNP per capita (\$)	410	520
Life expectancy (years)	54	63
Infant mortality (per 1 000 live births)	71	68
Adult illiteracy rate (%):		
Men	50	22
Women	54	49
Access to safe water (percentage of population)	28	...

Source: World Bank. 2000. *World Development Indicators, 2000*. Washington, DC.

Table 30

**NET OFFICIAL DEVELOPMENT ASSISTANCE
TO HAITI**

Year	ODA
	(Million \$)
1994	601
1995	726
1996	369
1997	325
1998	407

Source: OECD.

recent move to decentralize government services and increase the resources available in rural areas provides new impetus for such partnerships to be developed.

Macroeconomic situation and policies

Coordination between the Central Bank and the Finance and Planning Ministries allowed advancements on several fronts even during the period that Haiti was without top leadership. A medium-term recovery plan was assembled in 1994 with the support of IMF, the World Bank, the United States Agency for International Development (USAID) and other donors. With piecemeal implementation, the plan has been partially successful in managing the reduction in government spending, privatizing industry, stabilizing inflation and directing external aid towards emergency relief, infrastructure rehabilitation and social needs.

The positive outcomes are a lower external account deficit, a lower than expected public sector deficit and improved overall growth. Per capita income fell by more than 2 percent per year on average between 1980 and 1991, then plummeted by nearly 6 percent annually during the 1991-94 embargo period, and has improved only slightly since then. Real GDP growth has, however, recovered to some extent since the embargo and was growing at 2 percent in 1999.

Owing to growth in its output and exports, Haiti's external debt is declining and was 27 percent of GDP in 1999, with a debt-service ratio of 11 percent of exports in fiscal year 1998/99. Most of the country's debt is on concessional terms.

The Central Bank of Haiti made substantial headway in reducing an inflation rate of 37 percent in 1994 to 10 percent in 1999. Likewise, the exchange rate has stabilized. Exports

Box 3

INCREASED SOCIAL SPENDING AS A KEY TO HIGHER GROWTH RATES

The long-term effects of low social investment are clearly seen by comparing Haiti's conditions to those of neighbouring countries as well as those of the Latin America and Caribbean region.

The World Bank has attempted to estimate economic growth in Haiti given relatively small changes in key social, legal and political variables, and also how it would fare under the initial conditions and policies existing in selected countries for the same period.¹

According to its estimation, a one-year improvement in male education attainment would have had the highest impact on economic growth in Haiti, increasing it by 1.3 percent per capita. A fertility rate of 1 percent less than the country's actual rate would produce almost the same economic growth benefit. Other factors that would have augmented growth to a lesser extent were more efficient government spending, improved functioning of the legal system and greater democracy.

One startling result of the study is that, had those variables been at the level

they were in the Dominican Republic, Haiti's per capita economic growth rate for 1985-90 would have been 3.5 percent per year, rather than -1.7 percent per year.

¹ World Bank. 1998. *Haiti: the challenges of poverty reduction*. Washington, DC.

Table 31

REAL GDP GROWTH RATES IN HAITI

Year	Average annual change in real GDP	Average annual change in real GDP per capita
	<i>(Percentage)</i>	
1980-91	0.3	-2.3
1991-94	-4.8	-5.9
1995	4.4	2.4
1996	2.7	0.5
1997	1.2	-0.9
1998	3.0	0.9
1999	2.0	0.3

Source: IMF.

stood at \$352 million in 1998/99, an increase of 23 percent over the previous year.

Haiti's main export is assembled clothing and footwear for the United States market. This activity accounts for 80 to 90 percent of Haiti's total exports. About 25 000 people in the Port-au-Prince area are employed in assembly plants for export production. This subsector has been growing strongly and has significant potential to increase if services can be reliably maintained. The share of agricultural exports fell from 50 percent of the total in 1980 to 11 percent in 1999, in part owing to growth in the assembled manufacturing sector but primarily as a result of the decline in agricultural production for export.

Imports represent nearly 30 percent of GDP and have tripled since the early 1990s. The share of food in the import bill declined in recent years from about 50 percent during most of the 1990s to 27 percent in 1999, mostly owing to increases in other imports. Imports are largely financed by donors (both in the form of financial aid and equipment) and by remittances from Haitians living and working abroad. An estimated \$300 million per year is received from overseas.

Haiti's critical macroeconomic problem has been and remains a lack of investment. Between 1988 and 1998, gross domestic investment fell by an average of 1.5 percent per year to reach 11 percent of GDP in 1998. This is little more than half of the share of investment in GDP of all low-income countries. Foreign assistance is a major but volatile source of investment.

The agriculture sector

Agriculture accounts for about 30 percent of GDP and almost two-thirds of the labour force. Agricultural production has declined steeply, falling by 20 percent in per capita terms between 1989-91 and 1999 (see Figure 23). The decline is due to deteriorating infrastructure, soil degradation and poor weather, including a severe drought in the northwest and Hurricane George in 1998.

Haiti's primary agricultural products are maize, sorghum, rice, beans, bananas, tubers and some animal products. Most farm production takes place on small plots owned by peasant farmers, with an average size of 1.2 ha. A few large plantations (1 percent of farms), mainly specializing in coffee and sisal, make up about 10 percent of the cultivated area.

The majority of Haitians are small farmers, and agriculture absorbs 63 percent of the economically active population. Rural-urban migration has nevertheless created dense slums around Port-au-Prince and a 34 percent urban population. Land is exchanged through inheritance, at which time it is divided among children into smaller plots. Because many land transfers are not recorded, ownership is obscure and complex. Agrarian reform to enhance productivity has been a goal of the Government of Haiti but is hampered by ownership traditions.

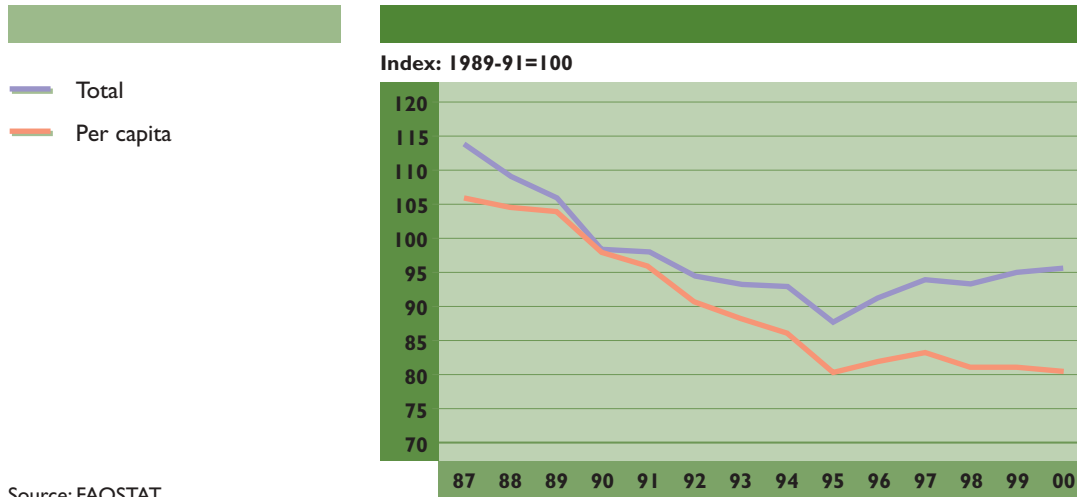
Trading at a street market

Although agriculture absorbs about two-thirds of Haiti's labour force, most rural dwellers are obliged to carry out additional commercial activities



FAO/18757/G. BIZZARRI

Figure 23

HAITI: TOTAL AND PER CAPITA AGRICULTURAL PRODUCTION INDICES

Source: FAOSTAT

Agricultural productivity is low by any standards and suffers from a lack of modern inputs. Very little animal traction is used, in spite of the benefits it would bring in increased productivity, milk and manure. Most farming households are unable to buy a plough animal and imported feed is unaffordable. The exceptions are the highest-income farm households, which produce about ten times as much as low-income households with the same land area because of greater expertise and access to modern inputs.

FAO's Special Programme for Food Security is operating in two locations in Haiti. The mission of the Programme is to support productivity-enhancing developments in areas of high food production potential. It has worked with several thousand small farmers in Haiti to intensify crop production and improve small-scale irrigation and water management operations. Through seed improvement, provision of inputs and reductions in post-harvest losses, farmers involved in the Special Programme have substantially increased their yields of maize and rice.

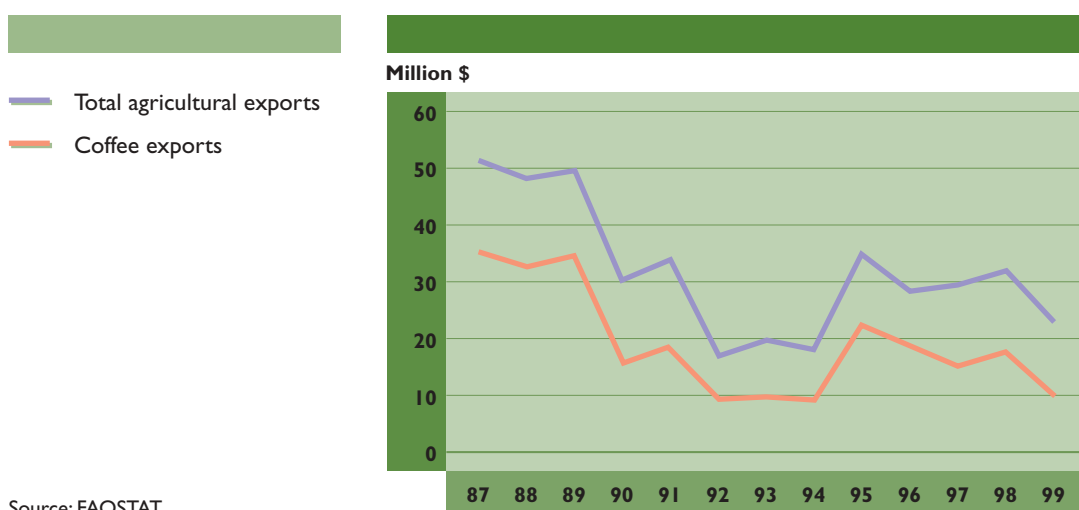
Haiti contains 560 000 ha of arable land, about 75 000 of which are covered by some form of irrigation system. Improvements in irrigation have been a priority for the Ministry of Agriculture, Natural Resources and Rural Development, and several projects are under way to rehabilitate components of the irrigation system in the important Artibonite Valley.

Agricultural exports contribute about 10 percent of total export earnings and were valued at \$23 million in 1999. Coffee is the only significant export crop, and the development of shade coffee production has recently proved a successful method of protecting local forest cover. Sugar had previously been an important crop in Haiti but imports from Guyana and other Caribbean countries have replaced processed sugar production and refineries in Haiti have been closed since the early 1990s. Sugar-cane production, the major contributor to erosion problems, has declined by 44 percent since 1987. The other significant crop is rice, which contributes significantly to the national diet. Rice production takes place in the irrigated and fertile Artibonite Valley. However, cheaper imports have discouraged local production, which has dropped by 17 percent since 1987. The values of total agricultural and coffee exports are shown in Figure 24.

As part of the economic restructuring programme in the post-1994 period, Haiti substantially lowered its import tariffs on many products and food imports flooded into the country. Cereal aid has been about 110 million tonnes per year during the 1990s. The values of total agricultural and rice imports are shown in Figure 25. Commercial imports have risen faster (in volume and calorie terms) than domestic supply since 1980. Food imports currently account for about half the value of Haiti's total merchandise imports and nearly twice the value of total exports.

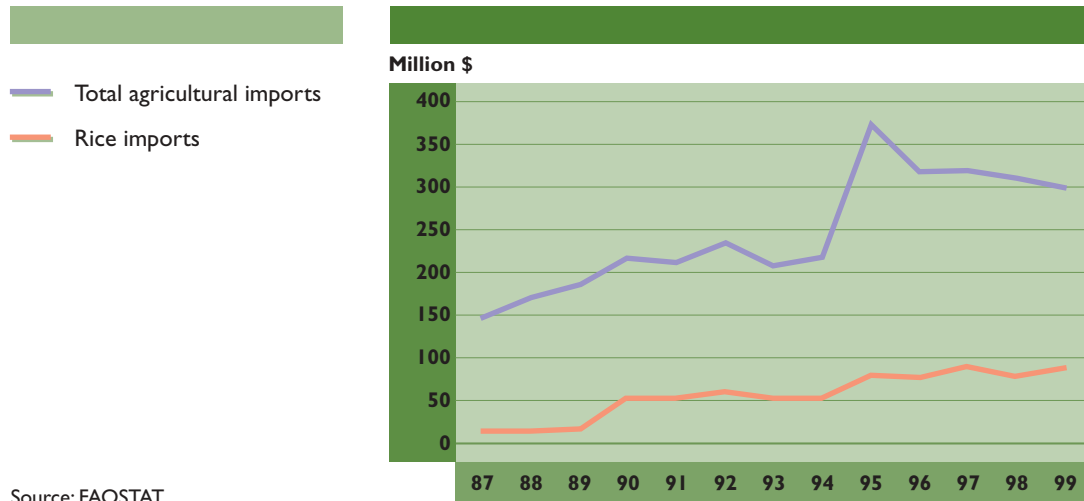
Figure 24

HAITI: TOTAL AGRICULTURAL AND COFFEE EXPORTS



Source: FAOSTAT

Figure 25

HAITI: TOTAL AGRICULTURAL AND RICE IMPORTS

Source: FAOSTAT

Degradation of natural resources threatens farm productivity and rural livelihoods. Haiti has a partially hilly terrain with a coastal plain and some fertile valleys. The most severe problem it faces is deforestation, which has reached irreversible proportions. Poor people cut trees to provide both fuel and a source of income. The water basins are heavily silted as a result of erosion. Roughly 80 percent of water in Port-au-Prince is contaminated with human waste and only 16 percent of rural dwellers have a basic pit latrine.

Environmental awareness among the rural population is rising as deforestation reduces the resources available to the poor, yet there is no local system in place to provide them with alternative source of income or energy. An option proposed by the Ministry of Agriculture, Natural Resources and Rural Development is to coordinate its own efforts and those of the Environment Ministry in identifying alternative farming practices and to implement appropriate practices with the assistance of microcredit.

The creation of alternative income-generating activities for the rural poor is critical for protecting the remaining tree cover. The Government of Haiti is anticipating the recovery of its tourism industry, which has been practically non-existent since the early 1990s. An inadequate transportation infrastructure, a paucity of tourist facilities outside Port-au-Prince and the increased security risk in rural areas are barriers to the development of tourism.

Not all rural residents rely solely on farming for their livelihoods. Most earn only about 50 percent of income from agriculture and are involved in small commercial activities in addition to, or instead of, farming as well as relying on foreign remittances. Nonetheless, the importance of landownership in Haiti, its predominantly rural society and the need for food production to achieve food security all imply that agriculture is destined to be an important sector in Haiti in the future.

Agricultural prospects and policy issues

Agriculture is a top priority in the government's development strategy. Among the principal reasons for this are the country's heavily rural population, its food security needs and the desire to increase agricultural exports. The four main objectives of the Ministry of Agriculture, Natural Resources and Rural Development are:

- development of irrigation infrastructure in the plains and water retention and distribution systems for the mountainous regions;
- increased land security and participatory water management;
- improved agricultural marketing, rural credit, extension resources and agro-industry support;
- reinforcement of agricultural research.

However, agriculture in Haiti must overcome some major hurdles before it can meet these four objectives and satisfy a greater share of the population's food needs. Some relief from food shortages has been provided through increases in commercial imports, but this does not solve the longer-term problem of food supply.

The increasingly heavy dependence on food imports is not seen as a sustainable path for Haiti. The potential to expand export earnings to finance these imports may be further developed, in particular through niche markets for agricultural commodities. Because of the constraints to enhancing agricultural productivity, however, developing competitiveness in traditional or new production lines is a costly undertaking which, even if successful, can only bear fruit in the medium to long term. This, along with the pressing demands and dismal nutritional status of the growing population, argues for additional solutions. Given the crucial role of agriculture for the survival of large segments of the population, an obvious policy option is to place emphasis on staple food production, especially at the small farm level, as a means for reducing poverty and improving the nutritional status of the rural poor. This would also reduce the need for food imports.

Challenges

A major study of Haiti's position in light of changing trade conditions¹⁰⁴ pointed to a number of critical factors impeding agricultural productivity in the country. These were:

- most farmers have little access to essential inputs;
- leasehold farmers have a limited capacity for investment;
- irrigated areas have insufficient water flow;
- all land area suffers from depletion of organic content, erosion and desertification;
- seed quality and availability are deficient;
- transportation costs are high because of poor roads;
- little technical support is available, especially in non-irrigated areas.

In a world with an increasingly open trading system, Haiti is extremely uncompetitive in agriculture. Low productivity resulting from the combination of factors listed above contributes to higher costs and/or lower output in the agriculture sector, thereby reducing Haiti's opportunities to enter international markets. These constraints will need to be addressed through a long-term, coordinated approach to public investment in rural areas. Needs range from sector-specific requirements, such as seed quality and extension advice, to broader issues related to the environment and public infrastructure.

Policy-makers are hoping to develop niche export markets for Haitian products. These would include the recently introduced Haitian Blue coffee, as well as specialty fruits and vegetables for export to Haitian consumers in the United States. The success of these efforts depends on carrying out a careful marketing strategy, as well as reaching trade agreements at different levels - including within the Caribbean Community and Common Market (CARICOM) and WTO.

Haiti has recently become a member of CARICOM, the Caribbean regional trading bloc. Adoption of CARICOM's common external tariff presents the possibility of stemming the flow of food imports from the United States and Europe and favouring imports from Caribbean neighbours. Haiti has negotiated the terms of its entry with a five-year suspension of CARICOM's tariff, hoping the grace period will allow it to find market opportunities within the regional bloc, and prevent huge increases in consumer prices of important staple commodities. Within CARICOM, Haiti faces competition from other member countries that have invested in agricultural modernization in commodities such as sugar, coffee, fruits and vegetables and rice.

Conclusion

Whatever the direction of government policies, their success in creating the basis for sustained recovery will hinge on the availability of adequate financial and technical resources. A large part of these must be generated through external assistance. Considerable donor support is being provided to revitalize the agriculture sector into a dynamic growth engine for the economy, including through projects aimed at integrated rural development, rehabilitation of roads and irrigation systems, and natural resource conservation and food security efforts. Increasing emphasis is being placed on sustainable employment-based projects, rather than direct aid delivery.

Prospects for the maintenance of adequate flows of external assistance will depend on donors' perception of how efficiently aid is likely to be used. The political environment will be a deciding factor in this context.

IV. Near East and North Africa

REGIONAL OVERVIEW

General economic performance¹⁰⁵

Over the last two years the economic situation in the Near East and North Africa has been shaped to a very large extent by sharp fluctuations in oil prices. Initially the oil price collapse of 1998 severely depressed the economic prospects for many of the oil-exporting countries and economic growth fell to only 0.8 percent in 1999. Moreover, severe drought in many North African and Near Eastern countries, together with the devastating earthquake in Turkey, undermined growth prospects in many of the non-oil-producing countries.

However, the recovery of oil prices from less than \$12 per barrel in the first quarter of 1999 to almost \$30 in the fourth quarter of 2000 helped to fuel a recovery in many countries of the region. Consequently, countries in the region showed a generally good economic performance in 2000, with regional real GDP growth estimated to be about 4.7 percent. In a number of countries, fiscal reform, privatization and increased foreign investment are key policy goals being pursued by governments. If carried through, these reform policies would improve economic prospects for the near future.

Table 32

ANNUAL REAL GDP GROWTH RATES IN THE NEAR EAST AND NORTH AFRICA

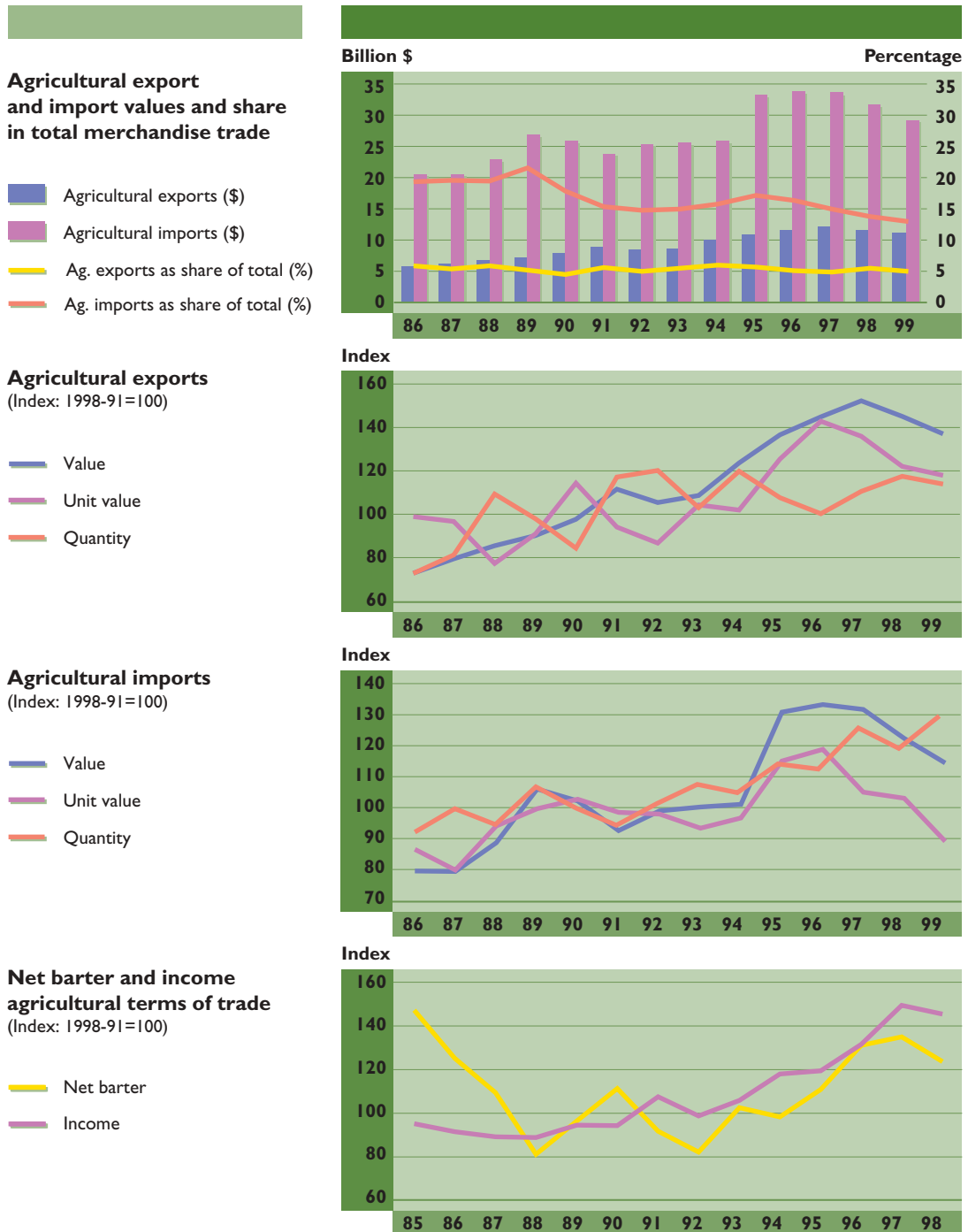
Country/region	1996	1997	1998	1999	2000	2001 ¹
	<i>(Percentage)</i>					
Algeria	3.8	1.1	5.1	3.3	4.3	4.2
Egypt	4.9	5.5	5.6	6.0	5.0	4.5
Iran, Islamic Republic	5.5	3.4	2.2	2.5	3.4	4.0
Morocco	12.2	-2.2	6.8	-0.7	2.4	5.0
Saudi Arabia	1.4	2.7	1.6	-1.0	3.5	2.9
Turkey	6.9	7.6	3.1	-5.0	4.5	4.8
Near East and North Africa²	4.6	5.1	3.1	0.8	4.7	4.1

¹ Projections.

² Including Bahrain, Cyprus, Egypt, Iraq, the Islamic Republic of Iran, Jordan, Kuwait, Lebanon, the Libyan Arab Jamahiriya, Malta, Oman, Qatar, Saudi Arabia, the Syrian Arab Republic, Turkey and Yemen.

Source: IMF.

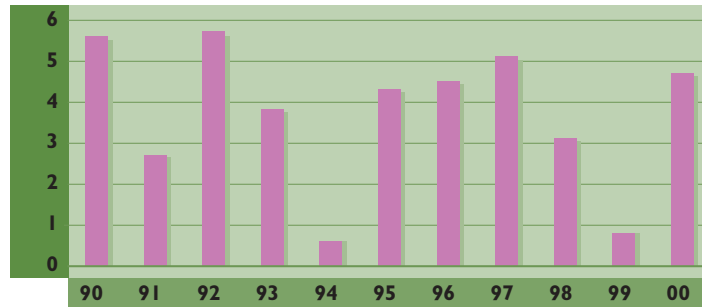
Figure 26
NEAR EAST AND NORTH AFRICA: SELECTED INDICATORS



NEAR EAST AND NORTH AFRICA: SELECTED INDICATORS

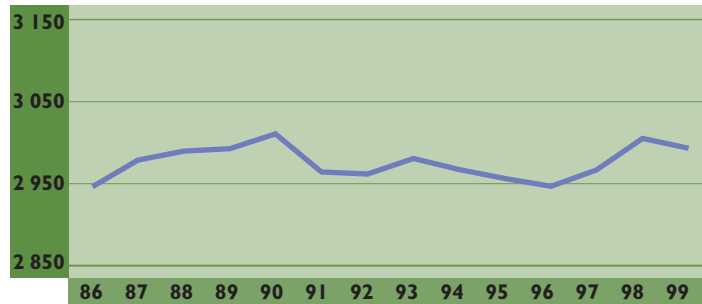
Real GDP*
(Percentage change from preceding year)

Percentage



Dietary energy supplies
(kcal per capita per day)

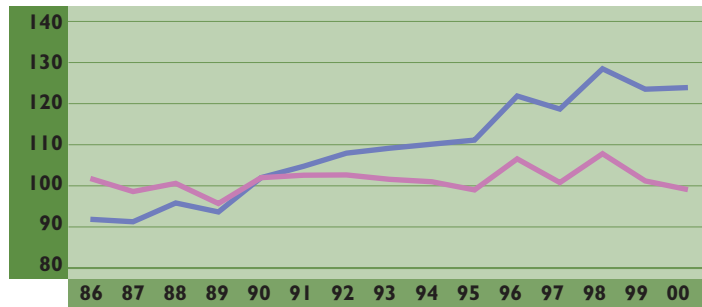
kcal



Agricultural production
(Index: 1989-91=100)

— Total agricultural production
— Per capita food production

Index



* Excludes Algeria, Morocco and Tunisia (according to IMF classification)

Source: FAO and IMF

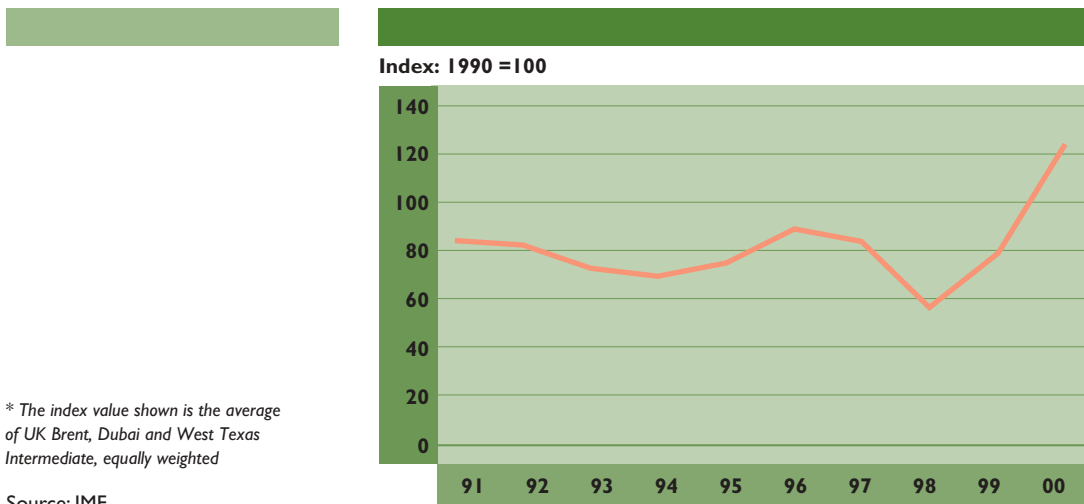
The Arabian Peninsula and the Gulf states are those most affected by oil price swings. Their terms of trade showed a remarkable upturn in 2000, following two years of deterioration. Real GDP growth in this subregion is estimated to increase from about 2 percent in 1999 to 4 percent in 2000 with continued strong growth anticipated for 2001. Growth in Saudi Arabia is expected to recover from -1.0 percent in 1999 to 3.5 percent in 2000, while the Islamic Republic of Iran saw its real GDP growth rise from 2.5 percent in 1999 to 3.4 percent in 2000.

The Eastern Mediterranean region has continued with steady growth, reaching 3.9 percent in 2000. Egypt's real GDP is estimated to have grown by 5 percent in 2000 after a 6 percent growth rate in 1999. Growth in Jordan is likely to accelerate to 3 percent for 2000.

Economic growth in Turkey fell sharply to 3.1 percent in 1998, after being affected by the Russian financial crisis. The anticipated recovery in 1999 was quashed by the devastating earthquake that left approximately 17 000 dead and disrupted production and services. The poor performance of the agriculture and tourism sectors also contributed to the 5 percent contraction of GDP. For 2000, a moderate 4.5 percent recovery is estimated.

North African economies are expected to grow on average by 4.6 percent in 2000, after the 3.4 percent rise recorded in 1999. Strong growth in the oil and gas sector will lift Libyan

Figure 27
PETROLEUM PRICE INDEX*



* The index value shown is the average of UK Brent, Dubai and West Texas Intermediate, equally weighted

Source: IMF

Table 33

EXPORT DEPENDENCY AND TERMS OF TRADE OF OIL-EXPORTING COUNTRIES IN THE NEAR EAST AND NORTH AFRICA

Country	Share in total exports		Change in terms of trade		
	Oil	Natural gas	1998	1999	2000
	<i>(Percentage)</i>				
Libyan Arab Jamahiriya	91	...	-28	-4	37
Oman	90	...	-28	-4	37
Yemen	87	...	-27	-4	36
Kuwait	85	...	-26	-4	35
Saudi Arabia	83	...	-26	-4	34
Iran, Islamic Republic	78	...	-24	-3	32
Syrian Arab Republic	64	...	-21	-4	25
Algeria	63	27	-24	-12	30
Qatar	63	...	-20	-3	26
United Arab Emirates	45	6	-15	-4	19
Bahrain	27	...	-9	-1	11

Source: IMF.

output growth to 6.5 percent in 2000, after several years of weak growth. Algeria's growth accelerated to 4.3 percent in 2000, although its agriculture sector suffered severe drought.

Agricultural performance

Drought is a recurring phenomenon in the region and causes sharp annual fluctuations in crop and livestock production in many countries, but its impact is most evident in cereal production (Figure 28). The region recorded strong agricultural output growth in 1998, with notable increases reported in Iran, the Syrian Arab Republic and Turkey and with Algeria, Morocco and Tunisia experiencing a significant recovery. However, in 1999 and 2000 the dominant factor in the region was again severe drought conditions.

At the regional level net agricultural production fell by 3.9 percent in 1999, and 2000 saw little improvement as production rose by only 0.3 percent. Cereal production fell by 17.1 and 4.6 percent in the two years, respectively. The Maghreb countries as well as Afghanistan, Iran, Iraq, Jordan, the Syrian Arab Republic, Turkey and Yemen experienced falls in cereal production of between 16 and 80 percent. In per capita terms, agricultural production, and cereal production in particular, dropped off markedly in 1999 and 2000.

Afghanistan suffered two consecutive years of drought in 1999 and 2000, which exacerbated the already precarious

Table 34

NET PRODUCTION GROWTH RATES IN THE NEAR EAST AND NORTH AFRICA

Year	Agriculture	Cereals	Crops	Food	Livestock	Non-food
	(Percentage)					
1991-95	1.8	0.4	1.8	1.8	2.2	1.3
1996	9.8	17.1	12.6	10.1	2.9	5.0
1997	-2.7	-11.5	-6.3	-3.3	5.9	8.1
1998	8.4	17.0	10.5	9.4	2.9	-6.6
1999	-3.9	-17.1	-6.7	-4.2	2.3	0.8
2000 ¹	0.3	-4.6	0.3	0.3	0.0	0.2

¹ Estimates.

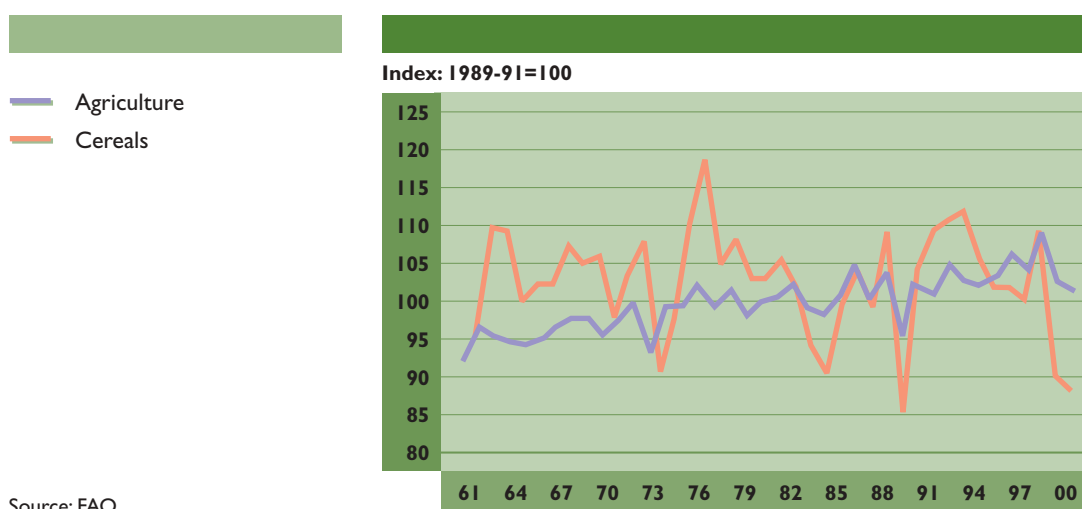
Source: FAOSTAT.

food supply situation caused by ongoing civil strife. About half the country's population is affected and more than 3 million people are facing severe food shortages. Production of cereal crops declined by 16 percent in 1999 and is estimated to have declined by another 44 percent in 2000. Animal losses have also been heavy.

Iran suffered droughts in 1999 and 2000 that were even worse than the severe drought of 1964 and have affected more than half of the country's population. In 1999, wheat

Figure 28

NEAR EAST AND NORTH AFRICA: PER CAPITA AGRICULTURAL AND CEREAL PRODUCTION INDICES



Source: FAO

production declined by 3.3 million tonnes. While production in 2000 is estimated to have risen by 6.7 percent, it is still 2.7 million tonnes below the level of the 1998 harvest. Rice and barley output fell by 15 and 39 percent, respectively, between 1998 and 2000. Animal losses are estimated to be about 800 000. In neighbouring Iraq, drought also caused a large drop in cereal production, with the 1999 harvest 35 percent below that of 1998. Production in 2000 is estimated to be 795 000 tonnes, signifying a further drop of 52 percent owing to continued drought conditions and shortages of essential agricultural inputs.

Two consecutive years of drought have also seriously affected cereal and horticultural crops in Jordan. Wheat production fell sharply by 74 percent in 1999 and, although output is estimated to have recovered somewhat in 2000, it is still 20 percent below the 1998 level.

In the Syrian Arab Republic, the severe drought of 1999 reduced cereal production, which was 62 percent lower than the bumper crop of 1998. Wheat, barley and maize output in 1999 fell by between 35 and 51 percent. However, a modest recovery is expected in 2000, with cereal production expected to rise by about 16 percent. Inadequate rainfall contributed to an 8.7 percent fall in Turkey's cereal output in 1999, with wheat and barley production down by 14 and 24 percent, respectively. For 2000, some recovery in cereal production is expected.

Algeria, Morocco and Tunisia were also hit by severe drought conditions in 1999 and their combined cereal production declined by 36 percent compared with 1998, which was a normal year. Inadequate rainfall affected the winter crops for 2000 in these countries, whose combined output of cereals suffered a further decline of 39 percent. In Algeria, wheat production dropped from 2.3 million tonnes in 1998 to 1.1 million tonnes in 1999 and to an estimated 0.8 million tonnes in 2000. Barley output fell by 43 percent between 1998 and 2000. Wheat production in Morocco fell by 51 percent in 1999 and by a further 36 percent in 2000. Barley output contracted by 76 percent between 1998 and 2000. Tunisian wheat and barley output fell by 38 and 20 percent, respectively, between 1998 and 2000.

In contrast, Egyptian wheat production for the period was about 5 percent higher than the already above-average 1999 harvest. Rice production is estimated to have increased by 34 percent between 1998 and 2000, although maize and seed cotton output was up only marginally on 1998 figures.

Agricultural trade and policy reform

The Near East and North Africa region has remained a large net importer of agricultural commodities over the last two decades. The value of annual agricultural imports has been hovering around \$30 billion, which is three times the value of the region's exports.

The share of agricultural imports in total imports has remained relatively stable at about 16 percent, but with considerable variations among countries. The region is

Table 35

NET PRODUCTION GROWTH RATES IN SELECTED COUNTRIES OF THE NEAR EAST AND NORTH AFRICA

Year	Algeria	Egypt	Iran, Islamic Rep.	Morocco	Syrian Arab Rep.	Tunisia	Turkey
<i>(Percentage)</i>							
Agriculture							
1991-95	5.7	4.1	4.9	-2.0	5.1	-1.5	0.5
1996	17.6	10.5	5.3	54.4	11.7	72.9	4.4
1997	-19.9	5.1	-2.1	-15.0	-6.6	-31.4	-0.8
1998	12.1	-1.2	14.7	14.7	20.7	26.3	6.4
1999	4.6	6.4	-6.1	-11.2	-17.2	4.8	-4.7
2000 ¹	-4.1	1.0	3.4	-6.3	9.3	-1.4	-0.1
Cereals							
1991-95	30.7	4.4	4.5	25.6	15.1	-8.4	-1.0
1996	129.1	2.8	-5.6	466.6	-1.7	361.2	4.3
1997	-82.3	9.2	1.7	-59.4	-27.9	-63.2	1.4
1998	247.8	-0.6	20.0	61.8	22.0	57.9	11.6
1999	-49.1	7.9	-27.7	-41.8	-37.9	9.1	-15.4
2000 ¹	-20.4	3.4	4.2	-46.1	6.9	-39.8	0.0
Roots and tubers							
1991-95	13.5	13.8	4.4	1.1	4.5	1.7	2.2
1996	-4.2	1.3	2.1	39.8	-6.8	15.9	4.2
1997	-17.6	-28.6	4.6	-4.5	-39.5	7.0	3.0
1998	16.1	9.6	4.5	-6.0	85.4	2.1	4.2
1999	-9.4	-9.2	0.1	1.6	0.9	8.5	0.0
2000 ¹	-4.6	-0.3	0.5	-6.2	-9.4	-9.4	0.0
Vegetables							
1991-95	11.0	2.2	-0.3	-5.1	2.9	1.1	4.0
1996	-5.0	14.2	28.2	43.1	-7.8	13.4	1.5
1997	-0.5	5.1	3.6	-2.0	-6.7	-8.5	-5.5
1998	8.1	-0.9	12.3	15.0	24.3	10.2	3.9
1999	8.6	10.9	3.0	-8.8	-10.7	17.0	0.0
2000 ¹	-9.2	0.3	3.8	6.7	3.4	0.4	0.0

¹ Estimates.

Source: FAOSTAT.

becoming increasingly more dependent on imported food items, especially cereals, followed by dairy products, sugar and vegetable oil.

In 1999, about 55 million tonnes of cereals were imported. This is about one-fifth of world imports of these commodities and makes the region vulnerable to any sharp rise in the international prices of cereals.

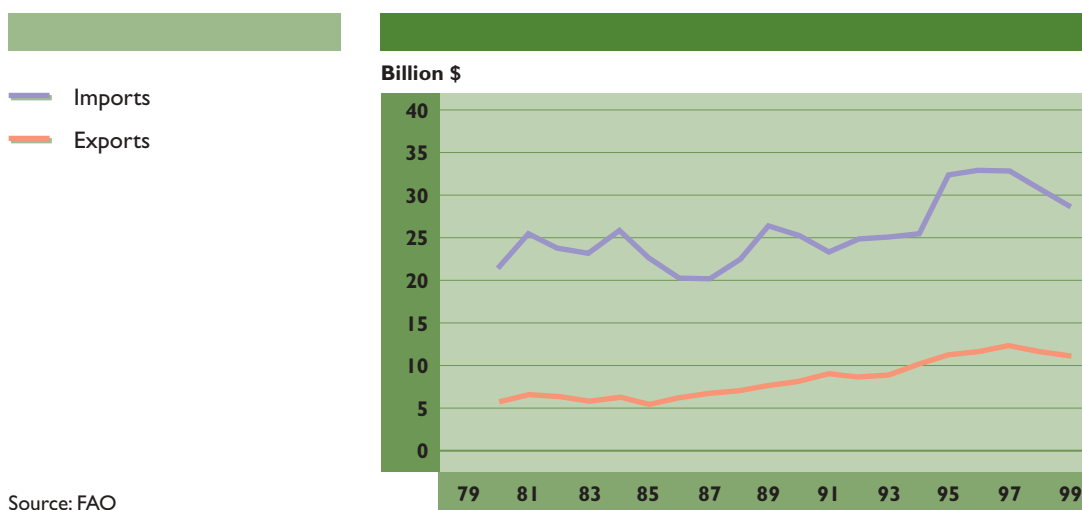
The region's agricultural performance, including its dependency on food imports, has been and continues to be affected by the recent policy reforms that many governments have been implementing.

In 1998, Turkey reduced its import duty on maize from 35 to 20 percent and continued to grant free entry for specified volumes of grain from the European Community (EC) on a year-by-year basis. In Egypt, the privatization of the farm inputs and agroprocessing industries has begun. In 1997, the nine-year ban on poultry imports was lifted, although an 80 percent duty was imposed to protect the local poultry industry. The efficiency of financial intermediation has been enhanced and some restrictions and subsidies have been removed. In Iran, the removal of subsidies on fertilizers and pesticides is proceeding, and Iraq has relaxed restrictions on the procurement of cereals.

The Syrian Arab Republic is implementing a series of policy reforms, involving the pricing of farm produce and marketing and trade regulations for agricultural commodities. To promote

Figure 29

NEAR EAST AND NORTH AFRICA: TOTAL AGRICULTURAL IMPORTS AND EXPORTS



Source: FAO

Table 36
**TOTAL CEREAL IMPORTS FOR THE NEAR EAST
 AND NORTH AFRICA**

Year	Imports	
	Volume	Value
	(Thousand tonnes)	(Million \$)
1990	41 888	7 790
1991	37 177	6 004
1992	39 090	7 005
1993	39 784	7 129
1994	40 232	6 686
1995	44 365	9 214
1996	42 868	10 118
1997	53 695	10 359
1998	49 769	8 331
1999	54 860	7 856

Source: FAOSTAT.

output and exports, the government abolished its 21 percent tax on cotton and cotton textiles. In Morocco, quantitative restrictions on external trade have been eliminated and replaced by tariff protection, which in turn is to decline by 2.4 percent annually in compliance with the WTO Agreement on Agriculture. In Tunisia, the Partnership Agreement with the EC foresaw major trade liberalization to be implemented by the year 2000.

Such policy reforms will certainly have a positive impact on the regional economy but may have negative implications for the food security of individual countries in the short term. A number of countries have been seeking group arrangements in the form of trade areas or common markets.¹⁰⁶ Cyprus and Turkey have signed a customs union agreement with the EC and are preparing for membership. Efforts to establish a Euro-Mediterranean partnership for the creation of a free trade area by 2010 are intensifying. An EC agreement has been reached with Morocco, Tunisia, Israel and Jordan, and negotiations are continuing with Egypt, Algeria, Lebanon, the Palestinian Authority and the Syrian Arab Republic. The establishment of an Arab Free Trade Area is another promising development.

Water resources management

The Near East and North Africa region has 6.2 percent of the world's population, 8.6 percent of its arable land and 11 percent of its irrigated land, but only 1.5 percent of its

renewable freshwater resources. The region relies heavily on surface and underground water. Agriculture is the main user of renewable freshwater: at present, of the 18 countries for which data are available, nine use more than 90 percent, four use from 80 to 90 percent and only five use 80 percent or less of their renewable freshwater supply for agriculture.

It is well recognized that the availability of water for agriculture in the region is extremely low. For the region as whole, annual renewable freshwater resources are estimated to be 698 billion m³. Table 37 shows its distribution by country groupings.

Several countries of the region depend entirely on internal sources for renewable freshwater (e.g. Morocco, the United Arab Emirates and Yemen). The dependency ratio is very high for the most important Arab food-producing countries (e.g. Egypt, Iraq, the Sudan and the Syrian Arab Republic) and very low for the non-Arab food-producing countries such as Iran and Turkey. In the three Maghreb countries where rainfed agriculture is practised (Algeria, Morocco and Tunisia), the ratio of irrigated land to arable land is relatively low.

If 1 500 m³ of renewable freshwater resources per capita per annum is considered as the threshold, then 15 out of 21

Installing an irrigation network

Irrigation has a vital role to play in management of the region's scarce renewable freshwater resources



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countries in the region were below the threshold in 1995 and six countries remained above it. Six countries had less than 200 m³ of renewable freshwater per capita per annum, which may be adequate for drinking-water and household use but leaves very little for agriculture.

Irrigation has a vital role to play in the management of renewable freshwater resources. At present, approximately 25 percent of the arable land in the region is under irrigation, including both modern and traditional systems (Table 38). The proportion is relatively high in the Gulf Cooperation Council (GCC) countries,¹⁰⁷ where water is most scarce and where rainfed agriculture is least feasible.

Investment in irrigation continues to receive priority among the countries of the region. Egypt continues with its South Valley project as well as making greater use of drainage water for irrigation in the eastern delta and north Sinai. The upstream development of the Nile waters depends on agreement with upstream countries, and the Nile River Basin Action Plan is a promising development in this regard. Egypt also needs to pay greater attention to environmental hazards caused by drainage water. Turkey is investing heavily in irrigation through its South East Anatolia Project (GAP). With an estimated cost of \$32 billion, this project involves the construction of 13 major structures, seven in the Euphrates Basin and six in the Tigris Basin. When completed, the GAP scheme is expected to irrigate 1.7 million ha by 2015. However, the downstream effect of the GAP schemes is of major concern to the Syrian Arab Republic and Iraq and no formal agreement has yet been reached on this question.

Table 37

SUPPLY AND WITHDRAWAL OF ANNUAL RENEWABLE FRESHWATER RESOURCES IN THE NEAR EAST AND NORTH AFRICA

	Country grouping			
	Maghreb countries ¹	GCC countries	Arab Near East	Non-Arab Near East
Renewable freshwater resources (<i>million m³</i>)	49 020	3 724	258 867	387 172
Population in 1998 (<i>millions</i>)	72.3	28.9	155.4	151.3
Renewable freshwater resources per capita (<i>m³</i>)	678	129	1 659	2 559
Annual renewable freshwater withdrawal (<i>million m³</i>)	23 220	21 410	135 309	127 955
Withdrawal as a percentage of renewable freshwater resources	47.4	574.9	52.3	33.0
Irrigated land (<i>thousand ha</i>)	2 661	1 777	10 820	14 305

¹ The Maghreb countries include Algeria, the Libyan Arab Jamahiriya, Morocco and Tunisia.

Source: FAO. 1997. *Irrigation in the Near East Region in figures*, p. 27-28. Water Reports No. 9. Rome.

Table 38

RENEWABLE FRESHWATER RESOURCES BY COUNTRY IN THE NEAR EAST AND NORTH AFRICA, 1995 AND 2025

	1995		2025 projection	
	Quantity (m ³)	Dependency ratio ¹ (Percentage)	Quantity (m ³)	
Countries with >1 500 m³ per capita			Countries with >1 500 m³ per capita	
Iraq	3 688	53.3	Turkey	2 090
Afghanistan	3 227	15.4	Iraq	1 840
Sudan	3 150	77.3		
Turkey	2 967	1.8		
Iran, Islamic Republic	2 044	6.6		
Syrian Arab Republic	1 791	80.3		
Countries with <1 500 m³ per capita			Countries with <1 500 m³ per capita	
Lebanon	1 465	0.8	Iran, Islamic Republic	1 455
Cyprus	1 213	0	Afghanistan	1 448
Morocco	1 110	0	Lebanon	1 022
Egypt	926	96.9	Cyprus	1 000
Algeria	512	2.8	Syrian Arab Republic	999
Tunisia	463	14.6	Morocco	775
Oman	455	0	Egypt	610
Yemen	283	0	Tunisia	322
Bahrain	206	96.6	Algeria	307
Jordan	161	22.7	Oman	182
Saudi Arabia	134	0	Bahrain	134
Libyan Arab Jamahiriya	111	0	Yemen	105
Qatar	96	3.8	Jordan	73
United Arab Emirates	79	0	Libyan Arab Jamahiriya	70
Kuwait	13	100.0	Qatar	68
			Saudi Arabia	60
			United Arab Emirates	45
			Kuwait	7

¹ The dependency ratio is the percentage of renewable freshwater received from sources outside the country.

Source: Data for 1995 are drawn from FAO, 1997, *Irrigation in the Near East Region in figures*, Water Reports No. 9, Rome.

Iran is paying greater attention to improving water use at the farm level by shifting from surface to pressurized irrigation. It has also signed an agreement with Turkmenistan for the development of the Tedzhen River. Iraq completed the irrigation project known as the Third River, which is 565 km long and collects drainage water for reclaiming new land. In the Libyan Arab Jamahiriya, the Great Man-Made River Project is expected to transfer fossil water to the Mediterranean coast to irrigate 200 000 ha and meet urban water needs. In the other three Maghreb countries the emphasis continues to be placed on the construction of large and small dams and canals to expand

Table 39

IRRIGATED ARABLE LAND IN THE NEAR EAST AND NORTH AFRICA

Country grouping	Total arable land	Irrigated arable land	Irrigated land as a percentage of total
	<i>(Thousand ha)</i>		
Maghreb countries	20 989	2 661	12.7
GCC countries	3 779	1 777	47.0
Arab Near East	41 392	10 820	26.1
Non-Arab Near East	52 336	14 305	27.3
Total	118 496	29 563	24.9

Source: FAOSTAT.

irrigation. In Afghanistan, the rehabilitation of war-damaged irrigation facilities is the highest priority for the coming years.

The region's irrigation systems are under strain. In nearly all countries of the region, irrigated agriculture is adversely affected by salinity and waterlogging. It is estimated that 50 percent of irrigated land in Iraq, 37 percent in Egypt and 29 percent in Iran suffers from some degree of salinity. The siltation of dams and canals is also a common phenomenon. Another serious issue is the overexploitation of groundwater, particularly in the GCC countries as well as in Afghanistan, Iran, Jordan, Morocco and the Syrian Arab Republic.

The efficient use of water is not adequately addressed by the countries of the region, despite the fact that water is a scarce factor in agricultural production. Sustainability of the irrigation systems is also at stake: at present, water for irrigation is practically free in most of the countries, mainly because farmers cannot afford to pay water charges, even to cover the operating and maintenance costs. There are also social obstacles to charging a fee on water for irrigation and even for other uses.

Low-priced water provides little incentive for farmers to invest in water-saving technologies such as drip irrigation. Rather it encourages farmers to overuse water, thereby exacerbating the problems of waterlogging and salinity. It fails to give local communities the necessary incentives to participate in responsible water management decisions.

The high level of water scarcity in the region is best reflected in the level of purchases of what is known as "virtual water". This refers to the volume of water embedded in commodities that are imported, both food and non-food. As 1 tonne of wheat production requires approximately 1 000 m³ of water, the importation of 1 million tonnes of wheat would correspond to the purchase of 1 billion m³ of water from abroad. It is

estimated that the flow of virtual water into the region equals the annual flow of the Nile River into Egypt.¹⁰⁸ A study has shown that, in 1994, food imported into the region was equivalent to 83 billion m³ of virtual water, or 11.9 percent of the region's annual renewable water resources.¹⁰⁹ For selected countries, the percentage was much higher: Egypt (31 percent), Algeria (87 percent), Jordan (398 percent), the Libyan Arab Jamahiriya (530 percent) and Saudi Arabia (580 percent). As food imports into the region are increasing by as much as 5 percent per year, the role of virtual water in postponing the challenge of water stress is important for the national authorities.

The capacity to buy virtual water is largely determined by export earnings, notably oil revenues, which are often unpredictable. At the same time, however, the alternative of having less reliance on this course of action is costly and probably unsustainable. The pumping and piping of fossil and/or desalinated water over long distances for cereals and fodder production, as attempted in the Libyan Arab Jamahiriya, Saudi Arabia and the United Arab Emirates, is an exceptional occurrence and would not be sustainable over the long term.

The region is the most water-scarce region in the world and significant efforts are being made in many countries to improve the management of water resources. Although there is still room for further progress, particularly regarding irrigation efficiency, the region appears to be structurally unable to feed its increasing population and will probably need to rely more and more on virtual water, i.e. external food production.

V. Central and Eastern Europe and the Commonwealth of Independent States

REGIONAL OVERVIEW

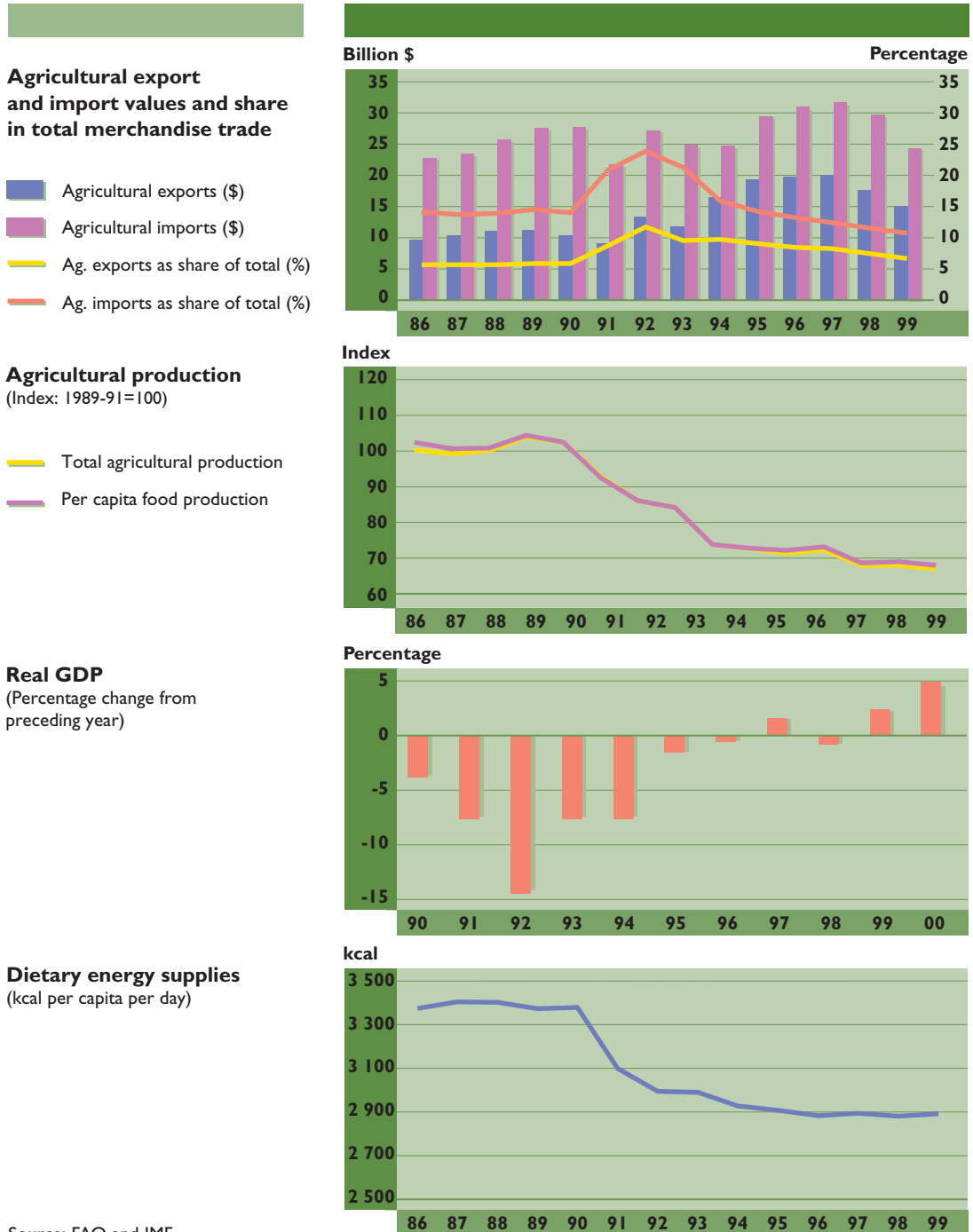
Macroeconomic trends and agricultural performance

GDP in the countries in transition in Central and Eastern Europe and the Commonwealth of Independent States (CIS) grew at 2.4 percent in 1999, following the 0.8 percent contraction in 1998. This more robust GDP growth is largely a consequence of a change from negative to positive growth in the Russian Federation from 1998 to 1999 (from -4.9 to +3.2 percent).¹¹⁰ The Russian Federation accounts for over 40 percent of GDP in the region. The fastest-growing economies in the region in 1999 were Turkmenistan (16 percent), Bosnia and Herzegovina (8.6 percent), Azerbaijan (7.4 percent) and Albania (7.3 percent). A further acceleration of growth is projected for 2000, as GDP growth should reach almost 5 percent, again largely because of the Russian Federation's strong performance.

Agricultural production in the region did not follow the turnaround that occurred in GDP growth in 1999. Indeed, overall agricultural output stagnated (with an estimated increase of 0.1 percent), following the contraction of 5.9 percent in 1998. The Russian Federation saw a further decline in production of 2.7 percent, as livestock production was reduced by more than 10 percent, and a 14 percent increase in crop production was insufficient to make up for the 33 percent decline recorded in 1998. Most of the other larger agricultural producers in the region saw some minor declines in agricultural output in 1999. The major exceptions were Kazakhstan and Romania, where production expanded by 29 and 18 percent, respectively, which meant that both countries more than recovered from the sharp drops experienced in 1998.

The provisional estimates for agricultural production in 2000 suggest a very small decrease of 0.7 percent. Positive performances are expected in the Russian Federation and Ukraine, where overall agricultural output appears to have expanded by 5 and 6 percent, respectively. On the other hand,

Figure 30
**CENTRAL AND EASTERN EUROPE AND CIS:
 SELECTED INDICATORS**



Source: FAO and IMF

production appears to have contracted to varying degrees in most other major producer countries.

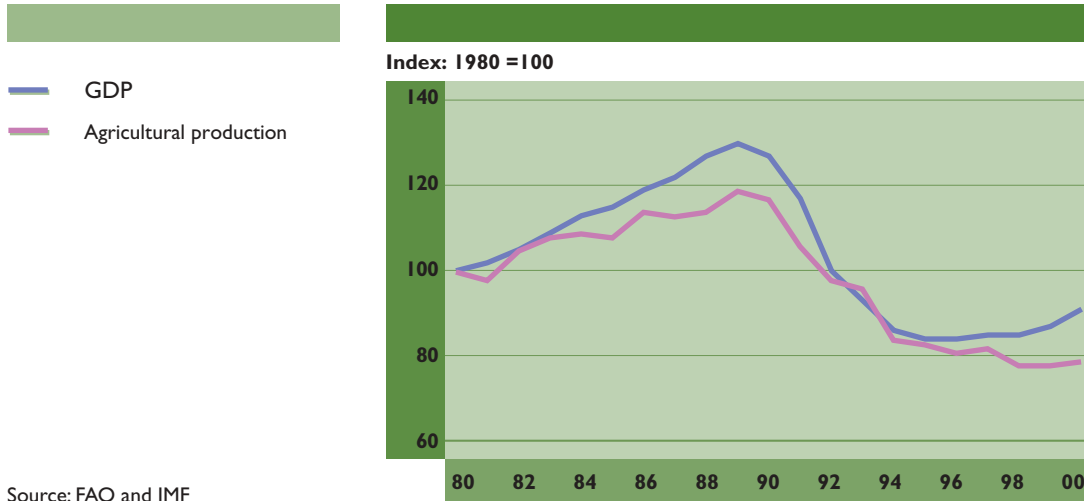
Whether macroeconomic or agricultural, growth statistics covering one or two years reveal few of the growing differences that have emerged over the past decade between Central and Eastern Europe and the CIS. From a relatively common starting point in the 1980s, policies and institutions of Central and Eastern European countries and the CIS grew progressively further apart in the 1990s.¹¹¹ The effects of this institutional “parting of the ways” include noticeable differences in mean GDP growth between the two subregions as well as important differences in the growth of agricultural productivity. As the region enters the second decade of economic reforms, the earliest and deepest reformers are beginning to approach the income and agricultural productivity levels of EC countries, while others face a far more substantial income and agricultural productivity gap.

Until the end of the 1980s, allocation decisions within the economies of Central and Eastern Europe and the CIS were primarily bureaucratic rather than market-determined. Although there were many differences between the two subregions during this period, the centrally planned economy provided a common institutional background, which in many ways defines the starting point of the transition process. During the last years of central planning, the region showed moderate aggregate growth in GDP of approximately 2 to 3 percent per year (Figure 31). Growth in the value of net agricultural production generally followed GDP, although at a slower rate. Beginning in the late 1980s and early 1990s, Central and Eastern European and CIS countries experienced a general decline in output that was larger than any slowdown to be measured officially in modern peacetime history. This “transformational recession” is usually attributed to the removal of severe economic distortions that existed during the period of central planning and to the “institutional disorganization”, or disruption of governance, which occurred in each of these countries as a result of the breakdown in the bureaucratic system of allocation.¹¹²

Reform policies of the 1990s were aimed at completing the dismantling of the bureaucratic-oriented economy and introducing new policies to support a market economy, both at the macroeconomic and sectoral levels. There has been a positive correlation between growth in GDP and the turnaround in agricultural production, which may point to the importance of general economic reforms for sectoral growth.

Figure 31

GDP AND NET AGRICULTURAL PRODUCTION INDICES FOR CENTRAL AND EASTERN EUROPE AND THE CIS



Source: FAO and IMF

GDP growth and agricultural performance: divergence between Central and Eastern Europe and the CIS

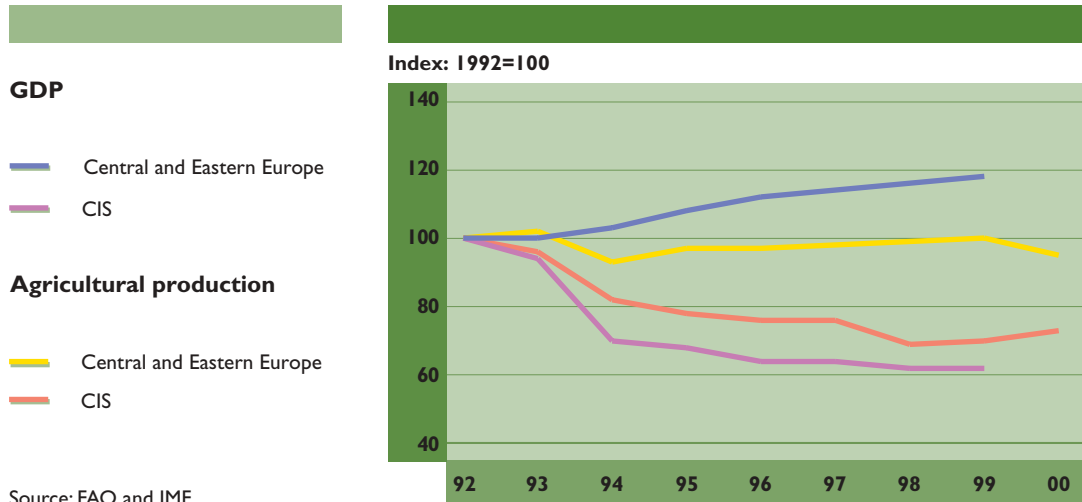
In spite of a common institutional starting point, differences between countries of Central and Eastern Europe and the CIS have been evident more or less since transition began in the CIS in 1992 (Figure 32). The most profound gap between these two sets of countries has been in the growth of GDP, while agricultural production appears to have stagnated in both groupings.¹¹³ While the depth of the fall in GDP in these countries can be attributed to some extent to initial conditions, the differences in the speed of recovery are generally attributable to the speed and depth of reforms.

The magnitude of the initial decline in GDP in the transition countries was strongly correlated with the weight of industry in the economy and its reliance on trade within the former Council for Mutual Economic Assistance (CMEA) or with countries of the former Soviet Union before the beginning of the transition period.¹¹⁴ Indeed, industry had the greatest concentration of goods that became unprofitable in the new market economy, and it is on this account that countries of the former Soviet Union experienced deeper recessions than those of Central and Eastern Europe.

There were also considerable differences in the depth of general policy reforms introduced in Central and Eastern

Figure 32

GDP AND NET AGRICULTURAL PRODUCTION INDICES FOR THE CENTRAL AND EASTERN EUROPE AND CIS SUBREGIONS



European countries and in the CIS. Most Eastern European countries introduced policy reform packages earlier, beginning in 1989-1990, while the countries of the former Soviet Union began between 1991 and 1994. In addition, reforms in Central and Eastern Europe were generally more rapid and more coherent than those in CIS countries. These factors led to a considerable divergence in GDP growth between the two regions during the recovery phase. The transition countries that implemented overall economic reforms most rapidly and thoroughly – such as Poland, Hungary, Slovenia, the Czech and Slovak Republics and Albania (i.e. the “advanced reformers”) – performed much better than intermediate and slow reformers such as Belarus, the Russian Federation and Ukraine.¹¹⁵ The fall in GDP in the Central and Eastern European countries that implemented rapid and thorough reforms was short-lived and slight, whereas the fall in the slowly reforming CIS countries was far longer and deeper.¹¹⁶

While there seems to be a strong correlation between overall economic reforms and GDP growth, at the sectoral level there does not appear to be a similarly clear correlation between reforms of the agriculture sector and growth in agricultural production. Part of the explanation for this may be the role played by initial conditions in determining growth of agricultural production. In fact, before the 1990s in Slovenia,

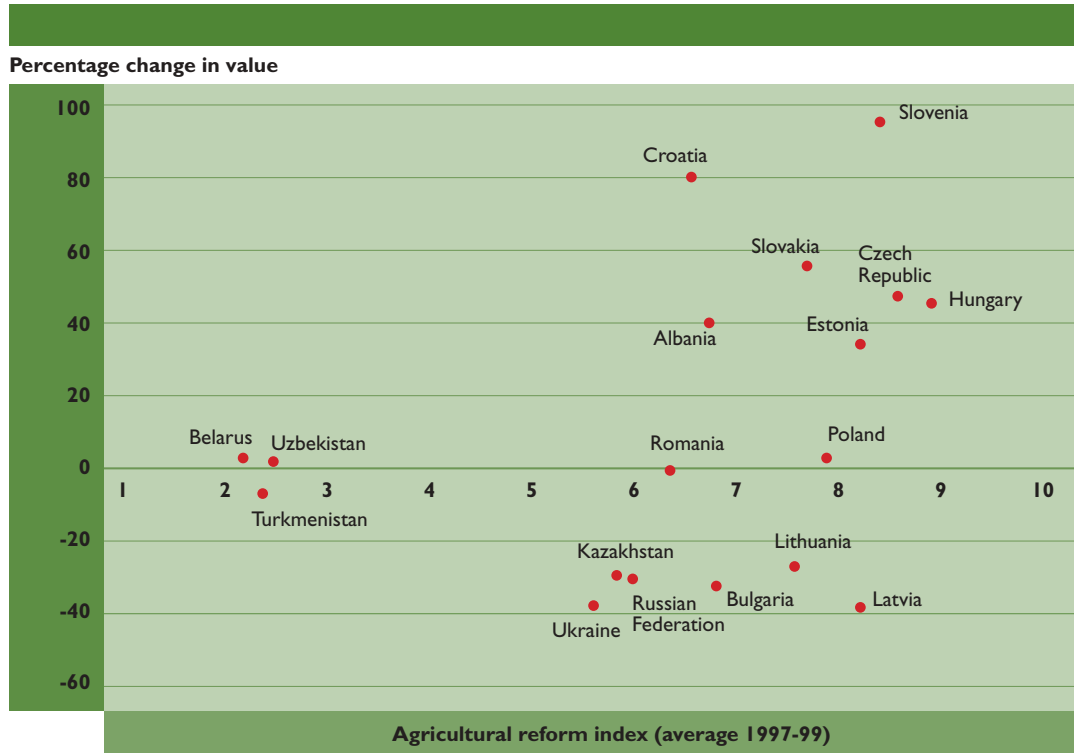
where agriculture was largely privately owned, and in Hungary, where much agricultural production was performed by reformed cooperatives, agricultural institutions differed strikingly from the more orthodox production and procurement systems of large state and collective farms in the former Soviet Union. Indeed, changes in agricultural output and labour productivity were strongly correlated with initial levels of “development” and “economic distortions” in countries of Central and Eastern Europe and the CIS.¹¹⁷ Another reason for the lack of correlation between the sectoral reforms and growth in agricultural production could be the more important influence of overall macroeconomic reforms and stabilization on agricultural performance.

The depth and coherence of agricultural policy changes appear to have had a much more significant impact on the technical efficiency of agricultural production than on levels of agricultural production in Central and Eastern Europe and the CIS. This is illustrated in Figure 33, where the percentage change in the value of net production per agricultural worker between 1992 and 1998 is juxtaposed against an aggregate indicator of the status of agricultural reform compiled by the World Bank.¹¹⁸

Although caution is needed in drawing conclusions, the data in Figure 33 nevertheless seem to distinguish three groups of countries based on the agricultural reform index. The first group (Belarus, Turkmenistan and Uzbekistan) is that of non-reformers. These countries have retained their former agricultural institutions and have thus delayed the transition recession and resulting pressure to reduce the agricultural labour force. The moderate reformers (Bulgaria, Kazakhstan, the Russian Federation and Ukraine) have partially reformed their agriculture sectors, although their institutions tend to be a mixture of old and new. They have sustained sizeable production falls and their agricultural labour forces have often grown, rather than diminished. For these reasons, they have seen the value of production per worker decline. The fast reformers (the countries situated in the top right-hand part of Figure 33) have suffered the initial transition recession, as have the moderate reformers, but have moved rapidly to replace old agricultural production structures with new market economy institutions and have reformulated government policies. The new market-oriented producers have responded to recession by reducing the labour force engaged in agricultural production, and their production falls have been more moderate.

Figure 33

WORLD BANK AGRICULTURAL REFORM INDEX AND CHANGE IN VALUE* OF AGRICULTURAL PRODUCTION PER WORKER



* Measured in International \$ (1989-91 prices)

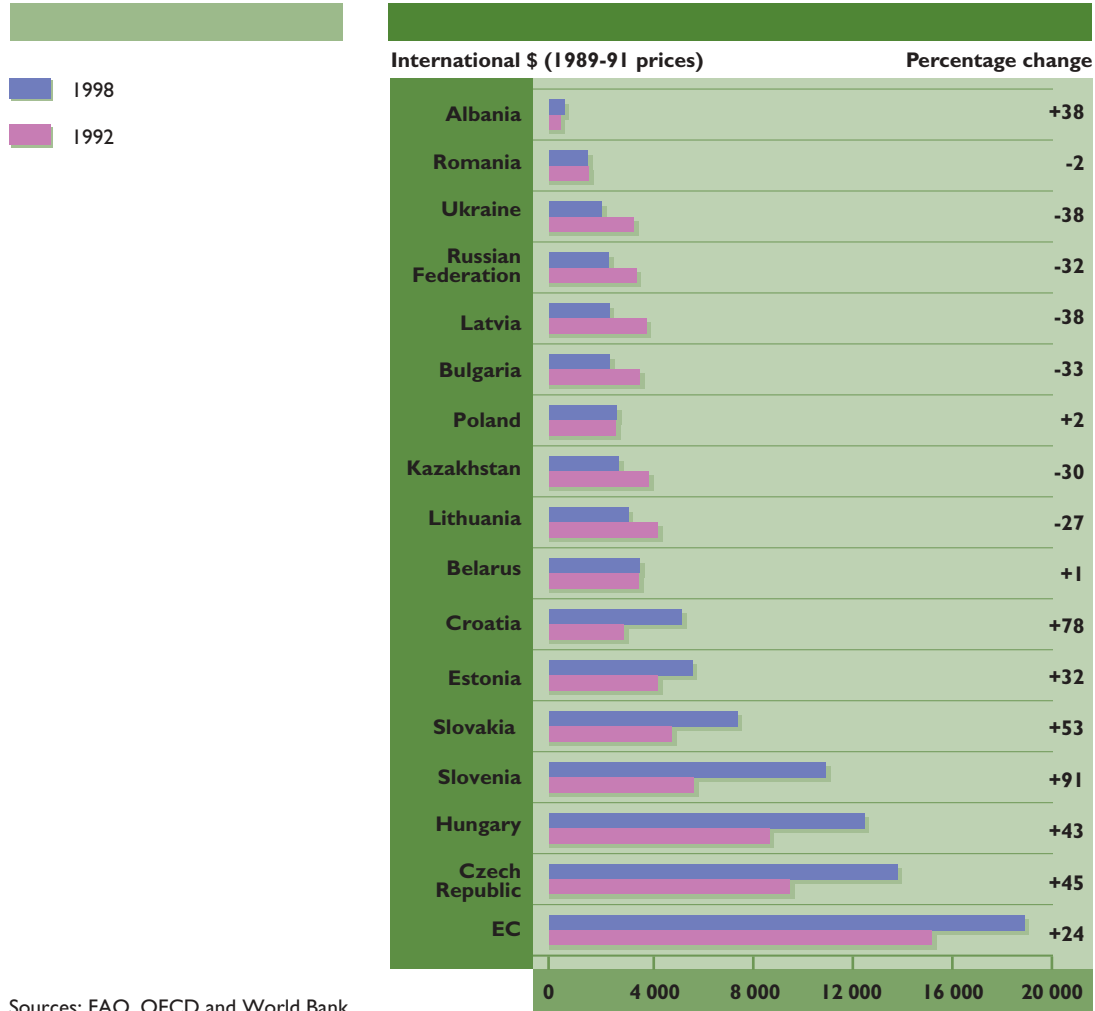
Note: The index of the status of agricultural reforms is an aggregate index composed of five subindices, each indicating the progress of reforms on a scale of 1 to 10. The subindices cover: market-conforming policy environment; land reform; privatization of agroprocessing and input supply; rural financial systems; and institutional framework. The index has been compiled in its present form for three years (1997-99)

Source: World Bank and FAO

Labour productivity gap between Central and Eastern Europe/CIS and OECD countries

There is still a sizeable labour “productivity gap” between most countries in Central and Eastern Europe/CIS and those in the OECD, although in the most advanced reformers of Central and Eastern Europe, this gap is diminishing quickly (see Figure 34). The level of agricultural labour productivity in Central and Eastern European and CIS countries was between 3 and 73 percent of that of EC countries in 1998.¹¹⁹ Only three countries among those listed show labour productivity of more than 50 percent of that of the EC (the Czech Republic, Hungary and Slovenia), and productivity for Central and Eastern Europe

Figure 34
**NET VALUE OF AGRICULTURAL PRODUCTION
 PER WORKER, 1998 AND 1992**



Sources: FAO, OECD and World Bank

as a whole was only 15 percent of the EC's level. For the largest CIS countries (the Russian Federation, Ukraine, Kazakhstan and Belarus), labour productivity was only 13 percent of the EC's level.

A more important indicator of the effectiveness of reforms is the *change* in agricultural labour productivity from 1992 to 1998. For this indicator, there are profound differences between the majority of Central and Eastern European countries and the CIS. Indeed, the growth in agricultural labour productivity from 1992 to 1998 was considerably more rapid

in most of the Central and Eastern European countries than in the EC (the exceptions being Bulgaria, Latvia, Lithuania, Poland and Romania). The most impressive record is that of Slovenia, which nearly doubled its labour productivity in six years. The record of the Central and Eastern European countries is considerably poorer. In aggregate, labour productivity in these countries fell by 31 percent in the 1992-1998 period, and only Belarus recorded a positive labour productivity growth of 1 percent.

The agricultural labour productivity gap between Central and Eastern Europe/CIS and the OECD countries is largely explained by the relatively large labour force employed in agriculture in the former. Column 1 of Table 40 illustrates the differences in the share of the labour force employed in agriculture in Central and Eastern Europe/CIS and OECD countries. Some transition countries saw dramatic reductions in the agricultural labour force as a result of land reform and farm

Table 40

AGRICULTURAL EMPLOYMENT IN 1998

Agricultural employment					
	(1) As a percentage of total employment	(2) As a percentage of agricultural employment in 1990		(1) As a percentage of total employment	(2) As a percentage of agricultural employment in 1990
Central and Eastern Europe and CIS			OECD countries		
Albania	64.0	121.8	Australia	4.8	-
Belarus	15.9	83.1	Canada	5.0	-
Bulgaria	24.7	130.7	Japan	5.3	-
Croatia	9.9	61.4	New Zealand	8.5	-
Czech Republic	4.2	45.9	Republic of Korea	12.2	-
Estonia	6.8	53.3	Switzerland	4.7	-
Hungary	7.7	43.8	United States	2.7	-
Kazakhstan	15.8	68.1	OECD average	7.9	-
Latvia	15.7	91.2	EC	4.8	-
Lithuania	20.0	111.8			
Poland	25.1	100.4			
Romania	35.6	125.1			
Russian Federation	13.7	107.2			
Slovakia	8.2	73.8			
Slovenia	5.6	99.6			
Ukraine	22.1	109.8			

Sources: OECD 20/20 Database for Central and Eastern European and CIS countries, and OECD, 2000. *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2000* (for percentage of labour force in agriculture). OECD 20/20 Database for Central and Eastern European and CIS countries (for agricultural labour force in 1998 as percentage of 1990).

privatization, but most did not. Column 2 of Table 40 shows that Hungary, Estonia and the Czech Republic were the most successful in reducing their agricultural labour force. It is not accidental that agricultural labour productivity in these countries grew exceptionally quickly in these years.

A second reason for the productivity gap is the inability of many Central and Eastern European and CIS producers to produce for export in significant quantities. This situation is due to a number of factors, which vary from country to country. For example, in Ukraine, where most tradable agricultural commodities are produced in large, collectively managed farms, low prices (resulting from government barriers to trade), high costs of production and transport, high risk as well as significant governance and financial difficulties combine to limit producers' competitiveness in production and exports. In Romania, tradable commodities are produced on inefficient, small plots, limiting capacity for the production of significant market surpluses.

The labour "productivity gap" is of particular significance for Central and Eastern Europe because of the large weight of the agriculture sector in its economies in comparison with most OECD countries. Consequently, productivity improvements would have a far greater impact on GDP and income. For instance, 4.8 percent of GDP in Poland (1998 data) is derived from agriculture, whereas this figure is only 2 percent in the EC.¹²⁰ The discrepancy is even greater for the countries of the Caucasus, Central Asia and the Balkans; for example, 54.4 percent of Albania's GDP (1998) derives from agriculture.

The productivity gap also means that agricultural producers of Central and Eastern Europe and the CIS are performing at a level that is far below the region's technological potential. With productivity improvements, the region could decrease net food imports and eventually contribute to meeting the world's growing food demand in the longer term. Narrowing this gap is critical for the countries of the region to be able to compete with the producers of OECD countries, increase export earnings and raise rural incomes. It is clear that the countries that have been most successful in bridging the productivity gap are those that have implemented the deepest and most stable reforms.

VI. Developed market economies

OVERVIEW

General economic performance

Average real GDP in the developed market economies¹²¹ grew at 3.2 percent in 1999 after a more modest 2.4 percent growth in output in 1998. As global economic activity rebounded relatively swiftly following the emerging market crises of 1997 and 1998, all developed market economies experienced a rise in GDP in 1999.

The United States continued to experience rapid economic expansion, with 4.2 percent GDP growth in 1999, the third consecutive year of real GDP growth of more than 4 percent. In Canada, GDP also expanded strongly, at 4.5 percent. Growth remained somewhat more subdued in the European Union, which recorded a relatively modest growth of 2.4 percent in 1999. Japan halted the 2.5 percent contraction in GDP recorded in 1998, but its level of economic activity remained stagnant in 1999. Australia experienced real GDP growth of 4.4 percent after the 5.2 percent growth rate it had recorded in 1998.

As reported in the World Review of this issue, economic activity in the developed market economies strengthened further in 2000, with GDP growing at an estimated 4.2 percent and most countries expecting to record higher growth rates. Canada and the United States are estimated to have seen output expand by 4.7 and 5.2 percent, respectively. In the European Union, strong domestic demand and a lower euro/US dollar exchange rate helped stimulate economic growth to reach an estimated 3.4 percent. Real GDP growth accelerated particularly strongly in Germany and Italy. Increased export demand resulting from the global recovery and the low euro exchange rate were the main factors driving the recovery in developed market economies. In Japan, some economic recovery seemed to be under way, with GDP growth estimated to be 1.4 percent, but many uncertainties about the country's recovery remain. Relatively robust growth rates of about 4 percent in 2000 are estimated for Australia and New Zealand, with the latter depending more on favourable external factors.

Agricultural production

Overall agricultural output in the developed market economies rose by 1.8 percent in 1999 after a modest increase of less than

1 percent in the previous year. Crop and livestock production increased by 1.8 and 1.6 percent, respectively, although cereal output fell by 2.8 percent in 1999. Preliminary estimates for 2000 suggest a more moderate expansion of agricultural output of less than 1 percent. However, cereal production is expected to recover, growing at approximately 3 percent.

A good production performance was recorded by EC countries, where agricultural output grew by 2.2 percent in 1999, after stagnating in 1998. Cereal production, however, contracted by 4.6 percent and wheat production, in particular, fell by 6 percent because of increased set-aside requirements and adverse weather conditions. Nevertheless, with relatively good performances for other crops, the EC's overall crop output increased by 3.4 percent. Livestock production, on the other hand, increased by only 0.5 percent. Weak output performances were recorded in France and the United Kingdom, where agricultural output expanded by less than 0.5 percent in 1999, but in Germany, Italy and Spain overall agricultural output grew by between 1.5 and 5.5 percent. In 2000, agricultural output in the EC is provisionally estimated to contract marginally, by less than 0.5 percent. However, cereal output is expected to recover and to grow at a rate of about 7 percent, with all of the larger producers, except for Italy, recording increased cereal production.

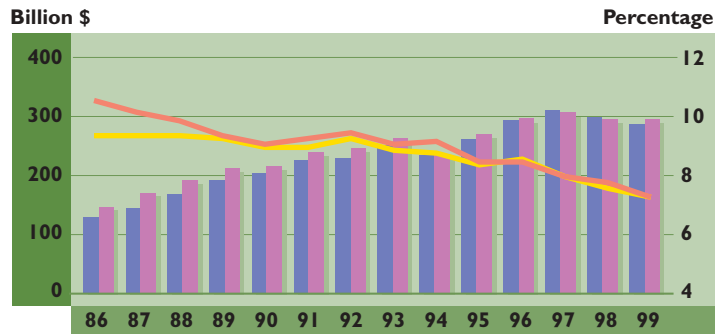
In North America, production rose by 1.9 percent in 1999 after a 1.3 percent increase in 1998. In the United States, output rose by 1.3 percent in 1999, after posting growth of less than 1 percent the previous year. Cereal production fell by 4.1 percent, following an expansion of 3.9 percent in 1998. Wheat production, in particular, fell by about 9 to 10 percent as a result of reduced plantings. Production growth in 1999 was stronger in Canada, where agricultural output expanded by about 6 percent for the second consecutive year. Cereal production grew at rates of 5.7 and 3.9 percent in 1999 and 1998, respectively, but without returning to the record level of 1996 after the 16 percent drop in 1997. In 2000, overall agricultural output in North America is anticipated to expand by about 2 percent as a result of an increase of slightly more than 2 percent in the United States and stagnant production in Canada.

In the Oceania region, agricultural output stagnated in 1999 after rising by 3.4 percent in 1998. Australian output grew by nearly 2 percent in 1999, but production in New Zealand dropped by 5.1 percent. In 2000, overall output is estimated to expand by 1.6 percent. The increases will mainly be in the

Figure 35
DEVELOPED MARKET ECONOMIES: SELECTED INDICATORS

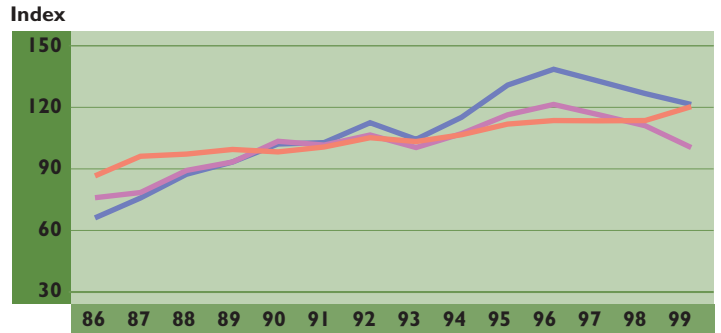
Agricultural export and import values and share in total merchandise trade

- Agricultural exports (\$)
- Agricultural imports (\$)
- Ag. exports as share of total (%)
- Ag. imports as share of total (%)



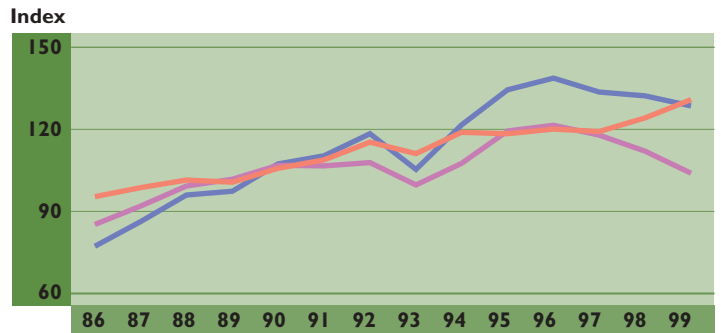
Agricultural exports
 (Index: 1989-91=100)

- Value
- Unit value
- Quantity



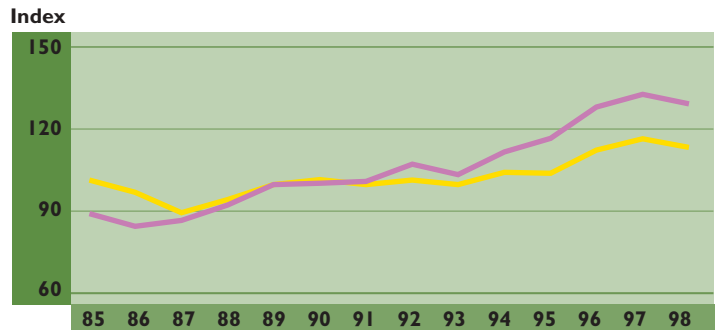
Agricultural imports
 (Index: 1989-91=100)

- Value
- Unit value
- Quantity



Net barter and income agricultural terms of trade
 (Index: 1989-91=100)

- Net barter
- Income



DEVELOPED MARKET ECONOMIES: SELECTED INDICATORS

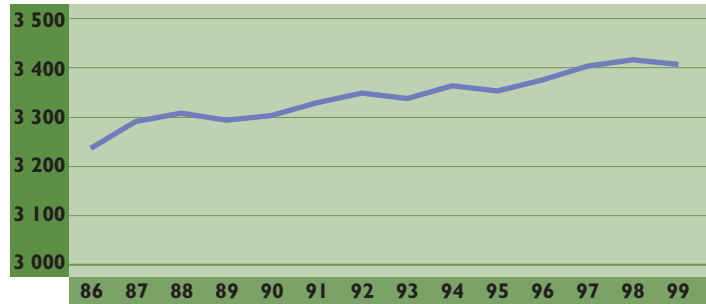
Real GDP
(Percentage change from preceding year)

Percentage



Dietary energy supplies
(kcal per capita per day)

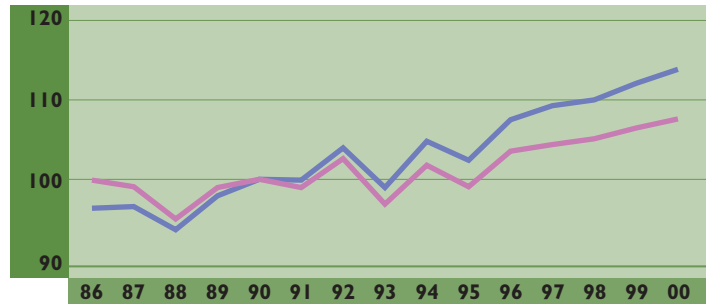
kcal



Agricultural production
(Index 1989-91=100)

— Total agricultural production
— Per capita food production

Index



Source: FAO and IMF

Table 41

NET PRODUCTION GROWTH RATES IN DEVELOPED MARKET ECONOMIES

Year	Agriculture	Cereals	Crops	Food	Livestock	Non-food
<i>(Percentage)</i>						
Developed market economies						
1997	1.5	-2.1	2.1	1.4	0.6	5.0
1998	0.8	3.3	0.0	1.3	1.9	-11.7
1999	1.8	-2.8	1.8	1.6	1.6	6.5
2000 ¹	0.9	3.1	0.7	1.0	0.6	-1.1
EC						
1997	0.0	-0.7	1.0	-0.1	-0.5	6.8
1998	0.1	3.4	-1.0	0.1	1.8	1.5
1999	2.2	-4.6	3.4	2.2	0.5	5.3
2000 ¹	-0.3	7.0	0.3	-0.3	-0.8	-0.1
North America						
1997	3.2	-1.8	3.6	3.2	1.3	2.3
1998	1.3	3.9	0.7	2.3	2.4	-21.5
1999	1.9	-2.8	0.4	1.5	3.6	12.9
2000 ¹	2.1	1.3	1.5	2.2	1.6	-2.1
Oceania²						
1997	2.4	-10.9	-2.2	1.2	4.6	9.4
1998	3.4	3.5	7.2	4.1	1.7	-0.7
1999	0.1	5.6	6.2	0.5	-1.5	-2.0
2000 ¹	1.6	-1.2	-3.9	1.8	2.7	-0.1
Japan						
1997	-0.7	-2.6	1.5	-0.7	-2.1	2.4
1998	-3.4	-10.4	-7.9	-3.3	0.9	-8.6
1999	0.8	2.8	1.8	0.8	-0.5	3.8
2000 ¹	0.3	2.5	0.8	0.3	-0.2	0.0

¹ Estimates.² Australia and New Zealand.

Source: FAO.

livestock sector. Crop production is likely to decline by nearly 4 percent. Australian output is expected to be up by about 0.5 percent, while production in New Zealand is estimated to rise by about 4.5 percent. Japanese agricultural production rose by less than 1 percent in 1999, after contracting in 1998. Crop and cereal production recovered somewhat from the sharp fall experienced in 1998. In 2000, overall output is estimated to rise by less than 0.5 percent.

Agricultural policy changes¹²²

Over the last decade or so, developed market economies have introduced various forms of agricultural policy reforms, but

these have varied widely in terms of the depth of reform, the range of measures adopted and timing. Under the WTO Agreement on Agriculture (at the conclusion of the Uruguay Round of multilateral trade negotiations in 1994), countries committed themselves not only to improving market access for agricultural imports but also to a gradual reduction in export subsidies and trade-distorting domestic support. Many countries have introduced policy changes aimed at reducing levels of support and shifting towards more targeted measures. However, policy reform is still an ongoing process.

In 1999, overall support to agriculture for all the OECD countries, measured by OECD's total support estimate (TSE) (see Box 4), amounted to \$356 billion, or about 1.4 percent of their aggregate GDP. This figure has remained fairly steady in the last three years but is lower than the average 2.2 percent of GDP recorded in the 1986-1988 period. In 2000, TSE is estimated to have fallen to about \$327 billion.

Support to agricultural producers in all OECD countries, as measured by OECD's producer support estimate (PSE) (see Box 4), increased in 1999 for the second year running. This was mainly due to widening price gaps between domestic and international markets, with declining international prices of agricultural products. The percentage PSE ranged from less than 1 percent in New Zealand to more than 60 percent in some countries. The level of support also varies across commodities, with rice, milk and sugar receiving the highest levels of support.

In 2000, however, support to producers is estimated to have fallen to about 34 percent of gross farm receipts, 5 percent below the 1986-88 average. Support decreased in most countries and for most commodities, mainly because of the

Table 42

OECD INDICATORS OF SUPPORT TO AGRICULTURE¹

Indicator	1986-1988	1998-2000	1998	1999	2000 ²
PSE					
Billion \$	236	258	253	273	245
Percentage PSE	39	35	34	37	34
TSE					
Billion \$	8	340	339	356	327
Percentage TSE	2.2	1.3	1.4	1.4	1.3

¹ All OECD countries.² Estimate.

Source:OECD.

Box 4

OECD INDICATORS OF SUPPORT

OECD uses a number of indicators to measure support to agriculture. Two key indicators are the producer support estimate (PSE) and the total support estimate (TSE), defined here.

Producer support estimate

This measure indicates the annual monetary value of gross transfers from consumers (resulting from domestic prices being kept above world market levels) and from taxpayers to agricultural producers. It is also expressed as

percentage PSE, i.e. as a percentage of gross farm receipts.

Total support estimate

This measure indicates the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support the agriculture sector. It includes transfers to producers (PSE) and general services provided to agriculture. The *percentage TSE* indicates the burden that this overall support represents as a percentage of GDP.

smaller gap between domestic and world prices, since the latter had increased in 2000. Although some changes to support prices did take place in a number of countries, no new policy mechanisms to lower support prices were introduced. The United States extended assistance to crop farmers to compensate for low world prices for the third consecutive year, and Canada granted payments for the same reason.

In 2000, several EC member countries as well as Australia and Japan established multiyear plans covering the agriculture sector and a number of support measures. In general, the plans focused on structural change, rural development and environmental quality, although the Japanese programme aimed at increasing food self-sufficiency to 45 percent by 2010, compared with 40 percent in 1998.

On agricultural trade policy, implementation of the Agreement on Agriculture continued in 1999 and 2000. Reductions in tariffs and expansions in tariff quota access advanced in line with the agreed commitments, although some countries raised tariffs within their commitment levels or under the special safeguard provisions. Total levels of export subsidies

also declined in 2000, mainly in the EC, owing to a rise in world prices.

Against growing concern among consumers, the issue of improved food safety has continued to gain momentum. Almost all developed market economies have either made, or are in the process of making, changes to their food safety regulations, including measures to address concerns related to biotechnology. Food safety issues are increasingly being addressed with reference to the Codex Alimentarius Commission and its parent bodies, WHO and FAO. A number of countries have created food safety agencies and the EC has agreed to establish the European Food Authority to oversee food safety issues. The EC, Japan and Switzerland have also introduced labelling requirements for products derived from genetically modified organisms (GMOs).

A number of new policy measures introduced in 2000 were a response to natural disasters or concern about animal, plant and human health. Bovine spongiform encephalopathy (BSE) was the most significant of these emergencies and led to a number of measures aimed at reducing the risk to human health. The EC took a series of measures in response to BSE, including a trade ban on feed containing meat and bone meal and compensatory income support measures to affected farmers. More recently, the outbreak of foot-and-mouth disease in Europe early in 2001 has led to an extensive range of measures aimed at preventing the spread of the disease, but also to support farmers.

The environmental effects of agriculture have continued to be of concern in recent years. Many countries have increased their budgets for existing agri-environmental programmes and several have introduced new programmes, focusing on resource conservation and organic farming. The EC decided, as part of Agenda 2000, that farmers must meet environmental standards set by each Member State in order to qualify for funding under certain programmes. New policies aimed at improving water quality were introduced in Australia, Denmark and the Netherlands. Italy, the Netherlands, the United Kingdom and the United States also introduced initiatives in favour of organic farming.

The year 2000 marked the final year for implementation of the WTO Agreement on Agriculture. Current levels of agricultural support in developed market economies are still high and continue to encourage domestic production, distort trade and depress world prices. It is estimated that the prices received by their farmers were on average 43 percent above

world market prices. Nevertheless, according to OECD, this overall level of market protection in developed market economies had fallen from 61 percent in 1986-88, partly as a result of efforts to achieve WTO commitments. Domestic price support measures have been gradually shifting towards less market-distorting measures, but progress has been very limited in some countries. Although the decline in support indicators in 2000 suggests a movement towards greater market orientation, the gap between countries with the highest and lowest levels of support is widening. The resumption of agricultural trade negotiations within WTO provides an opportunity to accelerate the policy reform process and help the agriculture sectors of most of the developed market economies to become more market-oriented.

NOTES

- 1 The macroeconomic data in this section are drawn from IMF. 2000. *World Economic Outlook*, September. Washington, DC.
- 2 Unless indicated otherwise, the sources for AIDS statistics in this section are: UNAIDS/WHO. *AIDS epidemic update: December 1998 and December 2000*; and UNAIDS. *Report on the global HIV/AIDS epidemic: June 2000*. Geneva.
- 3 J. Decosas. 1996. HIV and development. *Special edition of AIDS*, 10 (Supplement 3): 69-74.
- 4 UNAIDS/WHO. *AIDS epidemic update: December 1998*. Geneva.
- 5 UNAIDS, op. cit., note 2.
- 6 Ibid.
- 7 DALYs are used to measure the cost of disease. Calculations include the disability effects as well as the mortality effects of disease, and age weights are used to discount the importance of infant and elderly deaths.
- 8 UNAIDS/WHO. 2000. Op. cit., note 2.
- 9 L. Bollinger and J. Stover. 1999. *The economic impact of AIDS*. Glastonbury, Connecticut, USA, The Futures Group International.
- 10 FAO. 1994. *What has AIDS to do with agriculture?* By M. Haslwimmer. Rome.
- 11 Op. cit., note 5.
- 12 Op. cit., note 10; and FAO. 2000. *HIV/AIDS in Namibia: the impact on the livestock sector*. By I.E. Engh, L. Stloukal and J. Du Guerny. Rome.
- 13 Cited in FAO. 1994. *Is HIV/AIDS a threat to livestock production? The example of Rakai, Uganda*. By M. Haslwimmer. Rome.
- 14 Op. cit., note 4.
- 15 Op. cit., note 13
- 16 World Bank estimate for 1999.
- 17 Droughts have occurred in Ethiopia many times throughout history. See P. Webb and J. von Braun. 1994. *Famine and food security in Ethiopia: lessons for Africa*. Chichester, UK, John Wiley & Sons.
- 18 The agricultural policies pursued in the 1974-1991 period are discussed in FAO. 1993. *The State of Food and Agriculture 1993*. Rome.
- 19 Economist Intelligence Unit. *Ethiopia: country profile 2000*. London.
- 20 FAO. 2000. *The State of Food Insecurity in the World 2000*. Rome.
- 21 Ibid.
- 22 Central Statistical Authority. 1993. *Report on the National Rural Nutrition Survey, Core Module*. Statistical Bulletin, No. 113. Addis Ababa.
- 23 Chronic malnutrition is not only related to food availability and is even found in regions with a food surplus. See, for example, D.L. Pelletier, K. Deneke, Y. Kidane, B. Haile and F. Negussie. 1995. The food-first bias and nutrition policy: lessons from Ethiopia. *Food Policy*, 20: 279-298.
- 24 The source for data in this section is World Bank. 1998. *Ethiopia: the*

- social sector note*. Report No. 16860-ET. Washington, DC; and UNICEF statistics (available at www.org.unicef).
- 25 Unless indicated otherwise, the data in this section are drawn from IMF, *op. cit.*, note 1.
- 26 IMF. 1999. *Ethiopia: recent economic developments*. IMF Staff Country Report No. 99/98. Washington, DC.
- 27 World Bank estimate for 1999.
- 28 The Ethiopian Government is currently an Observer at the World Trade Organization (WTO).
- 29 *Op. cit.*, note 26.
- 30 *Ibid.*
- 31 World Bank, *op. cit.*, note 24.
- 32 IMF. 1998. *Ethiopia—Enhanced structural adjustment facility medium-term economic and financial policy framework paper, 1998/99-2000/01*. Washington, DC.
- 33 Ethiopia is the area of origin of *Eragrostis tef*. Accounting for approximately 31 percent of the area under cereals, it is the main cereal crop and is used to make *enjera*, a pancake-like staple food.
- 34 Central Statistical Authority. 1999. *Agricultural Sample Survey 1998/99, Volume 1: Report on Area and Production for Major Crops*. Statistical Bulletin No. 200. Addis Ababa.
- 35 FAOSTAT (available at www.fao.org).
- 36 *Ibid.*
- 37 Qat is a mild stimulant which, like coffee, is largely grown in southern areas and is mainly exported to countries in the Near East. In 1995/96, it constituted about 7 percent of Ethiopia's foreign trade.
- 38 Central Statistical Authority. 1999. *Ethiopia: Statistical Abstract 1998*. Addis Ababa.
- 39 *Op. cit.*, note 35.
- 40 FAO. 1986. *Ethiopian highlands reclamation study. Final report*. 2 vols. Rome.
- 41 World Food Programme Ethiopia. *1998 Annual Report*. Addis Ababa, United Printers.
- 42 *Ibid.*
- 43 M. Demeke, A. Said and T.S. Jayne. 1997. *Promoting fertilizer use in Ethiopia: the implication of improving grain market performance, input market efficiency and farm management*. Working Paper No. 5, Grain Market Research Project, Michigan State University, USA and Ministry of Economic Development and Cooperation, Addis Ababa.
- 44 *Op. cit.*, note 38.
- 45 *Op. cit.*, note 38.
- 46 M. Demeke. 1999. *Agricultural technology, economic viability and poverty alleviation in Ethiopia*. Paper presented at the Workshop on Agricultural Transformation in Africa, 27-30 June 1999, Nairobi, Kenya. Egerton University Tegemeo Institute and Michigan State University.

- 47 Sasakawa-Global 2000 (a collaborative initiative of the non-governmental Sasakawa Africa Association and Global 2000) has refocused its activities to carry out research on minimum tillage, quality protein maize, Striga in sorghum, and threshing machines, which are areas where the government is not active.
- 48 Eighty percent of fertilizer sales transactions are through credit.
- 49 Figures on fertilizer consumption were provided by the National Fertilizer Industry Agency.
- 50 Farmers participating in FAO's Special Programme for Food Security achieved, on average, yield increases of more than 100 percent for teff, sorghum and wheat.
- 51 Oromia region accounts for about 50 percent of the national fertilizer market.
- 52 Figures refer to 1994.
- 53 Op. cit., note 19.
- 54 The *Belg* crop accounts for between 5 and 10 percent of total cereal production. However, in some areas it provides the bulk of the annual food supply.
- 55 FAO/WFP. 2001. *Special report: FAO/WFP crop and food supply assessment mission to Ethiopia*, 9 January 2001. Rome.
- 56 The EFSR maintains a rotating stock of 283 000 tonnes of cereals.
- 57 Unless indicated otherwise, macroeconomic data and projections in this section are drawn from IMF. 2000. *World Economic Outlook*, October 2000. Washington, DC.
- 58 AsDB. 2000. *Asia Recovery Report*, October. Manila.
- 59 World Bank. 2000. *East Asia. Recovery and beyond*. Washington, DC.
- 60 World Bank. 1998. *East Asia. The road to recovery*. Washington, DC.
- 61 Op. cit., note 59.
- 62 FAO. 1999. *The State of Food Insecurity in the World 1999*, p. 27. Rome.
- 63 J.C. Knowles, E.M. Pernia and M. Racelis. 1999. *Assessing the social impact of the financial crisis in Asia: integrative report*. Manila, AsDB.
- 64 The exchange rates of local currencies against the US dollar fell by as much as 70 percent in Indonesia and between 30 and 50 percent in Malaysia, the Republic of Korea and Thailand during 1997 and 1998. The rates recovered later to some extent but remained at between 30 and 50 percent below their pre-1997 levels.
- 65 World Bank. 2000. *World Development Indicators 2000*. Washington, DC.
- 66 Ibid.
- 67 FAOSTAT (available at www.fao.org), data for 1998.
- 68 FAO. 1997. *Asia-Pacific Forestry Outlook Study. Country Report – Viet Nam*. Working Paper No. AFPSOS/WP/31. Bangkok, FAO Regional Office for Asia and the Pacific.
- 69 FAO/UNDP. 1995. *Agriculture in post-transition Viet Nam: opportunities and challenges*. TSS-1 Report VIE/95/01T. Bangkok, FAO Regional Office for Asia and the Pacific.

- 70 The agricultural population is defined as all people who depend on agriculture, hunting, fishing or forestry for their livelihood. This estimate comprises all people actively engaged in agriculture as well as their non-working dependants.
- 71 Op. cit., note 65.
- 72 UN Economic and Social Commission for Asia and the Pacific. 1995. *Macroeconomic reforms in the economies in transition*, p. 10. Development Paper No. 18. New York, UN.
- 73 P. Wolff. 1999. *Viet Nam – the incomplete transformation*, p. 24-25. German Development Institute Book Series No. 12. London, Frank Cass Publishers.
- 74 Ibid., p. 26-30.
- 75 General Statistical Office. 1999. *Viet Nam Living Standards Survey 1997-98*. Hanoi.
- 76 For an overview of the collectivization process and subsequent policy reforms, see Tran Thi Que. 1998. *Viet Nam's agriculture. The challenges and achievements*. Singapore, Institute of Southeast Asian Studies.
- 77 Ibid., p. 16.
- 78 This information was provided by officials of the Vietnamese Ministry of Agriculture and Rural Development.
- 79 Another distinct set of problems is related to the lack of an adequate legal and administrative framework for the functioning of a market economy. For an overview of the requirements for a legal framework, see UNDP. 1999. *Completion of Viet Nam's legal framework for economic development*. UNDP Discussion Paper No. 2. Hanoi.
- 80 See IMF. 1999. *Viet Nam: selected issues*. IMF Staff Country Report No. 99/55 (July 1999).
- 81 For a description of the index, see IMF. 1998. *Trade liberalization in IMF-supported programs*. World Economic and Financial Surveys. Washington, DC.
- 82 Op. cit., note 80.
- 83 Ibid.
- 84 IMF. 2000. *World Economic Outlook*, September. Washington, DC.
- 85 About one-third of the total agricultural labour force was landless (see S. Barraclough, 1973. *Agrarian structure in Latin America*. Lexington, Massachusetts, USA, Heath).
- 86 A. de Janvry, E. Sadoulet and W. Wolford. 1998. *The changing role of the state in Latin American land reforms*. Berkeley, USA, University of California.
- 87 This index ranges from zero when all holdings have the same area, to unity, when the total agricultural area is operated by one holding. For example, the Lorenz Index was 0.85 in 1985 in Brazil, 0.86 in 1994 in Peru, 0.88 in 1993 in Argentina and 0.93 in 1991 in Paraguay.
- 88 F. Vogelgesang. 1996. Property rights and the rural land market in Latin America. *CEPAL Review*, 58.

- 89 Op. cit., note 86.
- 90 World Bank. 1997. *Project appraisal for a land reform and poverty alleviation pilot project*. Report No. 16342. Washington, DC.
- 91 J. Heath and K. Deininger. 1997. *Implementing "negotiated" land reform: the case of Colombia*. Paper presented at the LAC Cross-fertilization Seminar, 6 March 1997.
- 92 C. Deere and M. Leon. 1997. *Women and land rights in the Latin American neo-liberal counter-reforms*. Working Paper No. 264. Michigan State University, USA.
- 93 Guatemala is characterized by an extremely high degree of *minifundismo*, which affects its indigenous population in particular. Between 1964 and 1979, farms of less than 0.7 ha tripled in number and grew from 20 to 40 percent of the total farm households. Over the same period, the average holding in this category shrank from 0.4 to 0.25 ha.
- 94 P. Parera. 1998. *A literature review of eight country experiences with agrarian and land tenure reforms in Latin America*. Unpublished document prepared for the FAO Regional Office for Latin America and the Caribbean.
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- 96 P. Groppo. 1996. *Agrarian reform and land settlement policy in Brazil: historical background*. Available at: www.fao.org/sd/LTdirect/Ltan0006.htm.
- 97 A. Buainain. *Structural adjustment and financial crisis in Brazil: impacts on agriculture and food security*. FAO Working Paper (in preparation).
- 98 K. Deininger. 1998. *Making market-assisted land reform work: initial experiences from Colombia, Brazil and South Africa*. World Bank.
- 99 According to a 1997 official government document (cited in A. Buainain, op. cit., note 97), the cost can reach \$40 000 per family; according to a joint report by INCRA and FAO, the cost per family is \$23 000. The cost of purchasing land itself is estimated to average \$11 600 per family (K. Deininger, op. cit., note 98).
- 100 First implemented in Ceará State, the programme was expanded to cover Bahia, Maranhão, Minas Gerais and Pernambuco. A similar approach is being applied with IFAD support in the State of Sergipe.
- 101 Op. cit., note 97.
- 102 The World Bank has guaranteed funding of up to \$1 billion, while the Brazilian Government will pay the remaining \$1 billion.
- 103 Op. cit., note 98.
- 104 IRAM/Groupe Croissance. 1998. *La tarification des principaux produits agricoles en République d'Haïti*. Paris.
- 105 The macroeconomic data in this section are drawn from IMF. 2000. *World Economic Outlook*, September. Washington, DC; EIU. 2000. *Country Forecast: Middle East and North Africa: Regional Overview*, December, London; and EIU individual country reports.

- 106 For example, the Arab Common Market (ACM), the Council of Arab Economic Unity (CAEU), the Gulf Cooperation Council (GCC), the League of Arab States, the Arab Maghreb Union (AMU), the Economic Cooperation Organization (ECO), the Organization of the Islamic Conference (OIC). In addition, in 1996 all Arab countries signed the agreement founding the Arab Free Trade Area.
- 107 GCC countries include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.
- 108 J.A. Allan. 1999. A convenient solution. *UNESCO Courier*, February, p. 30.
- 109 FAO. 1997. *Water resources of the Near East region: a review*, p. 24. Rome.
- 110 IMF. 2000. *World Economic Outlook*, September. Washington, DC.
- 111 Central and Eastern Europe refers to the Eastern European countries as well as the Baltic states.
- 112 J. Kornai. 1994. Transformational recession: the main causes. *Journal of Comparative Economics*, 19(1): 39-63; O. Blanchard. 1997. *The economics of post-communist transition*. Oxford, UK, Clarendon Press; S. Gomulka. 1998. Output: causes of the decline and the recovery. In P. Boone, S. Gomulka and R. Layard, eds. *Emerging from communism: lessons from Russia, China and Eastern Europe*, p. 13-42. Cambridge, Massachusetts, USA, MIT Press.
- 113 The aggregates of Figure 32 conceal the variation in GDP and agricultural production growth among countries within each group.
- 114 See, for example, S. Gomulka, op. cit., note 112.
- 115 See M. De Melo, C. Denizer and A. Gelb. 1997. From plan to market: patterns of transition. In M. Blejer and M. Skreb, eds. *Macroeconomic stabilization in transition economies*, p. 17-72. Cambridge, UK, Cambridge University Press.
- 116 The aggregate growth figures for the Central and Eastern European region exclude Serbia, Montenegro, Kosovo and Bosnia and Herzegovina, for which GDP data are lacking.
- 117 K. Macours and J. Swinnen. 2000. Impact of initial conditions and reform policies on agricultural performance in Central and Eastern Europe, the Former Soviet Union and East Asia. *American Journal of Agricultural Economics*, 82(5): 1149-1155.
- 118 C. Csaki and A. Fock. 2000. *The agrarian economies of Central-Eastern Europe and the Commonwealth of Independent States: an update on status and progress*. ECSSD Environmentally and Socially Sustainable Development Working Paper No. 24. 3 June 2000. Washington, DC, World Bank.
- 119 These data are from OECD and the World Bank.
- 120 OECD. 2000. *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2000*. Paris.
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- 122 This section draws on OECD. 2000 and 2001. *Agricultural Policies in OECD Countries: Monitoring and Evaluation*. Paris; and other OECD data.

PART III

ECONOMIC IMPACTS OF TRANSBOUNDARY PLANT PESTS AND ANIMAL DISEASES



I. Overview

Pests and diseases have threatened farmers since farming began. The damage they cause can be economic (through lost output, income and investment) as well as psychological (manifested in shock and panic). Combating pests and diseases is a necessity for farmers and, as a rule, decisions regarding control are made by the individual farmer. However, the presence of a pest or disease on one farm poses a threat to adjacent farms and sometimes even to distant localities. As such, pests and diseases imply negative impacts on third parties and call for an additional response, either from affected parties or a public agency.

Infrastructure and services to prevent and combat pests and diseases are a public good that can be provided more efficiently by governments than by individual farmers. Yet, the most effective form of government intervention depends on the pest or disease in question. Experience has often shown that government provision of pest and disease control services can create a dependency among farmers and discourage their adoption of integrated pest management approaches that enable them to address the problems themselves. In such circumstances, government provision of knowledge, science and information may be the best and most sustainable way of serving the farming community in the long term.

The justification for government control intervention is stronger for transboundary pests and diseases than for those that only occur locally. Furthermore, in some countries the loss of food as a result of pests and diseases may threaten food security or rural livelihoods, making intervention politically unavoidable.

Plant pests and animal diseases pose the greatest immediate threat when they move as plagues or when they are introduced for the first time into ecologically favourable conditions where there are few natural factors to limit their spread and people do not have experience in managing them. Such occurrences often have the most evident economic impact and, in many cases, affect marginalized people most severely.

The spread of emergent diseases and invasive species has increased dramatically in recent years. At the same time, numerous developments – such as the rapidly increasing transboundary movements of goods and people, trade liberalization, increasing concerns about food safety and the environment – have heightened the need for international

cooperation in controlling and managing transboundary pests and diseases.

The *transboundary* plant pests and animal diseases reviewed here include:

“Those that are of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries.”

Definition recommended by FAO

EMPRES Expert Consultation, 24-26 July 1996

(www.fao.org/WAICENT/FAOINFO/AGRICULT/AGA/AGAH/EMPRES)

This definition¹ covers many pests and diseases that can cause damage or destruction to farmers' property, threaten food security, upset rural economies and disrupt trade relations. Box 5 lists some of the most important transboundary pests and diseases.² This review discusses their economic impacts and the costs of control. It explains why regulatory measures are justified in restricting transboundary plant pests and animal diseases, why the issue is of growing concern and what the main measures are for combating the establishment of unwanted and economically significant pests and diseases.

The review begins with a brief history of international control efforts and the incidence of selected transboundary pests and diseases by region. The factors behind a country's need to combat these pests and diseases are outlined, together with the effectiveness of interventions. It also explains the economic rationale for controlling transboundary pests and diseases. Some guiding concepts for determining the most effective level of control are to be found in theories concerning public goods and externalities. They indicate when there should be government involvement in control as well as addressing the equity issues involved in financing interventions.

The review then presents empirical evidence on the economic impacts of transboundary pests and diseases, including impacts on agricultural production, food security, trade and the environment. The impacts of control measures, such as the use of pesticides and stockpiling, are also discussed.

Following this is a summary of the primary tools used for pest and disease eradication and control as well as the range of possible responses – from exclusion to tolerance – on the part of a given organism. The same section also discusses options

Box 5

SIGNIFICANT TRANSBOUNDARY PLANT PESTS AND ANIMAL DISEASES

MIGRATORY PLANT PESTS

Transboundary migratory pests move in search of food and suitable breeding places. They include locusts, armyworms and the quelea bird. Such migrations can extend over thousands of kilometres, across seas and political borders. The pests usually concentrate as swarms (locusts), infestations (armyworms) or flocks (quelea birds).

Armyworm

Armyworms are caterpillars that develop into nocturnal moths, capable of long-distance migration (covering more than 100 km per night). The caterpillars cause extensive damage to grazing land, cereals and sugar cane. Compared with locust outbreaks, armyworm infestations usually occur on a smaller scale but may extend over several hundred square kilometres. Outbreaks and movements are usually related to the rainy seasons.

Locusts

Locusts are the most damaging of the migratory pests. They have adapted to semi-arid or desert environments where rainfall

is scarce and irregular but often torrential when it occurs. The locusts fly to areas of recent rain, where moist and sandy conditions, developing vegetation and the absence of natural enemies offer ideal breeding conditions.

Quelea

The red-billed quelea is a common and destructive bird pest of ripening grain in many semi-arid parts of sub-Saharan Africa. Millet, sorghum, wheat and rice are the most frequently attacked crops. Migration is influenced by rainfall patterns that affect the availability of certain annual grass seeds, which are the staple food of this species. They migrate over distances of more than 1 000 km, consequently crossing political borders. Affected areas may lose most or all of their cereal crops.

QUARANTINE PLANT PESTS

Unlike migratory pests, quarantine pests can be introduced to a country in a multitude of ways and be relatively difficult to identify. There is no "worst" pest because impact depends more on local agricultural

conditions than on particular biological features of pests. Fruit flies, aphids and other pests of leafy vegetables and cut flowers are increasing in importance as transboundary pests.

Estimates of global losses from pests were made by Oerke *et al.*¹ for eight crops by region. These estimates were made for all pests, not only transboundary types. The authors found that pest-induced losses were more than 50 percent of attainable crop output. Insects caused destruction of 15 percent of crops, pathogens and weeds 13 percent each, and post-harvest pest infestations another 10 percent.

Traditional transboundary pests (for example plant seeds or long-lived timber pests) had long dormant stages and were found in dry commodities, such as grain, or in vessels, such as rats, aquatic species in bilge water, mosquitoes and zebra mussels. Trade in high-value horticultural commodities, transported by air, has brought more pests in cryptic stages. They hide inside fresh produce and packaging (for example fruit fly larvae, thrips and leafminers).

ANIMAL DISEASES

The introduction of animal diseases occurs in many ways. The most common occurrence is through live diseased animals and contaminated animal products entering a country either as imports or as food waste from international aircraft or ships. Other introductions result from the importation of contaminated biological products (for example vaccines) or germplasm (semen or ova); the entry of infected people (in the case of diseases that are transmittable from humans to animals); the migration of animals and birds; or even from natural spreading by insect vectors or wind currents.

African swine fever

African swine fever is the most lethal transboundary disease affecting pigs. It is also a virus disease that has shown a great propensity for sudden and unexpected international spread over great distances. This is often associated with the transportation of virus-contaminated pig meat products, including food scraps in waste from ships and aircraft. There are no vaccines against African

swine fever. It is endemic over much of eastern and southern Africa, where eradication is not feasible at present because of wildlife cycles of infection between warthogs and other wild pigs and ticks, and now also because of endemicity in uncontrolled village pigs. The only practical disease control measure for commercial piggeries is the denial of access to wild and village pigs through fencing and other sanitary precautions. There is, however, a long-term prospect of controlling African swine fever in endemic areas through the development and breeding of genetically resistant pigs.

Bovine spongiform encephalopathy

Bovine spongiform encephalopathy (BSE), caused by novel infectious agents – prions – was first detected in the United Kingdom in 1986. It has since spread to a number of other European countries, although the majority of cases have been in the United Kingdom (see Box 9, p. 262, on the spread of BSE). In cattle, it has been transmitted through meat and bone meal (MBM) feed

supplements containing infected particles from affected animals. It can spread to humans through the consumption of infected tissues. In humans, it causes a fatal neurological disease known as variant Creutzfeldt-Jakob disease.

Classical swine fever

Classical swine fever, or hog cholera, is a generalized viral disease that only affects pigs. The disease is endemic in much of South and Southeast Asia, where it is a constraint to the development of the pig industry. In Europe, it caused major outbreaks in the EC in 1997 and 1999. Recent outbreaks have also occurred in Latin America and the Caribbean.

Contagious bovine pleuropneumonia

Contagious bovine pleuropneumonia (CBPP) is often regarded as an insidious, low-mortality disease of cattle, but this assessment is based on experiences in endemic areas. In susceptible cattle populations, the disease can spread surprisingly rapidly and cause high mortality rates. The disease is spread with the movement of

infected animals, including acute cases and chronic carriers. Major CBPP epidemics have been experienced in eastern, southern and western Africa over the last few years. It currently affects 27 countries in Africa at an estimated annual cost of \$2 billion.

Foot-and-mouth disease

Foot-and-mouth disease is highly contagious and can spread extremely rapidly in cloven-hoofed livestock populations through movement of infected animals and animal products, contaminated objects (for example livestock trucks) and even wind currents. Vaccination is complicated by a multiplicity of antigenic types and subtypes. Substantial progress has been made towards the control and eradication of foot-and-mouth disease in several regions, notably Europe and parts of South America and Asia. However, outbreaks occurred in Argentina, Brazil, Greece, Japan and the Republic of Korea in 2000, and in the United Kingdom early in 2001. A serious outbreak in Taiwan Province of China in 1997 forced the

slaughter of 3.8 million pigs. Eradication can only be viewed as a long-term objective in parts of Africa because of the existence of wildlife reservoirs for the virus.

Newcastle disease

Newcastle disease is a virus spread primarily through bird-to-bird contact among chickens, but it can also spread through contaminated feed, water or clothing. Outbreaks occur in most parts of the world, and there have been two major pandemics over the last century. It is a major constraint to the development of village chicken industries, particularly in Asia and Africa. A large number of wild bird species can harbour Newcastle disease virus and, occasionally, the disease affects large-scale commercial poultry units in developed countries, despite tight biosecurity measures. Mexico experienced a major outbreak in 2000, in which 13.6 million birds were destroyed.

Peste des petits ruminants

Peste des petits ruminants affects sheep and goats. The

spread of this disease has been partly due to the inadequate international availability of an effective vaccine until recently, and also because small ruminants have perhaps not received adequate attention in disease surveillance and quarantine programmes in some regions. The Americas, Europe and Oceania are free from peste des petits ruminants.

Rift Valley fever

Rift Valley fever is a mosquito-borne viral zoonotic disease. The first recorded outbreak of the disease, in Egypt in 1977, caused an estimated 200 000 human cases of the disease and approximately 600 deaths, as well as large numbers of deaths and abortions in sheep, cattle and other livestock species. In 1997, 1998 and 2000, outbreaks of the disease in eastern Africa not only caused livestock losses and human deaths but also seriously disrupted the region's valuable livestock export trade to the Near East.

Rinderpest

Rinderpest is the most serious cattle disease known.

The Americas, Europe and Oceania are free from rinderpest, and it was eradicated from southern Africa during the first half of the twentieth century by the strict enforcement of cattle movement controls, quarantining of infected areas and selective "stamping out" of infected herds as well as vaccination in areas at risk. However, by 1962, rinderpest remained endemic over a large swathe of the pastoral regions of eastern, central and western Africa. Considerable progress has been made towards the eradication of the disease in India; however, it is endemic in Pakistan.

¹ E.C. Oerke, H.W. Dehne, F. Schonbeck and A. Weber. 1994. *Crop production and protection: estimated losses in major food and cash crops*. Amsterdam, the Netherlands, Elsevier.

for managing and addressing the economic impacts of pests and diseases. Next, emerging and evolving issues affecting countries in their efforts to combat transboundary pests and diseases are presented and, finally, the institutions and policies governing international responses are discussed, along with the question of how to finance transboundary control.

A HISTORY OF TRANSBOUNDARY PEST³ AND DISEASE CONTROL

Plant pests

Reports of desert locusts (*Schistocerca gregaria*) causing destruction and famine date back as far as 3 500 years when, according to the Bible, God sent locust swarms to Egypt as one of the ten plagues. Ancient locust plagues were also reported in the Koran. In a contemporary account of the 1747-1748 locust plague in Ethiopia, it is reported that the locusts “covered the land like a fog”, and “devoured all the grain”. A “great famine” ensued in which “all the inhabitants” of the *daga* (highlands) and all of the *qolla* (lowlands) are reported to have perished. The dead were said to have been so numerous that there were too few survivors to bury them.

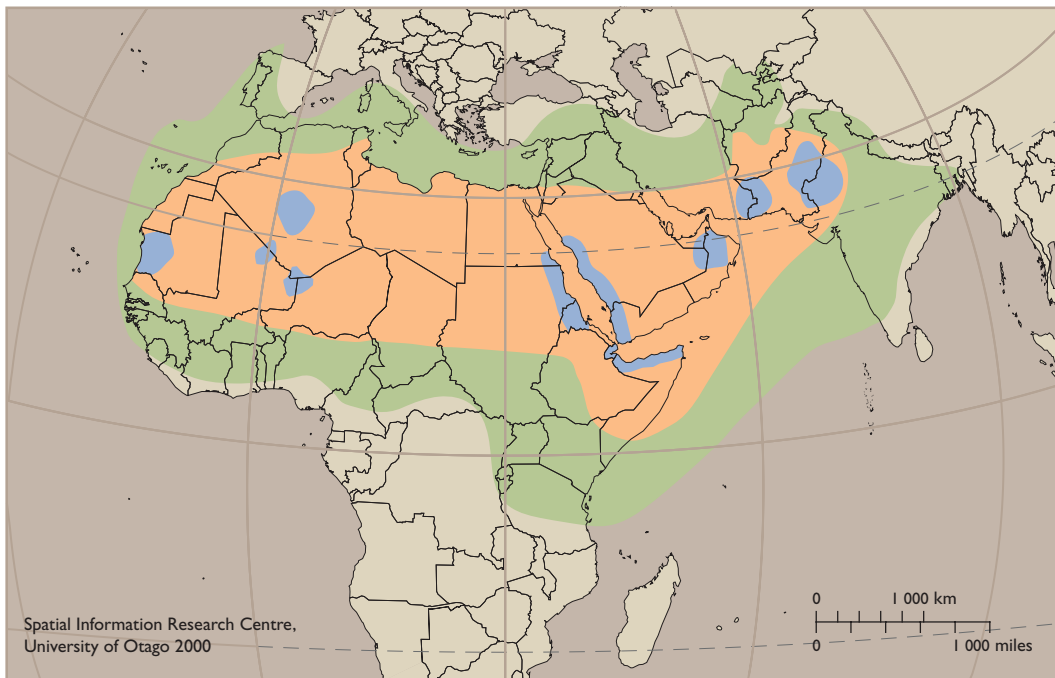
The frightening attacks of locusts that occurred in seventeenth-century Europe compounded factors such as wars, diseases and droughts, which had already created considerable insecurity in people’s lives. Systems of government intervention, including food distribution, compensation for damage and later control campaigns, became important at this time. During locust campaigns, a significant part of society was mobilized in attempts to prevent damage and to stop further spread of the insects. Initially, methods such as the digging of ditches to bury the marching, immature locusts (hoppers) were used. Later, arsenic bait was found to be effective. Within the past 50 years, aerial application of pesticides has become the main method of combating the pest.

The human-induced movement of plants and associated organisms has been important since the exploration of the New World, at the end of the sixteenth century, and of Australasia, from the eighteenth century. Non-native species were transported during voyages of exploration and via early trade in luxuries and spices – later supplanted by trade in food, beverage and fibre commodities.

In addition to cultivated agriculture, the introduction of crops and animals brought pests and diseases of significant social and economic impact. The early diseases moved quickly and were difficult to trace. Major potato crop failures from as far

Map 3

DISTRIBUTION OF THE DESERT LOCUST



Orange Invasion

Green Recession

Blue Gregarization area

Source: FAO

back as the early 1700s were associated with diseases imported from the Americas. Over time, the impact of introduced pests and diseases lessened as resistance and control measures were developed. The Colorado potato beetle, the next major potato pest to enter Europe (in the 1870s), was easier to see, slower to cause damage and more amenable to control. Possibly the first phytosanitary legislation was the Destructive Insects Act of 1877, passed in the United Kingdom to prevent entry of the Colorado potato beetle.

A global marketplace for major grains was solidified with the advent of the Industrial Revolution and the need to supply growing cities with raw materials for manufacturing. Before the Second World War, an estimated 30 million tonnes of grain

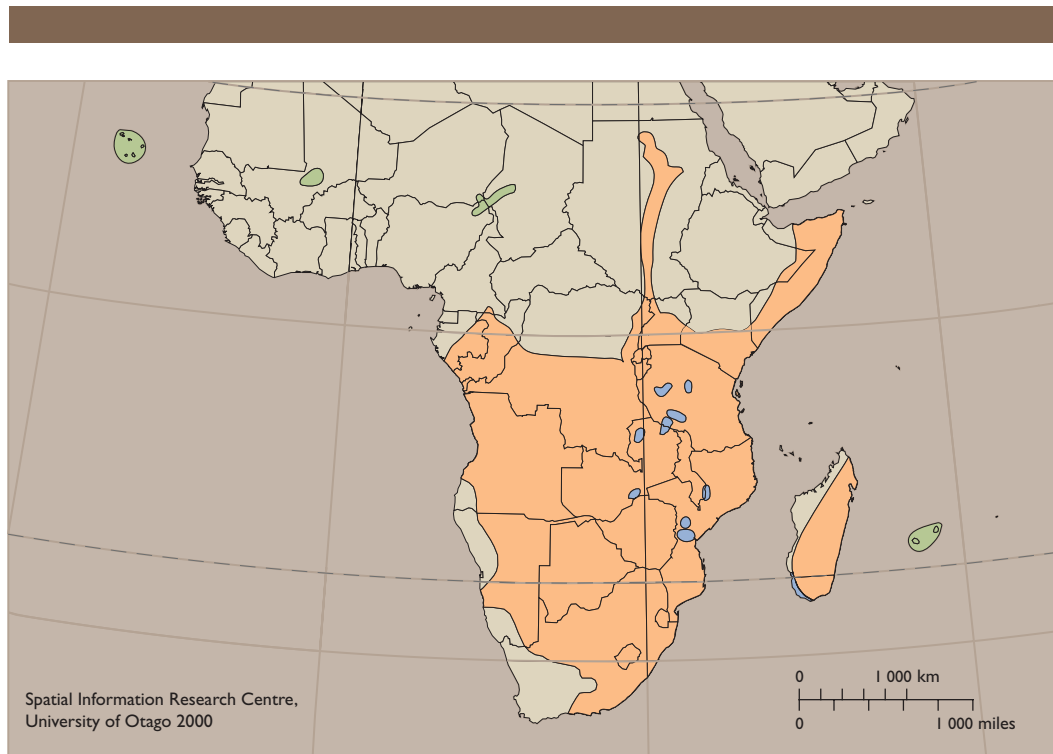
crossed borders every year. By the 1970s, increases in animal consumption raised the global demand for feed, and most grain pests became endemic. Today, about 250 million tonnes of grain are transported internationally every year. Growth in the trade of fresh fruit and vegetables is responsible for many of the quarantine pest problems today.

Animal disease

Many important infectious diseases of animals, such as rabies and anthrax, have been known from antiquity. One of the plagues of Egypt, described in Genesis, could have been an epidemic of Rift Valley fever. Cultural and religious taboos against eating some livestock species may have originated as

Map 4

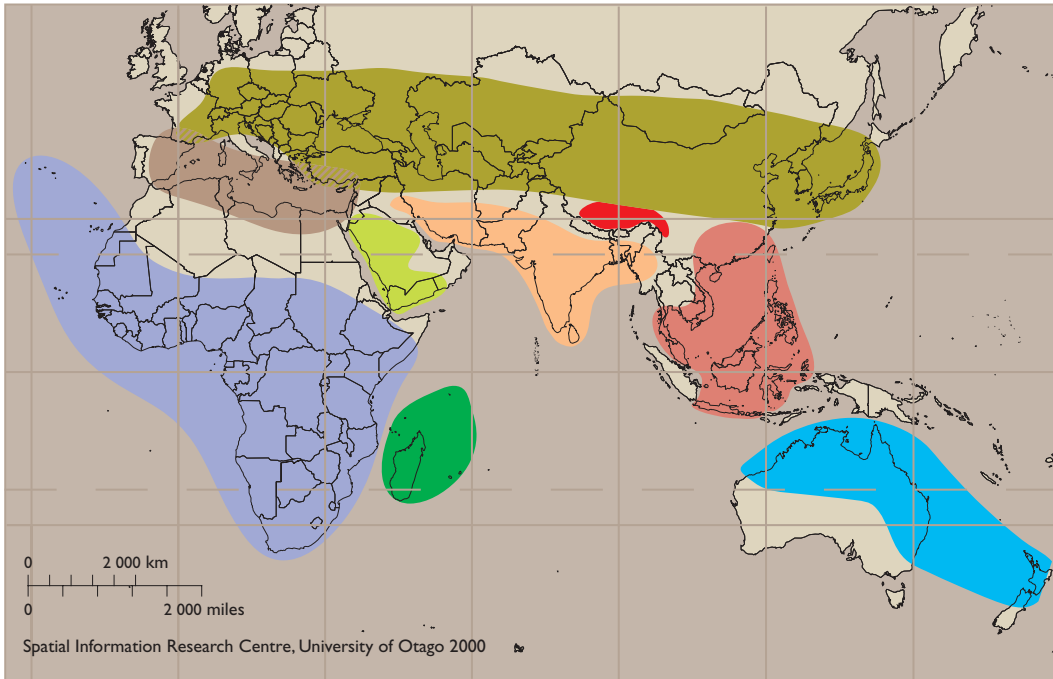
DISTRIBUTION OF THE RED LOCUST



Invasion
 Outbreak
 Substantial non-swarming population

Source: Centre for Overseas Pest Research. 1982. *The locust and grasshopper agricultural manual*. London

Map 5
GLOBAL DISTRIBUTION OF MIGRATORY LOCUST SPECIES



Source: Centre for Overseas Pest Research. 1982. *The locust and grasshopper agricultural manual*. London

hygiene protection against zoonotic diseases (i.e. diseases transmitted from animals to humans).

Little is known about the economic and social consequences of epidemic livestock diseases in early times. One exception is rinderpest. From a probable source in Central Asia, the disease swept into and through Europe, often during periods of war and social upheaval, causing countless cattle deaths and much human misery. The rinderpest crisis in Europe in the eighteenth century, and later in Africa, was probably the main stimulus for

Map 6

DISTRIBUTION OF THE SOUTH AND CENTRAL AMERICAN LOCUST



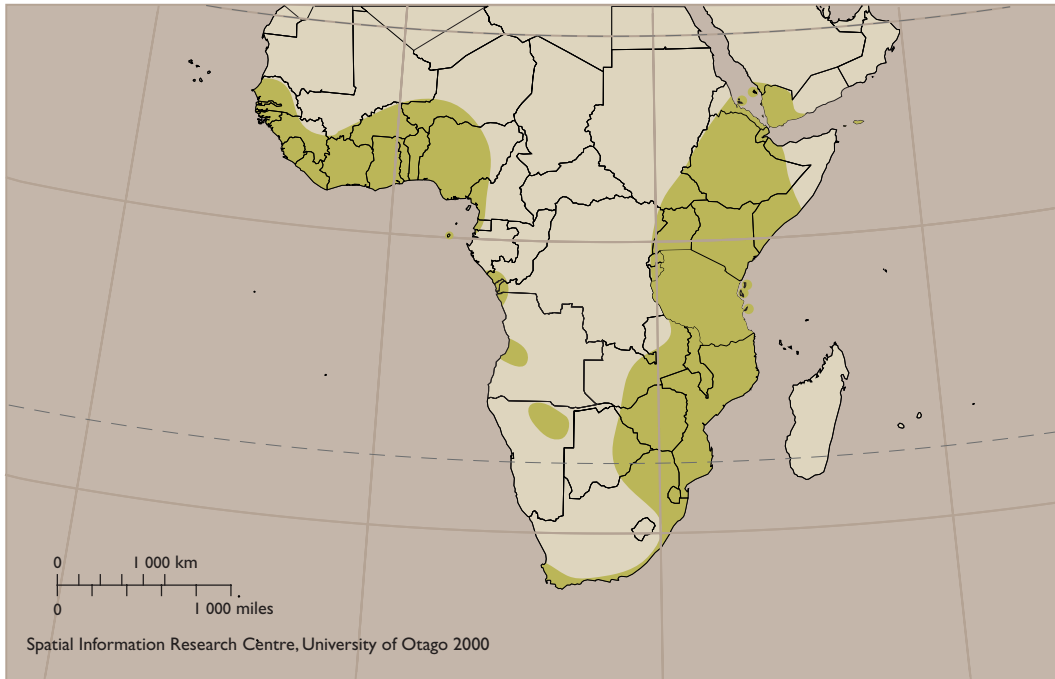
South American locust

Central American locust

Source: Centre for Overseas Pest Research. 1982. *The locust and grasshopper agricultural manual*. London

Map 7

APPROXIMATE DISTRIBUTION OF THE AFRICAN ARMYWORM IN AFRICA

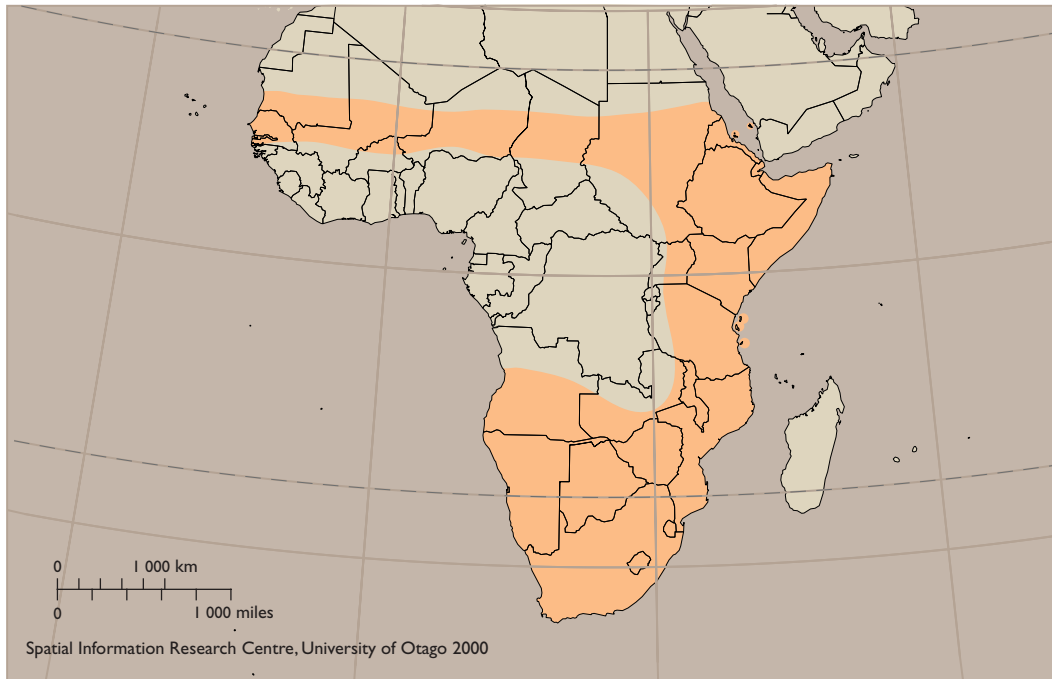


Sources: D. Rose, C. Dewhurst and W. Page. 1997. *The African armyworm handbook*. Nairobi, Desert Locust Control Organization; and FAO (EMPRES)

the development of effective veterinary services. It was in this period that the first modern veterinary schools in Europe were established, starting with Lyons in 1762, followed some time later by the first state veterinary services. Although rinderpest was eradicated from Europe by the end of the nineteenth century, it was re-introduced into Belgium in 1922 with imported Zebu cattle. This incident was directly responsible for the establishment of the International Office of Epizootics (OIE).

In the mid-nineteenth century, there was an explosion in the incidence and economic cost of epidemic livestock diseases which persisted well into the twentieth century. Diseases that advanced included foot-and-mouth disease, contagious bovine pleuropneumonia (CBPP) and classical swine fever. There were three main causes: first was the rapid intensification of livestock

Map 8

APPROXIMATE DISTRIBUTION OF THE RED-BILLED QUELEA

Source: FAO

production to feed the population explosion of the industrial age; second, improved transportation, ushered in by the steam age, enhanced international spread of both human and animal diseases; and, third, European colonization of other regions brought livestock into contact with new diseases that had previously only circulated in wildlife. Human encroachment into wild areas continues to be a source of disease spread.

REGIONS AFFECTED BY SELECTED TRANSBOUNDARY PESTS AND DISEASES

Certain basic conditions affect the likelihood of transboundary pests and diseases establishing and spreading in regions or countries.⁴ These include:

- climate;
- geographical isolation;

Table 43

IMPORTANT TRANSBOUNDARY MIGRATORY PESTS

Species	Region	Generations per year	Last plague
Desert locust	Africa, Near East, Asia	3-4	1986-1989
Red locust	Southern Africa	1	1930-1944
Migratory locust	Africa, Europe, Asia	Up to 6	1998-1999
Brown locust	Southern Africa	Up to 3	1985-1998
South American locust	South America	2	1946-1951
Central American locust	Central America	2	1939-1954
Moroccan locust	Africa, Europe, Asia	1	-
Italian locust	Europe, Near East, Asia	1	-
Senegalese grasshopper	Africa, Near East, Asia	1-3	-
Australian plague locust	Australia	2	1984
African armyworm	Africa, Asia, Pacific	4-8	-
Red-billed quelea	Sub-Saharan Africa	1	-

Sources: Centre for Overseas Pest Research. 1982. *The locust and grasshopper agricultural manual*. London; and FAO (EMPRES).

Table 44

PROPORTION OF REPORTED CASES OF SELECTED TRANSBOUNDARY ANIMAL DISEASES, BY REGION, IN 1997

Region	Foot-and-mouth disease ¹	CBPP	Rinderpest	Pest des petits ruminants ²	Classical swine fever	African swine fever	Newcastle disease ³
				(Percentage)			
Africa	1.8	99.6	... ⁴	97.2	0	100.0 ⁵	26.3
Asia	97.5	0.1	...	2.8	45.3	0	62.8
North America	0	0	0	0	0	0	0
Central America	0	0	0	0	15.7	0	0
South America	0.6	0	0	0	1.6	0	1.4
Caribbean	0	0	0	0	0.03	0	0.24
Oceania	0	0	0	0	0	0	0
Europe	0	0.2 ⁶	0	0	37.5 ⁷	0	9.8
				(Thousands)			
Total number of cases	1 177	24	...	344	108	392	2 504

¹ Cattle, buffaloes, small ruminants and pigs combined.

² Sheep and goats combined.

³ Poultry only, excluding wild birds.

⁴ Four outbreaks were reported but not the number of animals affected.

⁵ Ninety-five percent of these cases have been reported from Benin.

⁶ Portugal.

⁷ Excluding cases that occurred in the Netherlands, where 700 000 pigs were slaughtered to control the epidemic.

- crops and livestock produced;
- production systems used;
- hosts and vectors widespread in or native to the country;
- control methods used as part of routine agricultural management.

Maps 3 through 6 show the areas of impact of the major locusts in the world today. The recession area is the distribution of non-swarming (solitary) desert locusts. The gregarization area is where the transformation from the solitary to the swarming form frequently occurs. Preventive control is most important around the gregarization areas. Table 43 shows regions that experience damage from migratory pests and the most recent outbreaks of each.

In recent years, outbreaks of migratory pests have become less frequent for some species and more frequent for others, but the underlying reasons have not been fully understood. There has been a conspicuous decline in desert locust upsurges and plagues during the last 30 years, which might indicate successful preventive control operations or might have been caused by changes in the rainfall patterns in key breeding areas (or by a combination of both). The threats from quelea birds and armyworms do not reach such peaks of severity, but they cause more frequent problems for farmers. The distribution of these two pests is shown in Maps 7 and 8.

Table 44 shows the distribution of selected transboundary animal diseases. The data provide a rough overview of disease incidence by region.⁵

II. Factors determining the level of control

In recent years, the challenge of transboundary pest and disease movements has become greater, and the ability to regulate such movements has failed to keep pace. This has occurred in part because of the increasing need to integrate international considerations and consider private sector capacities in the design and establishment of effective protection services. Although the involvement of more stakeholders can lead to more effective and efficient decisions, it also complicates and lengthens the process of implementation. In spite of these trends, national considerations still drive decisions regarding protection against pests and diseases and responsibility rests primarily with national agencies.

A combination of the following national and international factors affects countries in their efforts to combat transboundary pests and diseases:

- Globalization, which has led to:
 - more and faster trade (more host material, more packaging and more opportunities for long-distance “hitchhiking”);
 - trade in fresh horticultural products, floricultural products, live animals and fresh animal products;
 - new travel and trading routes (e.g. from South Africa to Southeast Asia; from Southeast Asia to South and Central America).
- Conflict and civil unrest, which has led to:
 - difficulties in enforcing quarantine in many areas;
 - military and refugee movements;
 - a breakdown of institutional support for quarantine and loss of supply lines for materials;
 - increased smuggling;
 - inflows of food aid, which may be contaminated;
 - difficulties in obtaining access to border areas because of landmines and other hazards, thus making these areas difficult to survey.
- Concern about the effects of pesticides on the environment and human health.
- The privatization and deregulation of animal and plant health services in some countries.

Some countries are more vulnerable than others to invasions of transboundary pests and diseases. International cooperation is one way to reduce the disparity of control capacities and

resources between neighbouring regions or countries. When establishing international approaches to transboundary pest and disease control, it is important to identify the vulnerable regions, probable pathways and existing limitations.

Country and regional differences derive from perceived economic impacts, political conditions and civil unrest; regulatory regimes, including resources for prevention and enforcement measures and attitudes and views concerning risk; and biological and physical conditions.

ECONOMIC FACTORS

Because of the importance of national factors and financial resources in limiting the spread of transboundary pests and diseases, the poorer regions of the world are greatly affected. However, there is no direct correlation between country income levels and the ability of animal and plant protection measures to stave off threats to agriculture. In addition to the factors listed above, the following economic considerations affect efforts to prevent the spread of transboundary pests and diseases:

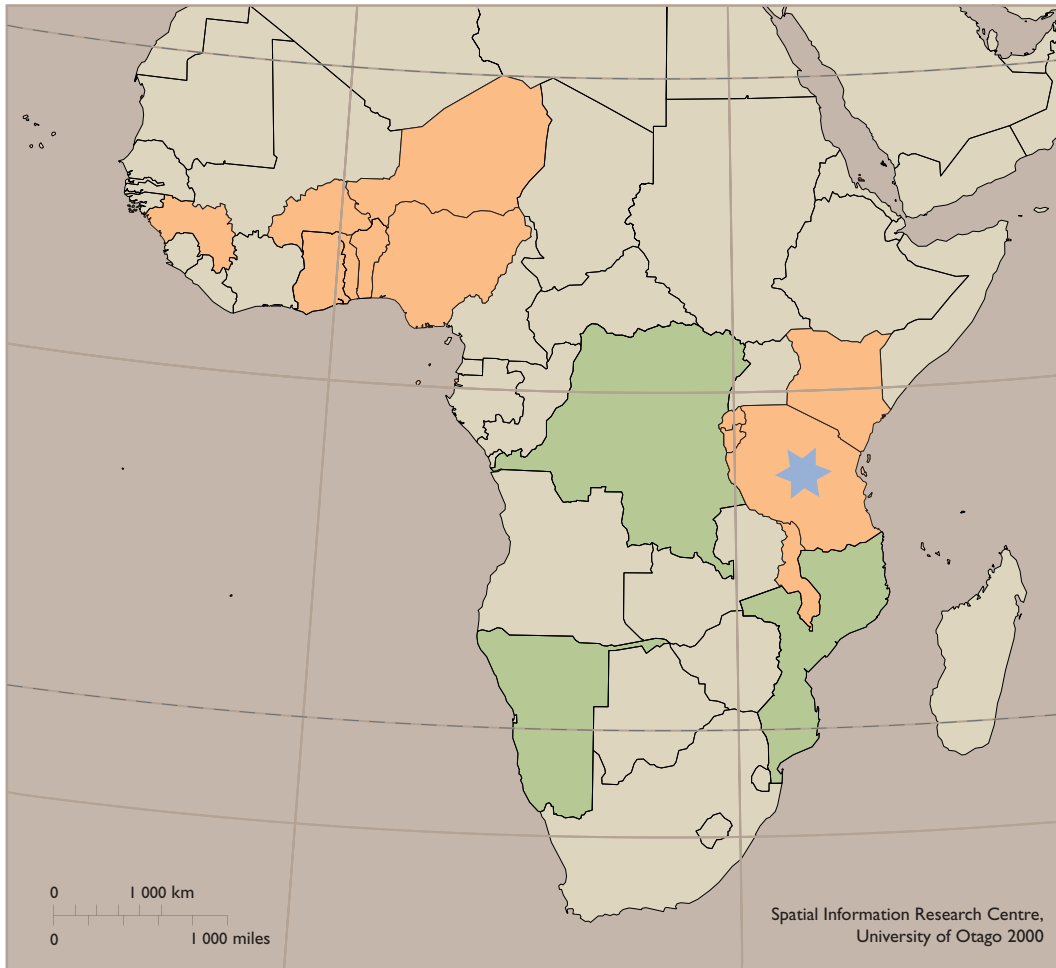
- The importance of agriculture in a national economy generally increases the resources allocated to quarantine. For example, China's food supply would be devastated by the introduction of a major exotic pig disease such as African swine fever. The country therefore has very strict import and border quarantine controls. Argentina and Brazil, to cite another example, allocate resources to the control of foot-and-mouth disease so as to be able to export meat to lucrative Asian and North American markets.
- Border controls that create significant price differentials for agricultural products (e.g. meat) between countries create a strong stimulus for clandestine movements across borders. For instance, livestock prices are normally higher where the major epidemic diseases are controlled. Thus, there is a price-driven trend of animal movements from areas of lower health status to those of higher health status, which creates the potential for spreading disease.

POLITICAL CONFLICT

The dissolution of the former Soviet Union and the formation of new trading blocs have increased the risk of pest and disease entry from neighbouring countries. The new governments have had to create new institutions and regulations for sanitary and

Map 9

INTRODUCTION AND SPREAD* OF THE LARGER GRAIN BORER IN AFRICA



Confirmed presence

Unconfirmed presence

Country of introduction

* The reported presence of the larger grain borer (*Prostephanus truncatus*) in African countries after its unintentional introduction in a food aid shipment, reportedly in 1979

Source: FAO

phytosanitary control. Different trading relationships have been formed from these political realignments, and they sometimes serve as pathways for the spread of transboundary pests and diseases. Improving sanitary and phytosanitary capabilities in these neighbouring countries may become an important way for countries with good quarantine systems to step up protection of their agriculture sector.

Civil unrest leads to the breakdown of phytosanitary and animal health controls as well as to the displacement of substantial numbers of people. Displaced people often attempt to take their belongings with them, including their livestock – and hence their diseases. It was in this way that rinderpest was introduced into Turkey by people seeking refuge in the eastern part of the country during the Iran-Iraq conflict in the late 1980s.

Areas where there is civil unrest or war are vulnerable to the entry of pests and diseases because of the lack of inspections and border controls and because of increased unregulated movement of military personnel and refugees. Foreign food aid has been accused of introducing unwanted pests into a number of countries throughout Africa. This was the case of the larger grain borer, unintentionally introduced into the United Republic of Tanzania in a food aid shipment in 1979 (see Map 9). The spread of the corn rootworm (*Diabrotica virgifera*) into Europe after an introduction into Yugoslavia as a result of military movements is well known.

REGULATORY REGIMES

Regulatory systems for managing transboundary pests and diseases are heavily dependent on the actions of both the government and private sectors. The effectiveness of such systems is determined by the level of resources that governments can provide as well as by the technical capacity that exists within the country concerned. The private sector has considerable responsibility in monitoring, inspecting and reporting. Different countries tolerate the risk of transboundary pest and disease entry to varying degrees.

Regulatory systems can also break down or be inadequate to respond effectively to new challenges faced in transboundary pest and disease control, either because of systemic deficiencies or because safeguards are evaded. For example, seven out of eleven primary outbreaks of foot-and-mouth disease that occurred in Europe between 1991 and 1996 are likely to have been caused by the illegal importation of livestock or livestock products.

for the medfly to move into Chile from other parts of South America.

Regardless of the ecological zone of movement, many plants, animals and microbes that are classified as pests are simply more invasive and manage to dominate over other species because of their adaptability or genetic elasticity. These species, or at times subspecies, can switch hosts or may already have a broad host range, thus allowing them to survive and establish in new geographic areas more effectively than their competitors. This biological mechanism is what makes introduced, or exotic, pests particularly harmful.

ECONOMIC RATIONALE FOR CONTROL

Most control measures are aimed at preventing the entry and/or spread of a pest or disease when a human action – such as trade or travel – or natural contagion could carry the organism into a previously unaffected location. Many individual pests and infected animals move across borders every year. The majority of these introductions do not activate an official response. This may be because the introduction is expected to have only a minor economic impact, it dies out in the country's environment, there is no capacity for detecting the introduction, or there is no known control measure that is effective.

However, some pest and disease movements pose a significant threat to national agriculture sectors and/or food security and therefore necessitate a response. The method of response is both a public and private decision and is dictated by the severity of the risk and extent of the impact. Two economic concepts, *public good* and *externality*, can provide a guide as to when control should be left to individual farmers and when it should involve public agencies.

A *public good* is one that offers benefits to a large group (potentially everyone) without reducing the amount of that good available to each person. The distinctive characteristics of a pure public good are non-excludability and non-rivalry in consumption. In contrast to a purely private good, such as the vaccination of an individual cow by a farmer, the provision of vaccine research is a public good that is often supplied by government. A problem that can arise with public goods is that of "free riding", in which people believe the good will be provided whether or not they pay a share of the cost. Furthermore, there may be incentives for individuals (or countries) to disguise their actual demand for such a good – sometimes understating it and sometimes overstating it, depending on their expected gain or potential cost burden.

An *externality* exists when the action (or inaction) of one individual (or enterprise) imposes costs on or creates benefits for another but the effect is not taken into consideration by the person (or enterprise) who carries out the action. An example of a negative externality is when a communicable disease affects livestock herds in a community, and one farmer chooses not to participate in the disease eradication programme. Although non-participation might be the best strategy for that farmer, it may create a reservoir of the disease in the area that could contaminate animals included in the eradication programme.

When a pest or disease affects only a small area and number of individuals (farms and others at risk), or if the consequences of an introduction are not severe, private responses from affected individuals can provide an economically efficient solution. The responses might be in the form of legal action or private negotiations, and will depend on the socio-economic conditions and risk tolerance of affected parties.

Similarly, when only one country or part of a country is affected by a pest or disease, the externality effects are relatively contained. The response is more likely to involve government action, but it may be based solely on domestic conditions and preferences and may occur relatively quickly. However, in the case of transboundary pests and diseases, large regions and many people are potentially affected by these threats, and proper management usually requires a regional or international effort guided by public authorities. This requires a system both for deciding which control decisions are supranational and which are national and for implementing international decisions efficiently.

The control of transboundary pests and diseases calls for the provision of public goods at the global or regional levels. The movement of pests and diseases across boundaries generally imposes a negative externality on a recipient country, which the country of origin has some obligation to prevent or minimize. The action taken by a given country to protect other countries from the invasion of pests and diseases through control measures and the provision of timely information can be considered a public good. As with the protection of human health, a global system of plant and animal health is a global public good, available to all countries and populations on an equal basis.

The specific aspects of pest and disease control that fall clearly within the realm of public goods are surveillance, information provision and research on improved methods of prevention or diagnostics. The development of agreed rules and

protocols can also be efficiently supported by public institutions, although success in this area depends on the participation of the greatest number of countries possible.

The framework offered by Jamison, Frenk and Knual⁶ in discussing human health also applies to the provision of international public goods in the domain of plant and animal health. They suggest that core functions should be provided internationally to all countries because they meet the definition of global public goods. These functions include information, standards and regulations, policy development and research and development. Additional functions should be provided to developing countries in the light of their scarce resources to provide for them, and in view of the externalities that are imposed on other countries if they are absent. These functions include enhancing the capacity and performance of the plant and animal health sector. The framework recognizes the interdependence of countries in the battle to control transboundary pests and diseases as well as disparities in the ability of countries to participate in the battle.

How much protection should be provided and by whom?

One challenge facing national and international authorities responsible for plant and animal protection is to determine how much protection is appropriate and who should be responsible for providing it.

Both questions can be answered more readily in theory than in practice. Actions to prevent the movement of pests and diseases across borders can be taken by individuals, by one or several country governments, by international organizations or by any combination of these. Efficiency requires that the effort invested in plant and animal protection by an individual, a government or an organization be proportional to the damage that would be caused in the absence of protection. Equity demands that the burden of providing protection be borne by those who impose the risk or allow it to spread (in the case of a preventable hazard) or those who benefit from protection against risk or, most often, a combination of the two.

In practice, it is difficult to assess the damage that may result from the introduction of a transboundary pest or animal disease. Countries use past experience, together with a scientific assessment of the organism, to judge the extent of the damage. In doing so, they should weigh the possible losses from an outbreak or introduction against the costs of taking action to prevent it. Yet, the difficulty of measuring both the scientific

likelihood and the economic extent of damage may prevent authorities from choosing the most efficient level of protection. Furthermore, the actual loss of crops or livestock that arises from a pest or disease can be far outweighed by the loss of trade opportunities for a country that becomes infested. Therefore, it is especially difficult to determine the proper amount of protection that a country should provide in cases where significant volumes of trade are at risk.

Until recently, the criterion for combating transboundary pests and diseases was to choose the more cost-effective of several control options, or to decide on an objective and aim to achieve it without regard to cost. However, the past ten years have yielded a greater number of studies examining both the costs and the benefits of pest and disease control – although largely still in developed countries – with a view to determining how much control is worth while in given situations. This greater scrutiny of control options has also occurred at the international level in compliance with WTO requirements for scientific studies to justify barriers to trade, including sanitary and phytosanitary measures (see Box 10, p. 272, on related international agreements).

Local, national and international control efforts (pesticides, vaccines, integrated pest management, etc.) against transboundary pests and diseases should be aimed at achieving the “optimal” level of protection (if it is known), where the marginal cost of control is equivalent to the marginal benefit.⁷ An international response is warranted if the damage – and hence the control effort – affects multiple countries. Thus, this approach would recommend additional spraying against the desert locust only if the benefits of an additional day of spraying (in terms of damage averted) would exceed the cost – including environmental or other hidden costs – of spraying for one more day.

It is far more difficult both to calculate and to meet such a clearcut standard at the transboundary level than at the national level. Transboundary pest and disease scenarios do not have the same uniformity or history of research as do national control experiences to support decision-making. Scientific uncertainty makes economic analysis difficult. Furthermore, control programmes involve multiple governments and organizations whose risk acceptance and willingness or ability to reduce risk vary.

The issue of who should provide protection is also more complicated in practice than in theory. Largely as a result of the globalization of trade in agriculture, pest and disease control is

increasingly driven by countries' global interests, although domestic agriculture sectors remain a major influence. Countries' international obligations are guided by the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (see Box 10, p. 272). National policy is determined by economic and political factors, both domestic and international.

A country is expected to take reasonable action through its quarantine system, or through other built-in responses in the case of migratory pests, to prevent the spread of transboundary pests and diseases. Importing countries are also expected to have safeguards in place to prevent spreading if an introduction occurs. However, it is not always clear what a country's obligations are in preventing the spread of transboundary pests and diseases. Not all of these pests and diseases are likely to affect all countries; hence, countries will not be equally willing to participate in a control effort. In addition, even if a country is vulnerable to a transboundary pest or disease, its government may feel that its own control mechanisms are adequate to prevent damage domestically and therefore be unwilling to participate in an international control campaign.

Countries may not meet their obligations to prevent the spread of transboundary pests and diseases for several reasons. For instance, technical and scientific knowledge about the spread of pests and diseases is often incomplete and inexact. It is expensive to conduct the kind of economic and environmental impact studies required by the donor community or trading partners. Second, countries do not all have access to the same technology or institutional response capacity.

A third complication arises from the "free rider" problem of public goods. This is because all countries can benefit when the goods are provided and, therefore, countries become reluctant to carry out unilateral control efforts. Moreover, for political or humanitarian reasons, donor countries often foot the bill for protection services that help other countries combat pests and diseases. Because of differing incentives, donor countries may provide insufficient protection relative to the "optimal" amount required, while countries that are in need of protection from transboundary pests and diseases may overstate their need. Affected countries may also see disincentives to adopting practices that improve or maintain their systems of transboundary control. This situation arises, for example, when migratory pests begin in one country and move to others. Expenditures for desert locust control have exceeded \$500 million over a ten-year period (1987-1996) and have largely

been funded by donor countries as opposed to affected countries (FAO,1998).⁸ Some observers believe that conflicting incentives among countries involved in regional desert locust control organizations have resulted in insufficient funding of monitoring and prevention operations, although the stated need for protection is very high. Incentive-compatible solutions can be devised but they require more complicated financing arrangements – such as copayments – or better information on the actual risks and costs of locust invasions.

Ultimately, it is understood that even good systems are not infallible and pests and diseases do spread. The globalization or regionalization of regulatory and control systems has many benefits, however, in reducing negative externalities and expanding the beneficiaries of public goods.

After it has been determined that an international response is warranted, the different control strategies needed for migratory and quarantine pests and diseases must be considered. The choice of approach depends on how the risk is spread (via natural pathways or via humans), the severity of damage if introduction occurs, and the nature of control options. International authorities must also consider whether their role involves the provision of public goods only – such as surveillance and research – or also the establishment and coordination of protocols and control efforts.

The primary goals of any control programme against transboundary pests or diseases are, first, to establish the “optimal” level of disease or pest presence to meet a country’s goals and, next, to choose the most cost-effective way of achieving that level of control. For instance, a policy of pest or disease freedom is a high standard that can impose significant costs on a country. This standard is attainable if the following criteria are met:⁹

- a review of costs and benefits suggests the standard is desirable;
- there is a realistic assessment of export market potential;
- the distributional impacts within the country are acceptable;
- means to fund the necessary control actions and institutions are identified.

Lower standards are more efficient if the above criteria are not met. The “optimal” level of control can vary from one country to another, depending on the results of analysis.

Control of migratory pests

The control of migratory pests raises the most obvious transboundary issues, as pest populations can expand quickly

from a localized outbreak to an upsurge, with serious infestations occurring simultaneously in several areas and neighbouring countries. The fast initial multiplication may occur unnoticed in remote and unpopulated areas and follow a natural (biologically induced) pathway. Once cropping areas are invaded, there is rarely sufficient time to prevent damage through control operations.

The widespread destruction that can accompany an outbreak or swarm of migratory plant pests makes it a political imperative for many countries to attempt control. Because of the high proportion of migratory pest damage occurring in poor regions, there is added pressure to prevent impacts on scarce food resources. Control is carried out as a response to the appearance of migratory pests, with the main effort aimed at eradicating them once they appear in significant numbers. The primary response is widespread pesticide spraying in affected areas once these have been defined. The rapid identification of early stages of swarms in the country of origin is critically important to minimize the damage to other countries.

This presents a classic externality issue: the inaction of one or more countries can impose major damage on other countries. The country paying for control may not face the same risk of damage as surrounding countries. The major decision faced by national governments and international organizations is in timing the response: which can be either in the early stages of gregarization or after swarms have arrived at their destinations. It is not clear from the science and history of experience which is the most cost-effective, but the cost burden falls on different countries depending on this decision.

Control of quarantine plant pests

Changes in trade flows and trade practices over the past 20 years have increased the number and diversity of risks to plant health faced by national governments. The rapid increase in leisure travel by the public is also a contributing factor. Unlike migratory pests, the introduction of quarantine pests normally involves human intervention, either by importing products or accidentally or deliberately smuggling them into a country. Most of these introductions are undetectable and, although most are also harmless, without improved detection methods for pests with cryptic life stages, exclusion efforts will not be successful. This problem is chronic for the control of virus and other disease organisms that are not readily observed at the time of inspection.

The challenge of quarantine plant protection is the fast pace

of change occurring in trade flows and technology. Because of the ease and multiplicity of ways in which invasive species can move, countries with important agriculture sectors must carefully assess risks to their production from plant pests on a frequent basis. Those countries engaged in international trade must be particularly vigilant in their normal prevention efforts (monitoring, inspection, etc.), but they must also maintain an ever-higher technological capacity to detect and prevent pests. In order to comply with sanitary and phytosanitary obligations, they must also devote resources to risk assessment. Because of a scarcity of data, this requirement can be a burden for developing countries.

Control of animal diseases

As with quarantine plant pests, the primary responsibility for controlling the spread of animal disease belongs to the country of origin as well as the receiving country. Both face the burden of requiring elaborate quarantine systems, as well as the risk of production losses – and worse if introductions occur. Yet the capacity of countries to provide these services frequently varies.

Animal diseases are spread either through natural pathways or human intervention. The transmission of certain diseases requires an insect to serve as a vector, which relies on external environmental conditions and possibly appropriate plant hosts to carry out its life cycle.¹⁰ Therefore, for biological reasons, these disease pathways have limited geographical scope, which simplifies the task of identifying pathways for disease transmission compared with plant pest introduction.

In regions with a good veterinary infrastructure the movement of livestock and derived products is regulated and controlled to prevent the entry and subsequent spread of exotic disease agents. Furthermore, disease surveillance systems with good laboratory diagnostic support are maintained to ensure the early detection of disease outbreaks and contingency plans are in place to respond rapidly to an epidemic. In addition, emergency funds have been set aside and farmers usually receive at least partial compensation for losses incurred. In many countries, however, public funding of veterinary services is insufficient and even declining. Diagnostic capacity is poor and livestock movements are uncontrolled. Farmers are not usually compensated for disease losses.

III. Economic impacts of transboundary pests and diseases

TYPES OF ECONOMIC IMPACT

The economic impacts of transboundary pests and diseases can be complex and go beyond the immediate impact on the directly affected agricultural producers. Some of the possible effects are illustrated in Figure 36. In specific cases, the actual economic impact will vary depending on factors such as the type of transboundary pest or disease, but the complexity of the effects often makes precise measurement of the economic impacts very difficult.

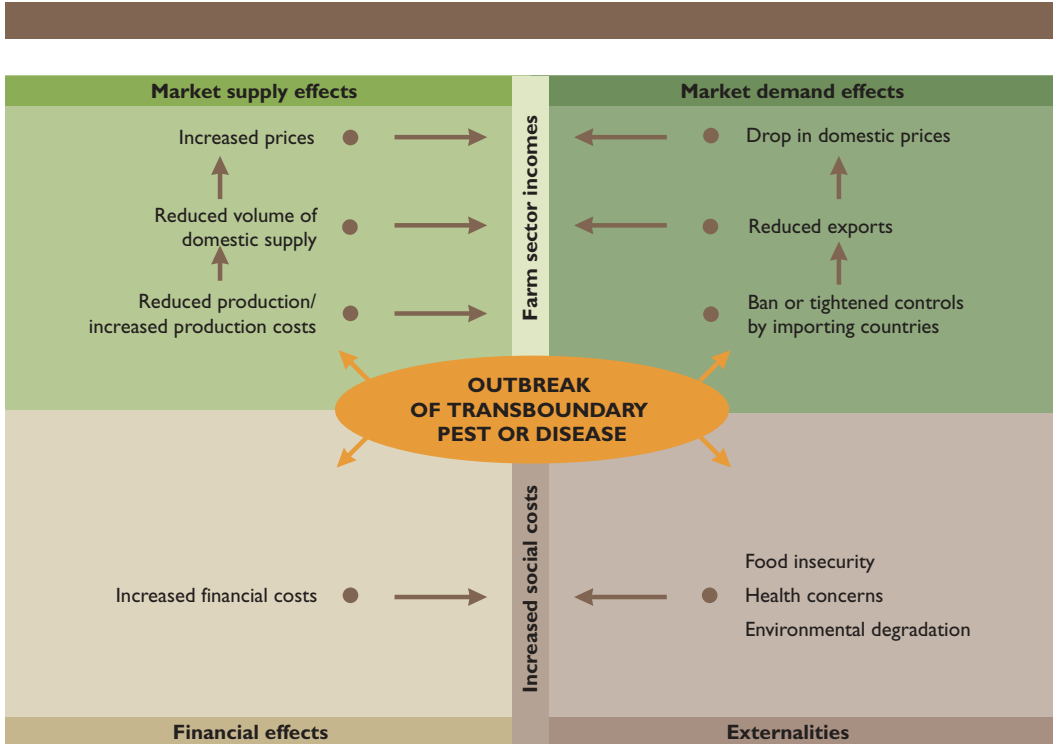
Production

The most direct economic impact of a transboundary pest or disease is the loss or reduced efficiency of agricultural production – whether it be of crops or animals – which reduces farm income. The severity of the economic effect will depend on the specific circumstances. If the farm economy is relatively diversified and other income opportunities exist, the burden will be reduced. Conversely, if the local economy is heavily dependent on one or a few vulnerable commodities, the burden may be severe and local food security impaired.

The impacts of reduced productivity on crops or animals can be long-lasting. Pest infestations can impair fertilization rates or seed recovery, while pesticide applications can harm soil and water fertility. Diseases can have lasting effects on livestock output in a number of “hidden” ways (such as delays in reproduction, leading to fewer offspring and the consequences of a reduced population) which often exceed the losses associated with clearly visible illness.

Although the loss of output from a transboundary pest or disease may appear easy to identify, it can nevertheless be difficult to measure in precise economic terms. Indeed, such an economic evaluation should not simply measure the value of lost output by multiplying estimated physical loss by the market price. This may exaggerate the likely economic impacts of damage. Actual economic impacts also depend on adaptation by farmers as well as possible market adjustments. Among the ways in which farm communities can respond are replanting,

Figure 36
POTENTIAL ECONOMIC IMPACTS OF TRANSBOUNDARY PESTS AND DISEASES



Source: FAO

releasing stocks or selling assets and engaging in non-farm income earning activities.

For these reasons, the welfare loss may be less than the value of lost output.¹¹ Only if the farmer livelihood responses are very restricted, or the community economy is heavily dependent on the commodity affected by the pest or disease, are the welfare losses likely to exceed the value of lost output.

Furthermore, the difficulty of distinguishing the production impacts of pests from other impacts – such as climate – has not been effectively overcome. Often, pest infestations and disease epidemics coincide with changes in climatic conditions, such as drought, early rains and other output-reducing events. The lack of record-keeping by farmers in developing countries adds to the uncertainty about how much a given change in production is attributable to pests or diseases, to weather, to farm management, or to other variables.

Price and market effects

In addition to impacts on production, there can be variations in prices, which are determined by the supply and demand effects induced by a transboundary pest or disease. Market effects can similarly induce variations in wages for farm and processing employment and can otherwise spread through to upstream and downstream activities. Depending on the market for the affected agricultural products, an infestation or outbreak can lead suddenly to higher prices (if most production is domestically consumed), or to lower prices (if most production is exported and quarantine prevents such export but not domestic consumption.) The relative effects of the production shortfall on producers and consumers depend on the relative elasticities of demand and supply, in other words the responsiveness of demand and supply to price changes. Negative price effects can also occur where consumer health concerns lead to reductions in demand.

Trade

Through the demand channel, introduced pests and diseases (mainly quarantine plant pests and animal diseases) can have major implications for farmers and countries that either produce for export or plan to export. Countries that are free from major pests and diseases will tend to protect their local agriculture by totally excluding the importation of products from areas affected by pests and disease or by making importation conditional to a series of precautionary measures. These trade implications of a transboundary pest or disease can have a greater economic impact than direct production losses. Conversely, the benefits of eliminating a transboundary pest or disease can be very large. The desire to gain access to high-value export markets is the driving force behind many plant and disease eradication efforts.

Food security and nutrition

Transboundary pests and diseases can often have significant negative impacts on food security and nutrition in developing countries. The growth of international trade in agricultural produce buffers the potential impacts on food availability, but there can still be major impacts on poorer communities that do not have access to substitute supplies. The food security impact is the paramount concern of many national policy-makers in developing countries and provides one of the main arguments in favour of international assistance for control programmes.

Human health and the environment

The main threat to human health arises from zoonotic diseases. Such contagion appears to have increased in recent years, perhaps owing to increasingly intensive livestock production in areas of proximity to human populations.¹²

Increasing concern is arising over threats to the environment, either from pests themselves or from the control measures used against them. Control measures have become a matter of serious concern since attention has focused on pesticide dangers and stockpiles of unused pesticides. There is also growing concern about invasive species, brought in by trade or movements of people, which dominate or otherwise harm the native ecology.

Financial costs

There are also budgetary implications of transboundary pests and diseases. Control measures generally involve budgetary outlays, including for inspection, monitoring, prevention and response costs. Demand is also often put on governments to extend financial assistance to the affected producers. The costs of some of these measures are proportional to the size of the agriculture sector being protected, while others are less closely related. Regarding the benefits of control measures, the benefits of prevention and emergency preparedness are generally not directly apparent, as they depend on assumptions about avoided costs of infestations and outbreaks.

EMPIRICAL STUDIES OF ECONOMIC IMPACTS

Published literature on the economics of transboundary animal diseases and their control is relatively scarce.¹³ A certain amount of unpublished literature exists, but it has a specific emphasis on the commodities that are most important for individual countries. Data on crop losses from pests are not very reliable in developing countries and have generally been derived from site-specific tests rather than from systematic research sponsored by governments.¹⁴

The existing literature is mainly focused on a small number of individual developed countries, concentrated on one affected commodity, and specific to a particular outbreak incident. It suffers from several serious omissions. Analyses in economic impact studies are often limited to effects on production, with relatively little regarding subsequent impacts on prices, trade or secondary and tertiary market effects. Neither do they include information on farmers' adaptation to the pest or disease problem. The literature rarely includes costs of international

control activities, externality costs either of outbreaks or control efforts, or infrastructure costs. Longer-term impacts, the dynamics of response to outbreaks and farmer or community adaptation are also universally lacking.

The results of the existing studies almost always demonstrate a net benefit from the control of transboundary pests and diseases, although such conclusions may be premature – for a number of reasons. The first reason is that studies of

Box 6

THREE STEPS TO ANALYSE IMPACTS OF PESTS AND DISEASES

The expected economic impact of introduced pests and diseases is the main basis for making decisions about their exclusion or control. In some countries, the law requires an economic analysis of costs and benefits as part of this decision process. Since 1995, the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) has required countries participating in international trade to base their sanitary and phytosanitary measures on international standards or risk assessments. Three types of analysis have been used or proposed to inform the decision-making process for management of transboundary pests and diseases:

- *risk analysis*, which identifies and quantifies risks and uncertainties as inputs into decision-making;

- *cost-benefit analysis*, which quantifies the costs and benefits of a specific management option;
- *risk acceptability*, which evaluates the preferences regarding risk and which may either guide a cost-benefit analysis or, in extreme cases, preclude any formal analysis.

Risk analysis

Risk analysis is carried out to identify and assess the risks and uncertainties associated with a hazardous activity and to identify management options that mitigate that risk. It consists of two stages: *risk assessment*, which is a positive or descriptive operation; and *risk management*, which is normative and essentially subjective.

In risk assessment, two major factors need to be determined: the *probability* of

transboundary pests and diseases usually examine a choice between control or no control. This is not necessarily an appropriate method of analysis because it tells nothing about the marginal decision faced by policy-makers: whether to carry out one more or one less unit of control. Thus, it cannot be used to determine what the appropriate *level* of control is.

Furthermore, studies generally measure crop losses rather than reductions in farm income. Crop losses are defined in

an event occurring (such as the introduction and establishment of a pest) and the *consequences* of that event. At the risk management stage, the *expected outcomes* of various management options can be examined in relation to *objectives*.

Risk analysis allows comparisons of the risks in the presence of mitigating efforts, such as pre-entry treatments, vaccination campaigns, inspections and post-entry control measures. In each case, the benefits of reducing risk can then be balanced against the costs. The results of risk analysis must confront a set of identifiable objectives. This step is subjective and depends on the risk attitude of the decision-maker. All major commodity-importing countries undertake some risk analyses for the most serious pests and diseases they face.

Cost-benefit analysis

Cost-benefit analysis is an objective process, intended to show the economic impacts of specific management options. Costs and benefits are projected over the relevant time period and for the population affected. Among the management options examined might be the level of exclusion, detection or response for a potential introduced species or disease. Cost-benefit analysis is important for assessing the economic returns from options that have impacts over time or that affect different populations.

A cost-benefit analysis may be expected to indicate the management option that has the greatest net benefit, but it does not by itself determine the best management choice. Non-economic criteria may be imposed, otherwise the risk analysis may limit the

available choices. For example, even an option with a benefit-cost ratio of less than 1 may still be desirable if it reduces an even very small risk of an unacceptable outcome. Insurance is an example of this.

The period of time considered in a cost-benefit analysis and the discount rate are significant when there are high initial costs (for instance, in establishing a detection system or undertaking eradication) and long or delayed benefits. The longer the period the greater the opportunity to gain benefits that recover the initial costs. However, a longer time period also allows for more uncertainty associated with the losses or benefits.

Intangible costs and benefits include aesthetic, option, existence and bequest values, all of which may apply to aspects of

terms of final yields or output, whereas the change in farmers' welfare is measured by loss of income, which depends on farm management choices, the possibility of compensation and other socio-economic factors. As an example, in the United States, farm production declines as a result of adverse weather or pests, but farm income may increase because of a combination of higher prices and government compensation.

Cost-benefit analyses for transboundary pest and disease

introduced organisms. Defoliating insects reduce the aesthetic impact of trees, and this can have an important value to homeowners and tourists, beyond the purely economic impact experienced by foresters and orchard owners. The presence of a destructive pest not only reduces yields for existing growers of a crop, it also reduces the option for new growers to grow that crop. The preservation of the existing natural environment in its original state may have an intrinsic value to many people. Finally, people may wish to pass on that natural environment in its original state to future generations.

These values may be significant compared with directly identifiable economic values for many introduced organisms, particularly in natural environments, and cost-

benefit analyses may need to take them into account. Contingent valuation, in which interested groups are asked to indicate their willingness to pay to prevent the loss of value, is one method that has been used to determine these values. Another method used is to calculate the expenditure people make in order to obtain or avoid similar benefits or losses.

Risk acceptability

In many cases decisions regarding the exclusion of unwanted organisms are based on the view that practically no risk is acceptable. This "precautionary approach" is sometimes taken when subsequent eradication of a pest or disease is unlikely to be achieved, since an introduction would be irreversible. An example of this is the use of "clean" lists, whereby only

organisms determined to have an economically acceptable impact are allowed to enter a country; all others are excluded. Such an approach may be taken in cases where the costs of undertaking a risk analysis are likely to be high relative to the marginal costs of exclusion. Alternatively, some introductions may be considered inevitable and not worth delaying, or they may be acceptable for some other reason.

Table 45

SUMMARY RESULTS OF SELECTED STUDIES ON THE IMPACT OF TRANSBOUNDARY PESTS AND DISEASES

Pest/disease	Period	Country/region	Estimated losses from outbreaks or benefits from control	Type of impact analysed	Study source
MIGRATORY PLANT PESTS					
African armyworm	–	Kenya, Ethiopia and United Rep. of Tanzania	Cost of control: \$10-\$16/ha Potential damage: \$11-\$15/ha	Financial and production	1
African armyworm	During outbreaks	Sub-Saharan Africa and southwestern Arabia	Losses: 20-60% of production	Production	1
Grasshopper	1986	Sahel	Losses: 15% of production in outbreak year (with control)	Production	2
Quelea birds	–	Sahel	Losses: 5% of national production (but up to 100% locally)	Production	3
Quelea birds	–	Savannah Africa	Losses: 1% of production	Production	4
Australian locust	1984	Australia	Net benefit of control: \$97 million	Financial and production	5
QUARANTINE PLANT PESTS					
Mediterranean fruit fly	–	United States	Potential loss: \$800 million/year (if it became established)	Production and trade	6
Fruit flies	–	Egypt	Losses: \$100 million/year	Production and trade	7
Fruit flies	–	Pakistan	Losses: \$200 million/year	Production and trade	8
Carambola fruit fly	–	Latin America and the Caribbean	Potential net benefit of control: \$709-\$938 million over 12 years (Potential benefit of suppression is less than half this amount)	Benefits and costs	9
Alien weeds	–	United States	Losses: \$35 billion/year	Total economic cost	10
Alien insects	–	United States	Losses: \$20 billion/year	Total economic cost	10

SUMMARY RESULTS OF SELECTED STUDIES ON THE IMPACT OF TRANSBOUNDARY PESTS AND DISEASES

Pest/disease	Period	Country/region	Estimated losses from outbreaks or benefits from control	Type of impact analysed	Study source
ANIMAL DISEASES					
Rinderpest	Different periods	Ethiopia, Kenya, Uganda and United Rep. of Tanzania	Benefit/cost ratio of control campaign: 1.35:1-2.55:1	Net benefit	1 1
Classical swine fever	–	Haiti	Losses: \$2.7 million/year (10% reduction in potential offtake)	Production	1 2
Foot-and-mouth disease	Early 1980s	Kenya	Losses: KSh 230 million/year (1980 value)	Production	1 3
Foot-and-mouth disease	1996	Uruguay	Benefits of eradication: \$20 million actual and \$90 million potential additional annual export revenue	Trade	1 4
BSE	2000	United Kingdom	Losses: £5 billion (from slaughter and lost markets)	Trade, production and financial	1 5

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management options generally deal only with direct costs and benefits. External costs or benefits to others who are not directly involved (nearby farmers, consumers) and environmental considerations are usually omitted.

The following sections look at studies of the different types of economic impacts caused by the presence or threat of migratory pests, quarantine pests and, finally, animal disease. There are two types of study: the first measures the proportion of potential output lost from infestations and outbreaks of pests and diseases, sometimes with monetary values attached; and the second type provides a monetary cost-benefit estimate of control efforts. The results of some of these studies are summarized in Table 45.

Economic impacts of transboundary migratory pests

Impacts on production, prices and trade. Two types of study have been conducted on the impacts of migratory pests: estimates of potential damage, and cost-benefit analysis of control efforts. Estimates of potential crop damage from migratory pests in the absence of control have been made by measuring damage as a proportion of total feasible output. Estimates of damage during outbreaks and plagues range from 100 percent of the planted crop to insignificant losses, depending on the year, country and pest species (see sources 2, 6, 16 and 17 in Table 45).

During outbreaks of the African armyworm, estimated grain losses in individual locations have reached as much as 60 percent (5). Grain losses in Sahel countries during the grasshopper outbreaks of 1986 were estimated to be 15 percent, in spite of control operations (16), in contrast with the 2 percent lost in non-outbreak years between 1992 and 1994 (6). Damage to cereal crops by quelea birds in specific locations could be as much as 100 percent but was estimated to be about 5 percent nationally in Sahel countries (9) and at about 1 percent for all of savannah Africa (17).

These estimates imply that migratory pests can cause substantial damage to crop production locally, but the losses often appear to be relatively contained on a national scale. Some studies may overestimate the potential crop losses caused by migratory pests. They rarely account for farmers' response to mitigate the effects of pests and are often based on calculations of optimal production conditions. In both ways, they may overstate the losses caused by the pests. They are also based on estimates of production in the absence of specific migratory pests.

Cost-benefit analysis looks at both the estimated losses from the migratory pest and the cost of trying to prevent losses. However, it is difficult to calculate the threat of pest damage in these studies. Preventive control is the preferred action of responsible international bodies (including FAO) against migratory pests¹⁵ and, in most countries, major campaigns are mounted as soon as outbreaks and plagues of migratory pests begin. Therefore, the actual crop damage reported in recent years does not reflect the situation that would have developed if no control had been initiated.

Another complicating factor is how to assess the impact of a campaign on subsequent pest generations. For example, one well-timed campaign may prevent the movement of locust swarms to other regions where extensive campaigns would have been required for a number of years. The damage that would have resulted over such long periods in the absence of control is not directly measurable.

Recent analyses have combined actual, but limited, data with a theoretical modelling approach to assess impacts of the desert locust. In FAO (1998), Joffe¹⁶ used a simulation model to estimate both the costs and the benefits of desert locust control. These were analysed by estimating the difference in crop losses with and without control (by simulating what losses would have been in the absence of control) and comparing those benefits to actual control costs (average of fixed and variable over a period of years). Joffe concluded that generally accepted control methods were technically effective but not economically efficient, owing to poor information, poor management and excess expense.

Belhaj¹⁷ studied the impacts of desert locust on agriculture in Morocco and the Sudan during the plagues and upsurges of the 1980s and 1990s. During these periods, extensive control campaigns were carried out both within the Sudan and in its neighbouring countries. Belhaj found no evidence of harm to agricultural yields from desert locust invasions. In fact, high cereal production levels were reported in invasion years in the Sudan. This surprising result is due in part to the coincidence of locust invasions with years of good rainfall, leading to higher yields and greater land area in production.

Nonetheless, the sudden and dramatic localized damage that can be inflicted by migratory pests is still the justification for trying to control the pests when they appear. There is great fear of the desert locust on the part of farmers in affected countries. A survey of farmers in the Niger showed that 57 percent consider the desert locust to be the largest threat to

their production of pearl millet throughout their farming lifetime, but other pests were mentioned as the greatest problem for any given growing season.¹⁸

Since these results have become widely known, there have been calls for control efforts to concentrate more on a strategic approach in primary breeding areas and less on widespread spraying of affected areas. Farmers in Morocco and the Sudan have expressed a willingness to pay for alternative strategies.

Given the likely economic inefficiency, why do decision-makers continue with current policies? Some point out that risk aversion by policy-makers is the strongest factor upholding the status quo, while net benefits tend to be overestimated by the omission of some important factors such as farmers' adaptation and excluded costs.¹⁹

Studies of other migratory pests have been carried out by focusing on estimated damage in the absence of control and comparing them with direct costs of control operations. Thus, these studies have the same drawbacks. In all likelihood, they give an incomplete picture of the true net benefits of pest control.

Without control efforts, the 1984 Australian locust plague would have resulted in lost output of an estimated \$A 103 million. Control costs were \$A 3.4 million; actual damage was \$A 3.6 million. The control costs, therefore, were far lower than potential damage.²⁰

The costs for controlling armyworm outbreaks in Ethiopia, Kenya and the United Republic of Tanzania and were compared with estimates of potential damage in the absence of control. The value of saved crops ranged from \$11 per hectare (average between January and June) to \$15 (average between October and December) whereas, for ground control operations, costs were usually less than \$10 per hectare, and costs of aerial control operations averaged \$16 per hectare. Therefore, the control costs closely approximated the value of saved crops.²¹

Impacts on food security. The effects of migratory pest damage on the food security for a whole country have not generally been analysed, but studies have tended to find that, because of improved rainfall, production is higher in locust years than in years when locusts are not present.²² This effect means that any widespread impact on food security is unlikely, and it also tends to reduce price effects. Joffe found that the production of coarse grains in Mali was up by 44 percent from the previous year in the locust and grasshopper year of 1985/

86 and prices for grain in rural areas were severely depressed. Similarly, large harvests were expected in affected countries in 1993 and 1994 during desert locust upsurges.

However, at the local level, food security can be temporarily threatened when a rural area is not well connected to distant markets, when stockpiles are low or non-existent or when non-farm income opportunities are low. An example of this was observed in 1988 in the Sudan, where several districts experienced production shortfalls of 50 percent while national output was diminished by only 7 percent.

Economic impacts of quarantine plant pests

Impacts on production, prices and trade. The economic damage caused by fruit flies has been the subject of more study than other quarantine pests because of the threat they pose to a country's ability to export and because of the effectiveness of detecting their outbreaks. Studies have focused on production losses, together with estimates of foregone trade, in the event of infestation. Research has not been carried out on the implications for prices, labour costs and food security.

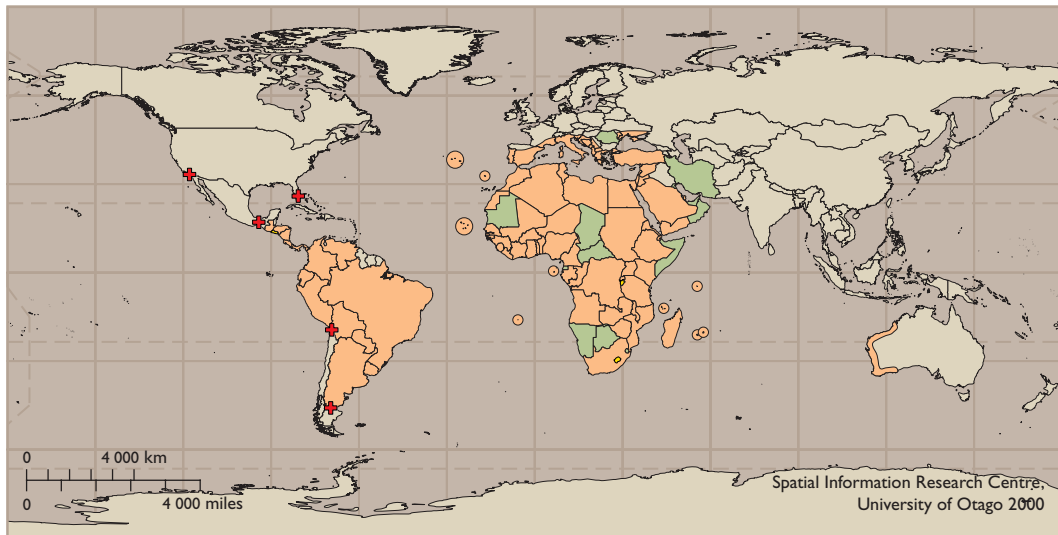
Based on existing volumes of trade and phytosanitary restrictions, the Mediterranean fruit fly (see Map 11) would cause more than \$800 million per year in lost output and trade if it became established in the United States.²³ Again including both production and trade losses, the economic impact of fruit flies (from both the endemic Mediterranean fruit fly as well as the newly introduced peach fruit fly) in Egypt is projected to be as much as \$100 million.²⁴ A similar economic study in Pakistan found economic losses caused by *Bactrocera dorsalis* and *B. zonata* fruit flies of approximately \$200 million annually, with a disproportionate impact falling on small farmers.²⁵

A study of the economic feasibility of eradicating the carambola fruit fly shows net benefits of between \$709 million and \$938 million (1995 value) over a 12-year period, while the net benefits of suppression would be somewhat less than half this amount.²⁶ The study examines the effects of suppressing or eradicating the fruit fly across its potential range of 12 countries in and near the Caribbean region. The benefit figures include the value of crop production protected and the continuation of exports. The costs refer to expenditures for control and eradication efforts.

A serious production impediment in many developing countries is the spread of introduced weed species, which results in much greater manual weeding, generally by women, for staple crops such as maize and rice. Hand weeding is often

Map 11

GLOBAL DISTRIBUTION OF THE MEDITERRANEAN FRUIT FLY IN 1999



+ Eradicated with sterile insect technique (SIT)
 ■ Established
■ Current status unknown

Source: Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture

the main limiting factor in determining the area of rice, maize and other important food crops that can be cultivated by subsistence farmers. The extra labour demand it implies reduces the amount of land that can be farmed as well as the productivity of the farming activity. Weed infestation accounts for production losses of 44 percent of potential output in Asia, but only 4 percent in Africa.²⁷

A different problem arises when pests are listed as quarantine pests but do not in fact cause severe damage. This situation can arise when information on the pest is lacking, or tools to control it once it is introduced are unavailable, as well as in response to industry demands for protection. The costs include lost trading opportunities as well as the direct costs of implementing quarantine. The eventual solution may be for all countries to drop restrictions on these less damaging pests. This outcome is entirely dependent on a scientific panel ruling at WTO in the event of a trade dispute.

Impacts on the environment. The impacts of plant pests on biodiversity and other ecological functions are causing environmental advocates to have a growing interest in sanitary and phytosanitary issues. Most environmental impacts of introductions have not been quantified, if indeed they have been identified. There are examples of both intentional and unintentional introductions, however, that are known to have caused extensive damage to a native environment.

A study of 79 alien species introduced into the United States since 1900 estimated the cost to native species to be \$96 billion.²⁸ Another study has put the annual cost of non-indigenous species at \$123 billion, with \$35 billion incurred by alien weeds and \$20 billion by alien insects.²⁹ Such figures may or may not be accurate, but they suggest a strong need to examine the spread of invasive species around the world more systematically. The cost to agricultural industries and to native environments could become the most serious burden of globalized trade.³⁰

Economic impacts of animal diseases

Impacts on production and prices. All transboundary animal diseases have the potential to kill affected animals, but the severity of the disease will vary depending on factors such as the species and breed of animal, its age and nutrition and the disease agent. Many transboundary animal diseases have mortality rates of between 50 and 90 percent in susceptible animals. Rift Valley fever normally produces only a mild infection in local African breeds of cattle, sheep and goats, while exotic breeds of the same species may experience severe spates of abortion. Under experimental conditions, some “mild” strains of classical swine fever virus kill less than half of the infected pigs while other “virulent” strains may kill up to 100 percent. The first outbreak of rinderpest in East Africa in 1887 was estimated to have killed about 90 percent of Ethiopia’s cattle and more than 10 million cattle on the continent as a whole. Widespread famine resulted.

Reductions in mortality and improvements in animal productivity are the traditional goals of disease eradication programmes. Access to export markets is now becoming an equally important reason. Improved response to outbreaks and increased access to vaccine have reduced the likelihood of many disease epidemics, but this experience is countered by increased trade, smuggling and susceptibility of small poultry and ruminant populations raised in intensive conditions.³¹

The only international cost-benefit analysis of animal disease

control is a study of the Pan-African Rinderpest Campaign in Ethiopia, Kenya, Uganda and the United Republic of Tanzania.³² The study estimated the production losses attributable to rinderpest with and without the control campaign and found benefits exceeded costs in each country. The benefit/cost ratio ranged from 1.35:1 to 2.55:1. As mentioned in relation to the desert locust cost-benefit studies, there are many variables that are not considered in a simple evaluation of costs and losses that might lead to an underestimation of the costs and/or an overestimation of the benefits of a control campaign.

Most analyses of animal disease do not include the cost of treatment, perhaps because it is regarded as minor. As with measurements of costs and benefits of desert locust campaigns, loss estimates are based on what the damage might have been in the absence of control. The effects of disease on animal productivity depend on the actual disease incidence, which may be reduced by a control campaign.

The economic loss from animal mortality continues to accrue because of lost productivity over the time period until the original population size has been re-established.³³ For example, the continued presence of classical swine fever in Haiti, with recurring outbreaks, has been estimated to result in a reduction of potential offtake of 10 percent, or 38 000 pigs, per year. At an average price of \$70 per slaughter pig, this would amount to an annual reduction in income of \$2.7 million for the local smallholder producers.³⁴

Productivity losses can persist even in animals that survive disease. Abortions caused by Rift Valley fever do not only entail the loss of offspring but also the loss of one lactation and thus reduced milk supply for human consumption in the year following an outbreak. Foot-and-mouth disease leads to considerable loss in milk production in dairy cattle. In Kenya, losses caused by foot-and-mouth disease in the early 1980s amounted to KSh 230 million (1980 value) annually, approximately 30 percent of which were due to reduced milk production.³⁵

The transitory effect of outbreaks on prices of livestock and livestock products can be exemplified by the most recent epidemics of classical swine fever, CBPP, Rift Valley fever and foot-and-mouth disease in Haiti, Botswana, the Horn of Africa and Taiwan Province of China, respectively. In each case, there were sharp upward or downward movements in domestic prices, depending on the supply effect on the local market: where animals for domestic consumption were slaughtered, prices

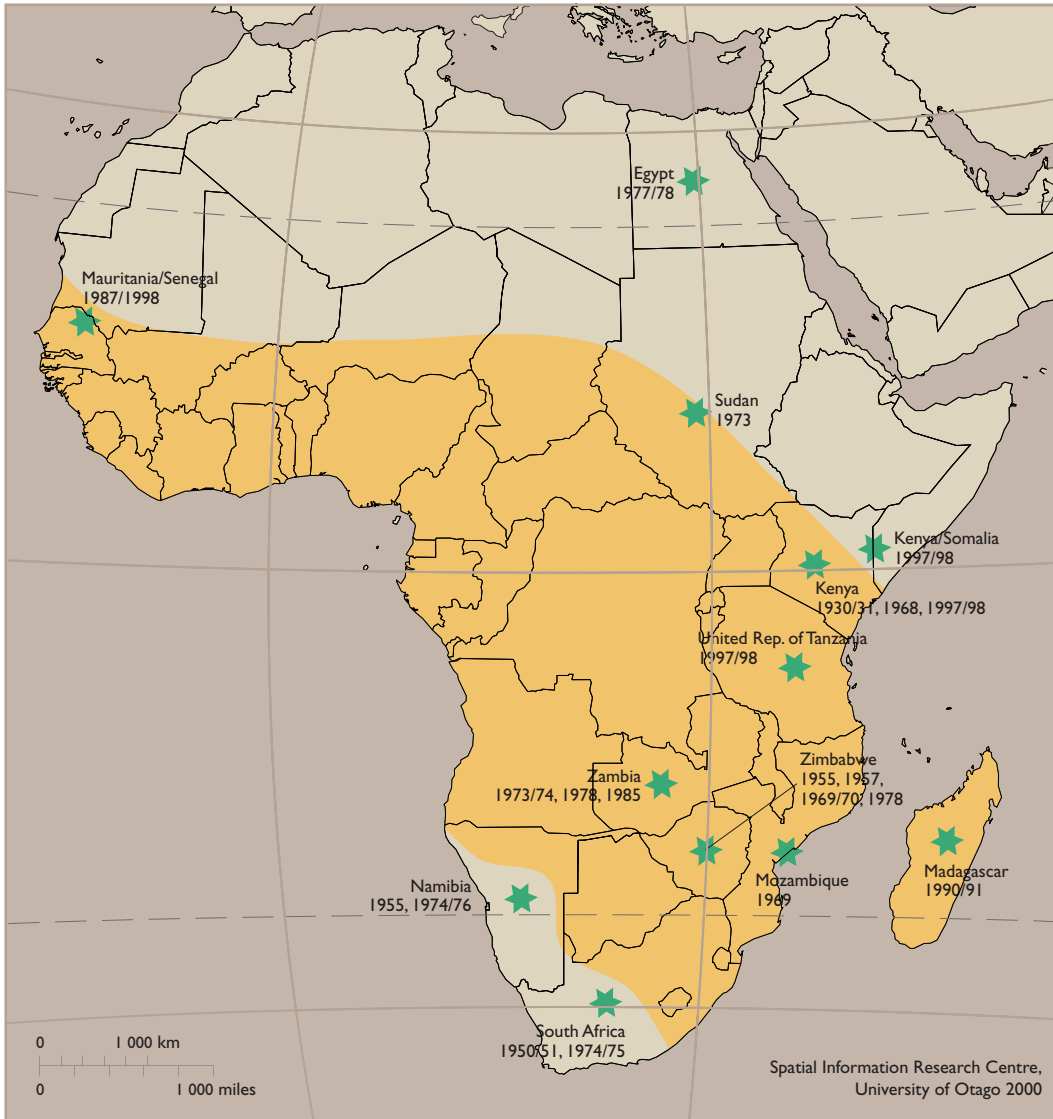
rose; where animals for export were sold domestically, prices dropped. Consumer health fears in some cases also reduced demand and prices. However, in none of these cases is it known how long price impacts lasted.

Impacts on trade. The 1997/98 outbreaks of Rift Valley fever in eastern Africa severely affected the pastoralist economy of the Somali region, although the region itself only experienced minimal incidence of the disease. The economic impact on the region stems from the ban declared by Saudi Arabia on all livestock originating from the Horn of Africa. Until 1997, approximately 3 million animals, mainly small ruminants, had been exported annually through the Somali ports of Berbera and Bossasso, generating more than 90 percent of all the foreign exchange receipts of Somaliland. After the imposition of the ban, livestock exports through the above ports dropped by more than 75 percent. The region's economy came close to a standstill because foreign exchange for the purchase of imports such as grains, sugar, medicines and fuel was scarce. In urban centres, a large proportion of the shops closed and prices of commodities such as grain and sugar skyrocketed, while the purchasing power of the general population declined dramatically.

Uruguay provides an example of a country that is gaining access to high-value markets after the eradication of foot-and-mouth disease. Uruguay was officially recognized as being free from foot-and-mouth disease without vaccination in 1996 and has consequently been able to take advantage of its export quota of 20 000 tonnes of beef to the United States. Exports increased by more than 100 percent by weight and 52 percent by value after the country was declared free from the disease. The higher price obtained for its beef in the United States relative to its sale on the domestic market – more than double in the case of chilled meat – has been estimated to provide an additional revenue to the country in the order of \$20 million per year. In the medium term, access to Pacific Rim markets was estimated to provide Uruguay with potential additional revenues of more than \$90 million per year. Prior to the disease's eradication, Uruguay was spending between \$8 million and \$9 million annually on foot-and-mouth disease vaccination.³⁶ Therefore, control costs are currently about 50 percent of revenues but may eventually be as low as 10 percent of revenues from exports alone.

Studies in Bolivia and Thailand found that control of foot-and-mouth disease would be financially worthwhile only if it

Map 12
RIFT VALLEY FEVER IN AFRICA



Probable endemic zone

Major epidemic

Source: FAO

allowed entry into export markets, thereby increasing prices for farmers.³⁷ The steps needed to enter export markets and maintain an emerging export industry can be costly. Countries need to impose sanitary and phytosanitary measures, such as inspection and testing of imported livestock, and prevent illegal smuggling of potentially diseased animals. However, once a country has reached a disease-free state, it is likely to take extraordinary measures to protect it. Based on a risk reduction strategy, the preferred response to an outbreak of CBPP in Botswana was slaughter and compensation for farmers, rather than vaccination, surveillance and movement control – even though the latter cost only 78 percent of the former.³⁸ This is because slaughter guarantees disease-free status sooner and provides opportunities for trade.

Impacts on community development. In some cases, the agriculture sector in a community is extremely undiversified, and the threat or appearance of a particular pest or disease can undermine the entire economy. An example is the important link between cattle farming and the Botswana macroeconomy. The introduction of CBPP led to slaughter of more than 300 000 cattle in Ngamiland, the worst-affected province. The immediate result was the closure of the export meat processing plant, which employed more than 200 people before cattle were destroyed. Exports then came to a standstill. In Ngamiland, the livestock sector was a very important catalyst for the overall economy, and a survey of the business sector after the eradication campaign showed that business turnover had generally declined by an average of 15 percent, which was attributed to the loss in disposable income from cattle. The indirect effects were further estimated to be more than seven times the amount attributed to direct losses.³⁹

Impacts on food security and nutrition. Unfortunately, no quantitative information on the impact of transboundary animal diseases on food security and nutrition could be found in the published literature. As mentioned above, impacts on food security are expected to be minor and short-lived, as long as substitute food sources exist and the community has either purchasing power or emergency assistance. For those countries that can afford multiple sources of supply, the globalization of markets reduces the impact of localized shocks from disease.

In poor countries and communities, however, other threats to food security and nutrition can arise from animal diseases. Livestock, in particular, contribute indirectly to food security

and nutrition as a source of protein, micronutrients, animal power and tradable assets. However, McLeod and Leslie⁴⁰ caution against a conclusion that livestock disease control is always beneficial to the poor. It is necessary to study the production system, costs and methods of control before assessing the distributional impacts on subpopulations in a country.⁴¹ The authors conclude that an export-oriented programme of disease control will benefit the poor only if the sector is already export-oriented or if targeted policies that include poor farmers are included.

Impacts on human health and the environment. Some animal pests and diseases can affect humans directly and even more may use animals as vectors that aid transmission. Areas with conflict or poor health controls pose a greater risk of human infection from animal disease. Larger production units and increased contact among animals also increases the impact of outbreaks.

The phenomenon of animals infecting humans (zoonosis) occurs even in highly developed countries with excellent sanitation, as has been demonstrated by BSE and vCreutzfeld-Jakob disease in some European countries (see Box 9, p. 262, on the spread of BSE).

The majority of transboundary animal diseases do not cause epidemics in humans, although occasionally humans can become infected. The viruses causing rinderpest, peste des petits ruminants, classical swine fever and Asian swine flu, as well as the causative agent of CBPP, are not infective for humans. Foot-and-mouth disease virus has been isolated from around 40 people worldwide following a mild course of disease.

Rift Valley fever virus can infect humans, where it causes a febrile illness, which is sometimes complicated by haemorrhage, encephalitis and blindness. The virus is transmitted among animals and from animals to humans by certain mosquito species, which gives rise to the distinct association of Rift Valley fever epidemics with periods of high rainfall. Humans also appear to contract the infection through direct contact with infected tissues and fluids of animals at slaughter. In 1977/78, a major epidemic occurred in Egypt, with an estimated 200 000 human cases of the disease and about 600 deaths. It is believed that up to 500 000 people became infected with Rift Valley fever during the 1997/98 epidemic in eastern Africa, of which about 500 may have died from the haemorrhagic form of the disease.

Animal diseases directly affect the size and composition of



FAO/20093/A, WODAGENEH

Checking pesticide stocks in storage

Pest outbreaks are erratic and difficult to predict so there is a danger that more pesticides than needed will be ordered or that the pest will migrate out of the country before their arrival

animal populations and thus indirectly have repercussions on the environment. In conjunction with other environmental factors, major livestock diseases determine which production system, species and breeds of animals are adopted by livestock owners. Thousands of hectares of fertile land in Africa remain underutilized as a result of animal trypanosomiasis leading to increased population pressure on land in adjacent disease-free areas.

Impacts of control methods

All campaigns against invasive species of pests tend to occur over large areas, thereby affecting a significant amount of territory and people. Use of pesticides in an effort to control pests, both introduced and indigenous, can lead to serious health effects in developed and developing countries. Control of animal diseases is far less risky to people and the environment. Again, economic impacts of these health effects have not been measured.

It is widely understood that pesticide use can be dangerous to farmers, nearby exposed populations and the affected environment. There are almost 5 million cases of pesticide poisoning in developing countries each year.⁴² WHO has estimated that there are 3 million severe human pesticide poisonings in the world each year, with approximately

220 000 deaths. While developed countries use about 80 percent of the world's pesticides, they have less than half of this number of deaths. It is not known how many of these poisonings should be attributed to control measures against transboundary plant pests.

However, pest eradication or the prevention of spreading can require pesticides for a shorter term and in a smaller area than would be employed if the pest were to spread. Therefore, it is important to balance the risk of pesticide use for control at different stages of pest outbreaks against the potential negative impacts. Few experts believe that pesticide use is currently at optimal levels.

Concerns remain about worker exposure, residues on food and harm to domestic and non-target wild animals. Fish and invertebrates are frequently vulnerable, especially aquatic arthropods (see sources 8 and 10 in Table 45, p. 234). The effect of locust control operations on honeybees has also been a problem in certain areas (16).

Stocks of obsolete pesticides have also become a serious health and environmental problem in many countries of Africa and the Near East. Since pest outbreaks are erratic and difficult to predict, there is a danger that more pesticides than needed will be ordered or that pests will migrate out of the country before the pesticides arrive. As a consequence of the need to be prepared for initiating a control campaign at short notice, stockpiles of pesticides can be found in many of the countries affected by migratory pests. Often they are not stored correctly, which has resulted in corroded containers, lost labels and release of the chemicals into the environment.

The affected countries regard pesticide stockpiles as a very important problem that requires urgent attention, especially for stocks near urban areas where there is a risk of the pesticides contaminating drinking-water, food or the air. However, in general they lack the resources and technology to mount appropriate disposal campaigns. Progress has been made in recent years by assisting countries during clean-up campaigns as well as by establishing improved storage conditions, more careful planning and systems for donating surplus stocks to other countries.

Findings from the economic studies

As mentioned earlier, published economic studies on the impacts of transboundary pests and diseases and on their control are relatively scarce and generally limited in scope, focusing on specific countries, commodities and cases of

outbreaks. Their frequent methodological limitations were also mentioned: impact analysis is often limited to immediate production impacts, without considering more indirect market effects, dynamic responses or farmers' adaptation to transboundary pest and disease outbreaks or longer-term impacts.

There is no uniform and widely used approach to the economic assessment of the impacts that transboundary pests and diseases can have. The studies that deal with migratory pests tend to focus on the immediate production impacts. They show that impacts can be quite significant but that they are frequently quite localized, with relatively less significant effects occurring at the national level. Local food security can nevertheless be temporarily threatened.

Studies on quarantine plant pests have focused both on production losses and on foregone trade, both of which can be very significant. Existing studies show large potential losses from pests and significant benefits from control efforts.

Studies on animal diseases have also focused on impacts on production and trade. Losses have been shown to be potentially very substantial for both. There are also examples of the closing of export markets causing major economic damage in general to developing countries. Studies on control efforts and eradication programmes have revealed instances of significant returns in terms of expanded trade opportunities. Although most animal diseases do not cause epidemics in humans, human health concerns can in some cases augment the damage from transboundary pests and diseases; the spread of BSE in Europe is a case in point.

The results of the existing studies almost always demonstrate a net benefit from control of transboundary pests and diseases. However, because of the general methodological problems affecting many studies, it is premature to conclude that this will be true in all cases. The evidence may thus require further scrutiny owing to problems such as insufficient data, overestimation of actual economic losses, neglect of secondary effects and externalities in transboundary pest and disease control. Indeed, specific studies have revealed certain externality costs associated with eradication and control efforts.

IV. Managing transboundary pests and diseases and their economic impacts

OPTIONS FOR CONTROL

A variety of management options exist when local, national, regional or international authorities face decisions on transboundary plant pests and animal diseases. The following sections focus on procedures for choosing the most appropriate action.

Farmers commonly encounter pests around their crops and deal with disease incidence in their livestock. Modern pest management does not attempt to eliminate all pests but tries to create an environment that maintains the pest populations at low densities. On-farm management is different from the control of transboundary pest and disease movements, the goal of which is to prevent the entry of a population that can reproduce and survive in the new location. Migratory pests are usually initially absent from the agricultural environment but arrive suddenly in large numbers and frequently cause destruction before any control methods can be implemented. Likewise, many animal diseases are too virulent or threatening to human health and trade relationships to tolerate, even at a low level. Therefore, prevention is still a key element in the management of migratory pests and animal disease.

Table 46 shows the range of phytosanitary measures used to manage transboundary plant pests and animal diseases. The measures are shown according to where the risk occurs: exclusion measures address the risk before it arrives in the regulating country; safeguards are imposed to reduce the risk in the regulating country (often at borders or first points of entry); and the control of and adaptation to an introduction (entry and establishment) or eradication of the disease occurs in the regulating country.

Reducing the probability of entry

Quarantine is the first line of defence against transboundary plant pests and animal diseases, and countries allocate considerable resources for implementing effective border and import quarantine policies and programmes to prevent

introduction. Quarantine is seen as a public good and government responsibility, since individual farmers and private veterinary services are relatively powerless to avoid or overcome introductions. Countries indicate their quarantine policy through lists of restricted or permitted organisms or articles.

The prevention, control and elimination of transboundary pests and diseases is more than a national public good. Because of cross-border spread, effective protection is only possible through a concerted and coordinated effort among neighbouring countries. The control efforts of individual countries may be continually frustrated by neighbouring countries not taking equivalent action. An international approach also allows better advantage to be taken of natural geographic barriers and broader biological and epidemiological patterns.

A key aspect of effective exclusion and safeguards is accurately estimating risk. Methods used include modelling to predict the ability of an organism to survive under the conditions of a geographic area that is not yet affected. Tools such as geographic information systems (GIS) make it possible to combine and cross-analyse a large amount of visual and numerical data, such

Table 46

PHYTOSANITARY MEASURES FOR MANAGING PLANT PESTS AND ANIMAL DISEASES

Sequence of control measures	Reduce risk of entry	Verification of compliance ¹	Control or mitigation	Adaptation or acceptance
I. Conditions indicating need to take measures	<ul style="list-style-type: none"> Request to import new commodity, or to import from a new country Surveillance indicates change in pathway risk or epidemiology Policy review on existing pathways or pest status 	<ul style="list-style-type: none"> At entry and distribution points for commodities, seeds and live animals 	<ul style="list-style-type: none"> Outbreak or incursion detected and control options exist Natural pathway led to introduction, and control is deemed appropriate 	<ul style="list-style-type: none"> Impact found to be weaker than predicted Improved ability of farmers to adapt Control terminated after proving ineffective Pest or disease cannot be controlled with existing technology Cost of control exceeds benefits

Continued

¹ Not applicable to migratory pests.

PHYTOSANITARY MEASURES FOR MANAGING PLANT PESTS AND ANIMAL DISEASES (continued)

Sequence of control measures	Reduce risk of entry	Verification of compliance ¹	Control or mitigation	Adaptation or acceptance
2. Examples of measures to prevent introduction of pests and diseases	<ul style="list-style-type: none"> • Training, technical assistance, surveys and research in country of origin • Network with officials and experts in origin areas of risk • Review of interception lists • Development of restricted lists² • Inspection in country of origin • Trade restrictions allowing imports only from a designated free area in a country where a specific pest is present • Requirement for advance treatment of high-risk commodities • Analysis to find pathways for preventive action • Modelling to predict potential range of organism and survival parameters 	<ul style="list-style-type: none"> • Inspection: visual; random sampling; targeted by risk; x-ray, sound equipment, other; detector dogs • Review of permits, phytosanitary certificates, bills of lading • Isolation for observation period • Treatment, re-export or destruction in response to interception • Limited ports of entry according to type of cargo and/or risk • Limited market destination • Containerization for transit through vulnerable zone • Public education and “amnesty” bins at site of entry 	<ul style="list-style-type: none"> • Detection and delineation of infested zone • Monitoring of surrounding zone • Suppression, containment or eradication using: pesticide applications; baits and attractants; sterile insect release; quarantine stations; vaccines; stamping-out; biological control agents • Systems approach using a combination of measures • Treatment of crops or animals leaving the area to avoid spread • Emergency reporting systems to inform on movement to new areas (leads back to risk reduction measures) 	<ul style="list-style-type: none"> • Research into new control options for producers • Registration of new pesticide or vaccine that is effective in control • Creation of disease-free nursery stock certification and supply • Control programme to keep pest or disease at a tolerable level • Change in cultivation practices • Addition of water treatment for water-borne diseases
3. Reasons for failure of control measures	<ul style="list-style-type: none"> • Information non-existent or misleading • Treatment options limited • Pathway not yet recognized 	<ul style="list-style-type: none"> • Inspection fails because of large volume of entry, poor sampling, etc. 	<ul style="list-style-type: none"> • Failure of detection techniques • Insufficient number of traps or insufficient area monitored 	<ul style="list-style-type: none"> • Control methods not used by all producers • Pest or disease may become resistant to the control measures

Continued

¹ Not applicable to migratory pests.

² All measures may fail if there is inadequate funding or political will to implement them.

PHYTOSANITARY MEASURES FOR MANAGING PLANT PESTS AND ANIMAL DISEASES (continued)

Sequence of control measures	Reduce risk of entry	Verification of compliance ¹	Control or mitigation	Adaptation or acceptance
	<ul style="list-style-type: none"> • Host not yet recognized • Inadequate modelling data 	<ul style="list-style-type: none"> • Pest/disease is in cryptic stage at the time of entry or is difficult to identify or diagnose • Natural pathway not regulated • Smuggling of high-risk items • Transshipment obscures country of origin 	<ul style="list-style-type: none"> • Pesticide applications or baits not feasible, affordable or available • Vaccines not available 	<ul style="list-style-type: none"> • New populations or strains cause outbreaks of non-indigenous disease
4. Problems resulting from reliance on measures listed above	<ul style="list-style-type: none"> • Requirements to reduce risk become onerous • Trade dispute results from imbalance between risk reduction and free trade values • Consumers in importing country lose benefit of new supply 	<ul style="list-style-type: none"> • Delays in release of cargo, and passenger delays • Potential for violation of civil rights • Potential for increased smuggling 	<ul style="list-style-type: none"> • More severe environmental impact from control versus prevention • Repeated introductions lead to high costs when the original pathway is not closed 	<ul style="list-style-type: none"> • Secondary impacts from the pest may not be recognized initially • Control efforts are terminated after existence of pest or disease is accepted

¹ Not applicable to migratory pests.

Source: Adapted from M.M. Quinlan. 2000. Phytosanitary measures for managing regulated plant pests. *In* N.S. Price and L. Seewooruthun, eds. *Proceedings of the Indian Ocean Commission Regional Fruit Fly Symposium*, 5-9 June 2000, Mauritius.

as satellite-retrieved images of the earth's surface, climatological information, disease and livestock population data, and to produce predictions of disease spread. An example of GIS used in this way is the Programme Against African Trypanosomiasis (PAAT) Information System, designed to identify the impact of the tsetse fly and trypanosomiasis on agriculture, to locate areas where control is technically feasible and to determine where animal and human trypanosomiasis occur together.

Satellite data from remote sensing have potential in predicting insect-borne transboundary animal diseases, notably Rift Valley fever. There are major Rift Valley fever outbreaks in

parts of Africa at irregular intervals of 15 years or even more, when environmental conditions (including unusually heavy rainfalls with filling of surface ponds, warm and humid weather and increased vegetation cover) in areas at risk favour the emergence and massive multiplication of the mosquito vector of the disease. In the future, the prediction of El Niño phenomena and the determination of normalized difference vegetation indices (an indicator of the amount of rainfall that has fallen in an area) through remote sensing may prove to be cost-effective ways of providing several months' warning of Rift Valley fever outbreaks, although these methods have not yet been applied in practice.

Directly transmitted transboundary animal diseases are less amenable to remote sensing. Early warning of diseases for which animal movements are a major factor in spread (such as foot-and-mouth disease, CBPP and rinderpest) depend on a good understanding of livestock movement patterns and on-ground intelligence of where disease is active, although there is scope to foresee risk by predicting movement as a result of climatic events. GIS and predictive modelling have been very useful in predicting the wind-borne spread of foot-and-mouth disease in Europe, thereby providing early warning. Several temperate climate countries have, therefore, incorporated such modelling in their contingency planning of response to foot-and-mouth disease. Such systems require good clinical and serological surveillance and diagnostic capacities to confirm cases as well as effective communication, collaboration and information sharing among countries.

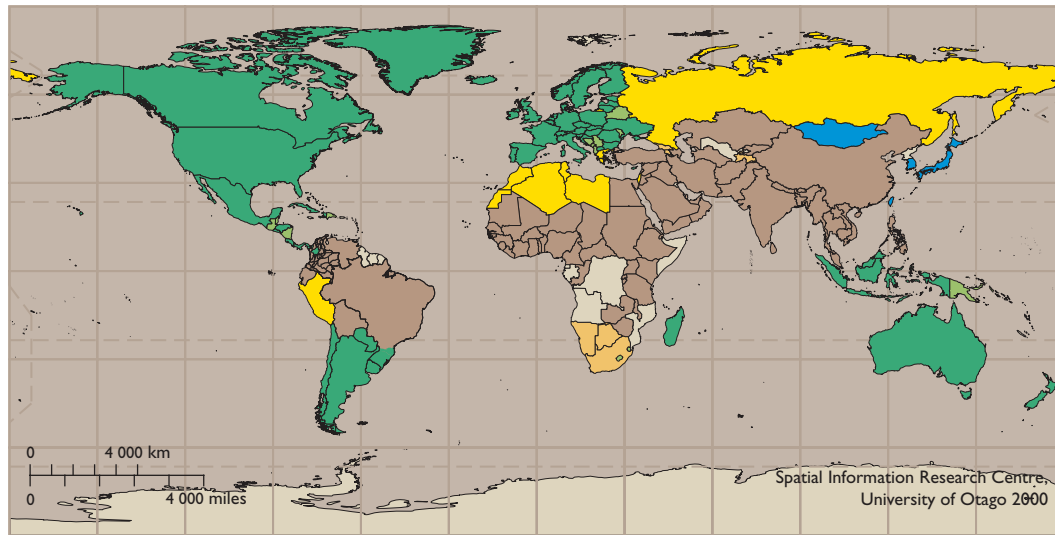
Recent information tools have also increased the ability to predict migratory pest invasions. Since outbreaks of migratory pests typically develop in response to rainfall and the greening of uninhabited arid environments, the potential of remote sensing as a supplementary tool to ground monitoring has been recognized for some time. In many affected countries and at regional and international organizations, vegetation indices are now regularly available from remote sensing sources and assist teams surveying for migratory pest outbreaks.





Response to an introduction or outbreak

Crop and animal protection is the immediate objective for controlling pests and diseases that enter a country. In these cases, farmers play a key role in implementing control operations but frequently need the support of plant and animal protection services or regional organizations for technical advice, equipment and supplies. Support includes surveillance,

Map 13

CURRENT GEOGRAPHICAL DISTRIBUTION* OF FOOT-AND-MOUTH DISEASE



- | | | |
|--|---|---|
|  Officially free |  No reports |  Endemic |
|  Probably free |  Sporadic | |
|  Historically free but incursion during 1996-2000 |  Free, with infected zones | |

* The status is based on recorded outbreaks during 1996-2000 and OIE classification

Note: The map refers to outbreaks that were officially reported to FAO, OIE or the World Reference Laboratory. It was produced before the incursion of foot-and-mouth disease into South Africa, the United Kingdom, France, the Netherlands and Argentina in 2001

Source: Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture

reporting and emergency actions. These steps continue until a decision is made to accept an introduction and abandon control activities.

The control of animal diseases may involve vaccination, movement control – at times achieved through the construction of major fences – chemoprophylaxis and therapy, slaughter of infected and possibly in-contact animals, disinfection and vector control in the case of vector-borne diseases. The latter can be achieved through the application of chemicals, by biological means and by changing the natural habitat.

Preventive vaccination can routinely be applied on a national

Box 7

EMPRES

In 1994, the Director-General of FAO was authorized to establish the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases as a priority programme.

The livestock diseases component of the programme aims to strengthen FAO's role in the prevention of and immediate response to emergencies caused by major epizootic diseases that cross boundaries. The plant pests component focuses on preventive control of the desert locust, leading to a reduced risk of catastrophic plagues.

The major thrust of the animal disease component of EMPRES has been to eradicate rinderpest. Progress on this goal has

been rapid and effective. It emphasizes proactive efforts to prevent emergencies by increasing early warning and early research, and through the application of research. EMPRES also aims to provide a catalyst for cooperation among countries in the fight against transboundary pests and diseases.

The desert locust component of EMPRES has emphasized the strengthening of national capacities for early identification of locust outbreaks through efficient surveying, followed by rapid reaction to control any outbreaks. Importance has also been given to reducing the amount of pesticides used and investigating environmentally safer technologies.

scale, as was the case with foot-and-mouth disease in the EC prior to 1991 and in Uruguay before the country managed to eradicate the disease, or to certain areas with an elevated risk of disease introduction, often termed "buffer zones". Preventive vaccination may reduce export opportunities. Disease-free countries are normally reluctant to import livestock and livestock products from countries allowing the use of corresponding vaccines. In addition, the application of vaccination will considerably prolong the time required before official recognition of disease freedom can be obtained or re-obtained in the case of a declared disease outbreak.

Interregional and international reporting systems serve to

inform officials of the entry and spread of pests and diseases of concern. This is done internationally through the FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), described in Box 7.

OPTIONS FOR MANAGING ECONOMIC IMPACTS

The socio-economic effects of transboundary pests and diseases are lessened through biologically based measures aimed at control, containment, eradication or disinfection. The economic impacts may also be lessened through risk management, which might include insurance schemes, increased agricultural production or improved infrastructure. Alternative sources of income and employment through rural development or financial aid can also help. Any combination of these measures might produce a more stable and/or higher income stream for a farmer than relying solely on biological methods.

Insurance protection. Risk can be shared among a large group of people through insurance. When the group includes people who face non-covariant risks, the averaging of risk can reduce the overall risk to the group and provide opportunities to manage risks. Private insurance schemes have been considered for crops subject to specific pest risks but the insurance companies have not yet accepted this approach, primarily because farmers face covariant risks of poor weather, pests and economic forces. However, government agencies have provided crop disaster insurance in many countries through subsidized programmes.

The feasibility of insurance schemes to compensate farmers or communities for crop losses as a result of migratory pests has undergone little study. Belhaj⁴³ found that insurance compensation to farmers for losses from desert locust outbreaks would be approximately equal to the costs paid for control, *if outbreaks occurred every year*. He concluded that, since desert locust outbreaks occur less frequently, cost-benefit analysis argues for an insurance programme against desert locust.

Increased or adaptation of agricultural production. Farmers are well aware of the potential for pests and diseases to harm their activities. In various ways, they select strategies that will mitigate any damage. Among their options are choices of where to locate, especially if they are pastoralists. Farmers can also choose production techniques and crops that are more resistant to infestations and other risks. This is one reason why

Box 8

ERADICATION OF THE ORIENTAL FRUIT FLY IN MAURITIUS

In 1991, the Ministry of Agriculture in Mauritius established a network of quarantine traps for exotic fruit flies. In June 1996, one oriental fruit fly (*Bactrocera dorsalis*) was found in a trap near the airport in Mauritius. The trap in which the flies were found was not one of the quarantine network traps, but a trap being used for a research project unrelated to quarantine. Because of the close links between research and quarantine operations in the country, the fly was reported and a major quarantine and eradication programme was initiated immediately.

Consideration of how to respond to the introduction included both economic and political issues. There are several other important species of fruit fly present in Mauritius (e.g. *Ceratitis capitata*, *C. rosa* and *Bactrocera zonata*), and the country currently has very few fruit exports. Crop losses from the oriental fruit fly were unlikely to add significantly either to the crop losses or to control costs within Mauritius.

The only immediate economic impact was the curtailment of fresh capsicum exports to Réunion, which amount to some hundreds of kilograms

pearl millet is a primary crop in the Sahel, where poor soils, variable rains and high evapotranspiration make other grains risky to grow.⁴⁴ Another approach is to diversify output so that periodic damage to one product can be buffered by the production of other products that are not afflicted by the same problems. Thus, farmers in certain areas engage in mixed farming systems of crops and livestock to spread the risk of infrequent and uncertain pest and disease infestations.

Another alternative for farmers to reduce the impact of transboundary pests and diseases is to increase their production to allow for storage of stockpiles and diminish the impact of pre-harvest losses. Farm management strategies are likely to incorporate some additional production when possible to serve as a buffer against losses.

Improved infrastructure. Crop losses and other increases in costs of production are often attributable to poor infrastructure and support services. In some countries, deteriorated or non-

per year. However, it was politically important for Mauritius to take responsibility to prevent the further spread of the oriental fruit fly into other islands in the Indian Ocean and on to the mainland of Africa, where losses would be enormous. Fruit exports of \$200 million from South Africa to Europe and the United States would be jeopardized. It was recognized that Mauritius benefits from quarantine actions taken by other countries in the region and that it must act in this case.

The quarantine trap grid was immediately extended in the area surrounding the

airport, and fruit in the area was inspected for larval infestations. Larvae were reared from infested fruit found near the airport and it was clear that the oriental fruit fly had established in Mauritius. Morphological examination indicated that the flies had originated in southern India.

Insecticide-bait applications were implemented and, over a period of 18 months, almost 500 000 male annihilation blocks (insecticide and male lure) were set near potential hosts over an area of 300 km² in the southern part of the island. Between June 1996 and May 1997, 144

flies were detected in monitoring traps, of which 141 were found in the first three months of the control effort. In June 1998, the Ministry of Agriculture declared Mauritius free of oriental fruit fly, just over a year after the last fly was found in monitoring traps. The total cost of the operation was approximately \$1 million, mainly for labour.

Since that time, a trapping grid has been maintained so that any new entry can be controlled. In late 2000, the programme was to convert from a European-supported regional effort to a locally funded country programme.

existent transportation infrastructure causes up to 30 percent post-harvest losses when products are taken to market. A lack of extension services to farmers reduces productivity in multiple ways, including an inability to respond to pest and disease problems when they arise.

Public provision of infrastructure is justified by the public good nature of infrastructure services such as roads, marketing information, credit systems, extension and education and irrigation canals. Investment in infrastructure has historically provided high returns and is virtually essential if countries are to raise their agricultural productivity. Improvements in such systems can reduce costs dramatically at the farm level, thereby compensating for losses from pests and disease.

Rural development. Both private and public action to improve opportunities in rural areas can help overcome losses from pests and disease. The public sector can take action to develop rural areas by encouraging alternative industries, locating public

facilities in vulnerable rural areas and expanding adult education opportunities, such as job training and skills improvement.

Farmers can also engage in income diversification strategies in order to reduce the impact of pest and disease outbreaks on their household income. Reardon⁴⁵ has demonstrated that increases in non-farm employment and income have occurred in rural areas across all regions. Among the factors cited by Reardon for encouraging households to undertake non-farm employment is a low level of food production owing to temporary or long-term constraints, including the loss of output from periodic pest and disease outbreaks.

Food and financial aid. National governments and international agencies rely on emergency safety nets when disaster strikes farming communities. These are mainly donations of food or financial aid intended to carry the victims through temporary shortages. While, in theory, such a response to emergency may be the most direct and low-cost way to prevent localized famine or hunger from developing from a pest or disease outbreak, in practice it is less effective because emergency safety nets are often underfunded or non-existent in the places they are most needed.

EVOLVING AND EMERGING ISSUES

Global prevention of transboundary pest and disease spread is being challenged by economic and ecological change. New technology is increasingly seen as the way to meet these challenges.

The most dramatic change comes from the increase in trade and movement of passengers and the new trade routes that have opened. The globalization of commodity trade is understandable considering that the unit costs of sea freight have dropped by almost 70 percent in real terms in the past 10 to 15 years while air freight unit costs have decreased by 3 to 4 percent over the same period.⁴⁶ Biological and ecological transformations are increasing the virulence of some existing pests and diseases, while also exposing animals and humans to previously contained emerging diseases. Consumers have grown increasingly concerned about food safety and are demanding more information and more stringent regulation of food supplies. Demands on public authorities are growing without a commensurate increase in resources.

Simultaneously, new technologies, new attitudes concerning risk and new trading principles may guide countries towards a

more rational and comprehensive world system of plant and animal protection.

Increased susceptibility to outbreaks and infestations

Air freight, which delivers fresh products more rapidly, has enabled pests and diseases to survive the transit more readily. In addition, totally new trade routes have led to new pathways for introduction and increased trade in livestock and livestock products also puts larger numbers of animal and people at risk of disease. These new trade routes highlight the greater susceptibility of crops or native plants, or even fish, to exotic pests when they have not co-evolved or when the parasites and predators of the pests are not present in the new environment.

The last 30 years or so have been remarkable for the emergence of apparently new infectious human diseases. This includes the appearance of diseases such as AIDS, Lassa fever and Ebola virus disease. The same has occurred with animal diseases. New zoonotic diseases have been emerging at a rate of at least one per year, including avian flu, Nipah virus, BSE (see Box 9, p. 262) and equine morbillivirus disease. Not only do new infections emerge, but also new biotypes or antigenic types of existing infectious diseases. A notable example has been the hypervirulent form of infectious bursal disease, which has swept across much of Europe and Asia in recent years, causing devastating losses to poultry industries. Vector-borne pathogens (e.g. West Nile fever) have expanded beyond their traditional range. Other examples include bluetongue disease in Europe and cases of Rift Valley fever in Saudi Arabia for the first time.

In many countries, there is a trend towards increased intensification and commercialization of livestock production, particularly in peri-urban areas. The higher concentration of animals that results, often under suboptimal husbandry conditions, provides greater opportunity for transboundary animal diseases and other infections (e.g. Nipah virus) to move rapidly and cause economic losses.

In some regions of the world, tropical rain forests and other wilderness areas are being converted to livestock farming. This brings human communities and their farm animals into close contact with a completely new range of infectious diseases and vectors that may have previously only circulated in wildlife reservoirs and may be completely unknown. Some of these diseases may be transmittable to humans and/or livestock, and they may spread very rapidly in the new, fully susceptible hosts.

One reason for the increasing concern about transboundary pests is the increasing susceptibility of agricultural and natural

Box 9

THE TRANSBOUNDARY SPREAD OF BSE

FAO has urged countries around the world to take action to reduce the risk of bovine spongiform encephalopathy (BSE).

Cattle in Britain were probably first affected by BSE – commonly known as mad cow disease – in the early 1980s, but the new disease, caused by a novel infectious agent called a prion, was only recognized in 1986. The disease has a long incubation period (more than three years), and therefore the epidemic in the United Kingdom expanded despite official control measures. BSE has since spread to other European countries, while several other countries outside Europe have reported BSE in imported cattle.

BSE was apparently transmitted in cattle in feed supplements that contained meat and bone meal (MBM). It is believed that a new variant of Creutzfeldt-Jakob disease (vCJD), a progressive, fatal neurological disease in humans, may be related to the consumption of BSE infected tissues. There is currently no method for diagnosis in early stages of infection and no cure for

the disease, either in animals or in humans.

All countries that have imported cattle or MBM from Western Europe, especially the United Kingdom, during and since the 1980s, can be considered to be at risk from the disease. FAO data show that MBM from Europe has been exported to many countries since the 1980s, when BSE was identified. Some countries also re-exported MBM to third countries. An initial risk assessment of BSE for selected countries not belonging to the EC has been carried out by the European Commission. It is based on whether countries have imported MBM or live cattle during the risk period (1980s onwards), as well as the measures in place for risk management in the livestock, meat and feed industries and the nature and structure of those industries.

Concern has spread among consumers, and the economic impacts of the BSE outbreaks in the EC will be felt for years. Beef prices in the EC dropped by 17 percent in the last months of 2000 (and are expected to continue a

downward trend). By the end of 2000, the disease had cost the United Kingdom more than 5 billion euros through slaughter of cattle and calves, loss of jobs and markets. Finally, it is impossible to put a price on the cost of the loss in public confidence in the livestock industry.

Although Britain has been fighting the disease for years, it was only recently that a multilateral response to the disease was developed. Pressure on governments to respond to the human health risk of BSE grew dramatically after it appeared beyond the borders of the United Kingdom in countries that were believed to have adequate safeguards. EC farm ministers met in late 2000 to implement strict control responses including the following:

- a temporary ban on MBM feed for all farm animals;
- testing of all cattle at risk;
- purchase-for-slaughter of all cattle aged more than 30 months, unless tested negative;
- listing of bovine intestines as specified

risk materials, thus limiting entry into the human food chain;

- increased beef support payments to farmers;

An EC transmissible spongiform encephalopathies (TSE) regulation, which may include full herd and cohort slaughter, is intended to come into force in July 2001.

Among the important lessons of relevance for transboundary pest and disease response is the need to recognize when collective action is needed. Current actions by the EC, national governments and the international agencies involved (FAO, WHO and OIE) are aimed at improving understanding of the disease characteristics and risks (much remains unknown about the disease and the infective agent) and assisting countries in protecting their animal and public health. Emphasis is being placed on better diagnostics, identifying risks to other animal species and the transmission of risks, both up and down the production and food chain.

Experts are currently recommending that countries at risk should implement effective surveillance for BSE in cattle as well as controls on the animal feed and meat

industries. At present, this means: reporting signs of disease, laboratory testing of samples from slaughtered cattle, the correct disposal of fallen stock and improved processing of offal and by-products.

However, all countries should take precautionary measures, including general improvements to their food and feed safety systems. Attention should be paid to slaughtering procedures (cease slaughter or rendering practices that could spread contamination that endanger human and animal health), and to the processing and use of offal and by-product parts. The rendering industry should be scrutinized and appropriate procedures adopted everywhere; appropriate risk analysis on their production and trading systems should also be conducted.

It should be stressed that the epidemic of BSE was the result of recycling animal protein and the subsequent amplification of the problem in the food chain. The banning of MBM and regulation of the feed industry should arrest the spread of the disease in all countries.

resources to infestation and damage. Plantation agriculture has increased the vulnerability to pests and diseases for years, with pesticide application and veterinary control the primary solutions. The genetic variability of the world's principal crops is now becoming more limited with the greater concentration of breeding stock in the hands of a few private companies. Resistance in insects and diseases is taking hold with the increased use of genetically modified crops. The genetic manipulation of these crops may keep them safe from infestation for a time, but the result may be more invasive or damaging pests that evolve in conjunction with these super plants.

Global warming trends may change rainfall and weather patterns in a number of regions, affecting in particular the global distribution of insect vectors, for example mosquitoes and Culicoides midges and the important transboundary animal diseases that they transmit (Rift Valley fever, bluetongue, African horse sickness). Climate change is also a source of increasing susceptibility to pests in many parts of the world.

Changed consumer and public attitudes

The “tool kit” for combating pests is shrinking faster than new technologies for control can be developed and proven. Likewise, pesticide spraying campaigns against migratory pests in Africa have come under attack. A global concern for the environment has driven much of this change. At the same time, consumers are demanding lower pesticide residue limits in the belief that human health is affected by these residues. Technology for pesticide residue testing is less expensive and becoming more readily available so that enforcement of these lower limits is more likely.

The same trend in public attitudes has caused a greater awareness of potential environmental impacts of the introduction of exotic pests. As this concern comes from an environmental perspective, tools and ideas from environmental science, law and policy are entering into the discussion on animal and plant health. Alien invasive species are seen as a primary threat to native species, possibly as serious as habitat reduction. Different interests are entering the discussion of plant and animal health and broadening them beyond purely technical control issues.

New surveillance and monitoring technologies

A vast array of molecular biotechnology applications is available and emerging in animal production and health, involving both

on-farm and off-farm activities. Use of DNA biotechnology in animal health may contribute significantly to improved disease control. Advanced diagnostic tests make it possible to identify the disease-causing agent(s) and to monitor the impact of disease control programmes, to a degree of diagnostic precision (subspecies, strain, biotype level) not previously possible. For instance, newly developed diagnostic tests are revealing an incidence of BSE that was previously undetected. Enzyme immunoassay tests have the advantage of being relatively easily automated and have been developed for a wide range of parasites and microbes. Their availability in developing countries is still low, however.

Molecular epidemiology is being used to trace the origin of pathogens better than ever before. This is particularly useful for epidemic diseases that can be better controlled by the early pinpointing of their source. The development of genetic techniques that allow the detection of pathogen DNA/RNA (rather than antibodies) in livestock also enhances animal health efforts.

Finally, recombinant vaccines can offer greater safety and specificity, more stability and distinctions between vaccinated and naturally infected animals. They may also offer possibilities for vaccines to be developed against parasites where conventional methods have failed.

An innovation that supports pathway analysis and could be used for liability actions in the future is the use of genetic “fingerprinting” to reveal the source of entry of a population of quarantined pests, as is already used extensively for foot-and-mouth disease and rinderpest through world reference laboratories. This has been demonstrated with fruit flies entering Florida and citrus canker in the same state. By establishing the source of the entry, measures can be taken to close down the pathway or improve its compliance. This may also be used to indicate if the population is a new introduction or a resurgence of an earlier introduction that was thought to have been eradicated.

An operational tool of great interest is the systems approach to compliance. A systems approach to quarantine security is much more complex than a single treatment, yet it will facilitate trade and reduce the environmental and social impact of unnecessary fumigation. These agreements are based on research showing the critical points of possible infestation and demonstrating compliance with measures that, when carried out in total, reduce the risk of the product introducing a quarantine pest to a level acceptable to the importing country.

Other new tools and technologies that show promise or are already proving successful include:

- improved detection methods (lures; sound; x-ray; chemical/biochemical testing);
- improved pest identification methods (low cost antibody testing techniques; genetic detail available to check; digital imaging);
- more precise source locating (including through genetic fingerprinting of introduced pests mentioned above);
- improved reporting and data sharing to give more actuarial data for risk analysis;
- greater use of preprogrammed response systems;
- more reliance on production systems or area clearances rather than individual checking;
- improved use of computerized statistical sampling techniques for greater reliability.

At the same time, challenges that new technologies may impose are:

- more automated packing, processing and shipping which precludes visual inspection;
- sampling problems/costs at delivery point owing to prepacked goods in large or sealed packs.

New regulatory and operational issues

Emerging issues that will affect future regulatory approaches include:

- more vertical integration or control among suppliers, traders and sellers (resulting in better-quality feedback);
- more produce source labelling and tracking through the supply chain;
- more specialized handlers for produce with greater volumes and values;
- greater cooperation in transboundary management of migratory pests;
- moves to demand full cost recovery for prevention and response (which may oblige greater participation in planning from traders/shippers);
- greater interest in and demand for the preservation of natural environments;
- increased legal responsibility for biodiversity preservation (e.g. under the Convention on Biological Diversity, national regulations).

The pressure to include environmental considerations more fully will force many nations to evaluate the relative advantages of creating a biosecurity approach across ministries and

agencies that maintains their areas of expertise, or to continue with separate policy divisions and to cooperate ad hoc on operational programmes.

In recent years, locust and grasshopper research has focused more on applied aspects, and considerable attention is now being paid to the task of translating promising research results into operational practice. The following points indicate particular areas where progress is being made:

- Biological control, based on the use of fungal diseases (mycopesticides), of locust and grasshoppers is now a practical alternative to chemical pesticides in certain situations.
- A large body of information has been collected on the safety and environmental aspects of locust control operations and can be used as guidance for campaigns and training.
- It has been possible to improve the resolution of vegetation maps of desert locust breeding areas, based on remote sensing technology. A system, designed to guide survey teams and facilitate forecasting, has reached the stage of field testing in eastern Africa.
- A number of studies have identified new or modified pesticide application methods that are safer and more environmentally friendly as well as more accurate and effective.
- Analyses of economic aspects and strategies of desert locust management have been started and have produced preliminary results.

On the other hand, there have also been important gaps in the research efforts. Field trials with desert locusts have been difficult because of the unpredictable and fast-changing nature of infestations. Research on some important migratory pests, such as the red locust, has been neglected. There has not generally been sufficient attention paid to research on the population dynamics of locusts or to the use of integrated pest management approaches in other migratory pests. Furthermore, the research institutes of locust-affected countries have not participated sufficiently.

V. Choosing and implementing appropriate solutions to transboundary pests and diseases

ROLES OF LOCAL, NATIONAL AND INTERNATIONAL POLICIES

The trend of the past two decades is for local and national policies on transboundary pests and diseases to be guided by international standards, agreements and priorities. The risk assessments required under international obligations must still be based on local conditions. While the predicted risk for human consumption, for example, may be considered the same throughout the world, the probability of a pest surviving in a new environment varies from place to place, depending on climate, host availability and other factors.

Local participation, particularly in stakeholder consultation, is necessary for any successful project. There is an increasing number of area-wide programmes around the world, either to stop an incursion of an exotic disease or pest or to create a pest-free production area within an infested country and thereby open up new trade opportunities. In these cases, local policies and actions around the borders of the designated areas are as important as in national border zones.

There are many compelling reasons why countries should cooperate in their programmes against transboundary plant pests and animal diseases, either formally through regional organizations described below or informally through networking.

Neighbouring countries often have similar production systems as well as shared epidemiological and pest and disease risk profiles. Mutual benefits and cost savings are to be gained through joint preparedness planning. This includes cooperation not only in the preparation of contingency plans but also in activities such as training programmes, laboratory diagnostic facilities and international vaccine banks.

The rapid and frank sharing of information on disease occurrences and pest outbreaks and the harmonization of quarantine and disease control programmes, particularly in areas adjacent to common borders, are also of considerable

mutual benefit. While these conditions have been achieved in some cases, and are progressing in others (e.g. through rinderpest eradication campaigns in Africa and foot-and-mouth disease eradication campaigns in Europe, South America and Southeast Asia), a lack of cooperation among countries in many parts of the world has been a major constraint to the successful control of transboundary animal diseases.

Existing agreements, institutions and programmes

International conventions, treaties and agreements have an impact on plant health and animal disease programmes in several ways. There are currently around 20 binding agreements at either the global or regional level, as well as a number of technical guidance documents and non-binding legal instruments.⁴⁷ There are also numerous private organizations dedicated to providing information on the incidence of pests and diseases. Table 47 lists some of the most important agreements and regional or international bodies related to transboundary pests and diseases.

Private organizations and technical associations

The leading organization for biological control expertise and much of the taxonomic references in the field is CABI, with centres in the United Kingdom, Malaysia and Trinidad and Tobago. Although a private organization, CABI is led by its member countries through annual meetings and consultations.

Trade associations in each country are important contact points for gaining stakeholder support for prevention programmes, since industry is often a major beneficiary of such efforts.

In each area of expertise there are technical associations. Associations in plant pathology, for example, exist in many countries as well as internationally. A new Internet-based journal has emerged from this type of specialist interaction.

List servers, to which individuals can subscribe to receive messages concerning particular fields of specialization, have proliferated, as have relevant Internet sites. ProMED is a private initiative to establish a global programme for monitoring emerging diseases. The ProMED-mail electronic network was inaugurated in 1994 and is intended to enhance the access of developing countries to medical information.

Financing

The final and indispensable condition for effective management of transboundary pests and diseases is adequate funding and

Table 47

MAJOR INTERNATIONAL AGREEMENTS AND BODIES RELATED TO PLANT AND ANIMAL HEALTH

International agreements/ conventions/ bodies	Objectives (in relation to transboundary pests and diseases)	Impact on transboundary pest and disease management	Contracting parties
PLANT HEALTH			
<ul style="list-style-type: none"> • International Plant Protection Convention (IPPC) - Established 1952 	<ul style="list-style-type: none"> • To achieve common and effective actions in the prevention of exotic pest introductions and to promote appropriate and harmonized control measures 	<ul style="list-style-type: none"> • IPPC, including its mechanisms and Secretariat, provides a forum for discussion and dispute resolution in the area of plant health and develops international standards in support of national plant protection organizations 	<ul style="list-style-type: none"> • 114 contracting parties
<ul style="list-style-type: none"> • Regional Plant Protection Organizations (RPPOs) - Nine established at present 	<ul style="list-style-type: none"> • To coordinate actions among member countries 	<ul style="list-style-type: none"> • RPPOs share information and resources and provide a forum for discussion 	<ul style="list-style-type: none"> • Regional organizations range in size from 3 to 51 member countries
ANIMAL HEALTH			
<ul style="list-style-type: none"> • International Office of Epizootics (OIE) - Established 1924 	<ul style="list-style-type: none"> • To promote international cooperation in the control of transboundary animal diseases 	<ul style="list-style-type: none"> • OIE provides information about disease outbreaks, coordinates studies and surveillance of disease, and harmonizes trade regulations in animals and animal products 	<ul style="list-style-type: none"> • 151 members
PLANT AND ANIMAL HEALTH			
<ul style="list-style-type: none"> • FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) - Established 1994 	<ul style="list-style-type: none"> • To strengthen prevention and response to emergencies caused by transboundary pests and diseases that constrain food security, adversely affect public health or impede international trade 	<ul style="list-style-type: none"> • The primary activities of EMPRES are early warning, early reaction and enabling research. This includes surveillance to monitor vulnerable areas, preventive action such as training workshops, and convening expert groups to share information 	<ul style="list-style-type: none"> • 165 member countries

MAJOR INTERNATIONAL AGREEMENTS AND BODIES RELATED TO PLANT AND ANIMAL HEALTH

International agreements/ conventions/ bodies	Objectives (in relation to transboundary pests and diseases)	Impact on transboundary pest and disease management	Contracting parties
ENVIRONMENT			
<ul style="list-style-type: none"> • Montreal Protocol¹ to the Vienna Convention for the Protection of the Ozone Layer - Established 1987 	<ul style="list-style-type: none"> • To reduce the use of substances that deplete the ozone layer. This includes chemicals used to combat pests 	<ul style="list-style-type: none"> • Under the Protocol, methyl bromide, which is extensively used as a broad-spectrum post-harvest fumigant both preventively and as treatment against quarantine pests, is to be phased out of use 	<ul style="list-style-type: none"> • More than 150 countries
<ul style="list-style-type: none"> • Convention on Biological Diversity - Established 1992 	<ul style="list-style-type: none"> • To preserve global biological diversity in the form of both organisms and ecosystems 	<ul style="list-style-type: none"> • The Convention advocates a precautionary approach to alien species that may conflict with the IPPC's approach of pest risk assessment 	<ul style="list-style-type: none"> • 179 contracting parties
<ul style="list-style-type: none"> • Global Invasive Species Programme, under the Convention on Biological Diversity - Established 1997 	<ul style="list-style-type: none"> To coordinate the Convention's policy on invasive species through CABl, the Scientific Committee on Problems of the Environment (SCOPE)² and the World Conservation Union (IUCN) 		
TRADE			
<ul style="list-style-type: none"> • WTO (formerly GATT) - Established 1995 	<ul style="list-style-type: none"> • To lower tariffs and prevent the use of other trade barriers in order to facilitate free trade. Recent rounds have moved beyond that to seek fair trade and trade in safe products 	<ul style="list-style-type: none"> • Deviation from international standards must be scientifically justified through a risk assessment process in order to avoid charges of unfair trade practices. WTO establishes a dispute mechanism and SPS standing committee to adjudicate on regulation of plant and animal health when it affects trade. The standard-setting bodies are Codex Alimentarius, IPPC and OIE 	<ul style="list-style-type: none"> • 140 member countries
<ul style="list-style-type: none"> • Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) - Established 1994 	<ul style="list-style-type: none"> • To establish a multilateral framework of rules and disciplines to guide SPS measures and to minimize effects on trade 		

¹ Full name: Montreal Protocol on Substances that Deplete the Ozone Layer.

² SCOPE is a committee of the International Council of Scientific Unions (ICSU).

Box 10

**AGREEMENT ON
THE APPLICATION
OF SANITARY AND
PHYTOSANITARY
MEASURES**

The Uruguay Round of trade negotiations was concluded in 1994, under the auspices of WTO (formerly GATT). The resulting Uruguay Round – or WTO – Agreements came into force in 1995, inaugurating an era of agricultural trade liberalization that affects farmers and agricultural policy in both developed and developing countries. One of those agreements is the Agreement on the Application of Sanitary and Phytosanitary Measures.

The objective of the SPS Agreement is to provide a framework for protecting human, animal and plant health and life, while preventing unjustifiable barriers to trade. Therefore, any exceptions to free trade in food and agriculture must be supported by scientific risk assessment and cost-benefit analysis. Countries are allowed the right to

establish their preferred level of sanitary and phytosanitary protection but, in the event of a dispute, WTO will convene a panel to assess whether a specific measure is in compliance with the provisions of the SPS Agreement. If the measure is found not to comply, it will be required to be changed or compensation to a damaged party ordered.

It is not always a simple matter to distinguish between justified SPS controls and restrictions arising from consumer preferences or concerns. Developing countries sometimes believe that their inability to obtain access to developed countries' markets is driven more by the latter than the former. This perception is difficult to refute because the risk assessment process itself, which is a basic tenet of the

appropriate funding mechanisms. An important reason for the uneven application of sanitary and phytosanitary standards is the lack of resources that some countries have to implement effective control procedures. One of the functions of regional groupings is to try to overcome differences in ability to pay, where the actions of one country can impose costs on the others. Other reasons for cost sharing include shared benefits and economies-of-scale in control operations.

However, the incentives to cooperate are low, especially for

SPS Agreement, is not fully established. The economic methods for defining appropriate socio-economic factors to be considered and for assessing effects on the environment have not been accepted by member countries.

Under Article 14 of the Agreement, developing countries were provided a reprieve of two to five years from the market access provisions. This period was intended to allow the creation and upgrading of mechanisms and provisions for meeting the requirements, without developing countries' agriculture sectors being damaged as a result of sudden competition. In 2000, the grace period expired for all developing countries. The main concerns that motivated this grace period are still valid, however: compliance costs

are very high and developing countries' capacity to regulate is weak.

The so-called capacity gap refers to the inability of some countries to afford the expense and provide the expertise to participate in the WTO procedures. Many developing countries lack the capacity (legal and scientific) both to participate as full and equal partners in the open markets imposed by the WTO Agreements and to formulate and implement fully effective sanitary and phytosanitary regulatory systems. They view the SPS Agreement as a burden or obligation rather than an opportunity for participation.

The compliance gap occurs when countries do not fully comply with the requirements of agreements reached with other countries. The primary reason for non-compliance is

insufficient resources and the result is an uneven application of the mechanisms called for in the agreements. In the case of plant and animal health, non-compliance on the part of some countries poses risks to other countries, with consequent strains on the Agreement itself. At present, even the largest and best-funded countries are not in full compliance with the SPS Agreement. Measures have been enacted without a full risk assessment or agreement on an international standard. This uneven application of standards leads to conflict over fairness issues, which weakens the effectiveness of the SPS Agreement.

non-exporting countries. This explains why some of the regional groupings operate better in theory than in practice. Typically, countries give higher funding priority to their national plant and animal health services than to cooperative associations. Countries have different levels of risk associated with pest and disease infestations and may resist contributing if they perceive other countries gain more benefit from the effort.

In the long term, the current imbalance in control capacities among countries can only be overcome if affected countries



FAO/1424/G. TORTOLI

Emergency operations to protect crops against a desert locust invasion

The "public good" nature of transboundary prevention and control calls for collective action and funding at the regional and international levels

strengthen cooperation with one another. All countries recognize that effective control in a neighbouring country is as important as their own management efforts. However, current mechanisms for cooperation have suffered from weak financial and political support.

In some cases of accidental introduction of a pest, the responsible government has voluntarily provided financing for eradication or control. This is negotiated bilaterally and is not required under international agreements currently in implementation. Donor agencies sometimes provide funding for a regional eradication programme or similar activities, such as eradication of the Caribbean fruit fly. Programmes to eradicate exotic species from protected areas or fragile environments or to carry out other plant health activities have also been financed through environmental initiatives, including the Global Environment Facility (GEF).

The EC has been at the forefront of maintaining a "polluter pays" standard in matters of plant and animal health risk. EC member states have a mechanism for recovering costs incurred as a result of the negligence of another member state in carrying out its duties in plant and animal health. The Convention on Biological Diversity may further define mechanisms for payment for liability by a government when a

government's officials do not carry out necessary phytosanitary measures in the control of a new pest or, under the Cartagena Protocol on Biosafety, control of a living modified organism released into the environment. The concept of legally binding liability is new in this field. It will be some years before the individual, legal entity or government that is responsible for an entry or outbreak will be paying for the costs of the negligent actions.

Questions regarding who should pay for which services also arise within the national setting. The financing of national programmes of quarantine, plant and animal inspection, pest and disease eradication and other sanitary and phytosanitary programmes is typically based on government funds. The economic rationale for public funding is elaborated on in other publications.⁴⁸ However, some countries charge user fees to cover the cost of activities with clear beneficiaries. Costa Rica has achieved full cost recovery on plant health services, for example. Cost recovery through user fees is particularly common for export certification schemes, since it is quite clear who the beneficiary is and the activity is closer to market promotion, rather than risk reduction for the consumers in the producing country.

Another possible source of finance for plant and animal health is that of enforcement penalties or liability payments. Fines and penalties have not been consistently used as deterrents to lax compliance because the burden of proof prevents effective enforcement. However, with tighter government budgets, improved monitoring tools and greater demands on quarantine systems, this situation could change.

VI. Conclusion

Transboundary pests and diseases are a permanent threat to crop and animal producers. They have major economic implications, both in terms of the private and public costs of an outbreak and in terms of the cost of measures taken at individual, collective and international levels to prevent or to counter infestations.

This review has discussed the economic rationale for public intervention, based on the “public good” nature of many control efforts. The need for public intervention frequently extends to the international level and calls for international and regional cooperation, without which many control efforts cannot be expected to be effective. However, in practice it can be more difficult to determine the appropriate level and type of control, or the proper mix of private and public and national and international action.

One problem is that the paucity of accurate data and information on the costs both of transboundary pest and disease effects and of control efforts makes it difficult to decide on the most cost-effective interventions. It can also be difficult to ensure the necessary collective action, particularly at the international level, as parties and countries involved may have quite different incentives for participating in control efforts. Closely related to this is the question of cost sharing in control action.

Recent years have seen both progress and retreat. The technical ability to control old problems has greatly advanced and improved information exchange has facilitated reaction to the emergence of transboundary pests and diseases. At the same time, however, increased movements of people and goods have facilitated the spread of many pests and diseases, while a number of new forms have appeared – the emergence and spread of BSE in Europe being one example.

These developments strengthen the case for collective action at the regional and international level. Following are some of the challenges faced in the area of transboundary pests and diseases today:

- Improve the economic evaluation of the costs of pest and disease occurrences and of the different control efforts. This will facilitate the selection of technically effective and cost-effective solutions and will help in devising appropriate mechanisms for cost sharing and funding of preventive and remedial action. In many instances, new ways of managing

the economic impacts (e.g. through insurance schemes) may be more cost effective than controlling a pest or disease directly.

- Strengthen international and regional cooperation. The “public good” nature of prevention and control calls for collectively agreed, funded and managed responses.
- Enhance the capacity of developing countries both for national action and for participation in collective efforts. Not all countries can face the cost of prevention or reaction alone. In particular, there is a clear need to help developing countries meet the requirements of the SPS Agreement so that they can participate fully in the international trading system. Particular attention to these countries’ needs in terms of assistance is required.

In short, the issue of transboundary plant pests and animal diseases is of growing economic and scientific complexity and consequently warrants priority attention.

NOTES

- 1 Other relevant definitions of regulated pests and diseases are as follows: “[A quarantine pest is a] pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled” (IPPC. 1999. *Glossary of phytosanitary terms*. International Standards for Phytosanitary Measures Publication No. 5. Rome, FAO); and “... a disease listed by the Veterinary Administration, and that, as soon as detected or suspected, must be brought to the attention of the Veterinary Authority” (OIE. 1999. *International Animal Health Code*. Paris).
- 2 The term “pest” includes all organisms (insects, diseases, etc.) that reduce yield or satisfaction from crops and other plants. In the case of animals, specialists use the term “animal disease” to include parasites and other pests in addition to disease. For simplicity, the term “transboundary pests and diseases” is used in this review.
- 3 A distinction is made between migratory and quarantine pests. Migratory pests move from one place to another on their own accord, whereas quarantine pests generally require a human or other carrier to move from one place to another (the term “quarantine” derives from the 40 days of isolation imposed in previous ages on foreign sailors arriving in Venetian ports).
- 4 Dynamic factors affecting risk are discussed in the section, Factors determining the levels of control.
- 5 These data were compiled from official disease reports submitted to OIE. They may severely underrepresent the actual number of cases, particularly for diseases of non-commercial animals, such as peste des petits ruminants in small ruminants, African swine fever in village pigs and Newcastle disease in poultry in Africa and Asia.
- 6 D.T. Jamison, J. Frenk and F. Knull. 1998. International collective action on health: objectives, functions and rationale. *Lancet*, 351(9101): 514-517.
- 7 The “marginal cost” is the cost imposed by one additional increment of the control effort. The “marginal benefit” is the benefit obtained from an additional increment of control.
- 8 FAO. 1998. *Economic and policy issues in desert locust management: a preliminary analysis*. By S.R. Joffe. Technical Series – Desert Locust Field Research Stations No. 27. Rome.
- 9 FAO. 2000. *Socio-economic impacts of freedom from livestock disease and export promotion in developing countries*. By A. McLeod and J. Leslie. Livestock Policy Discussion Paper No. 1. Rome.
- 10 The tsetse fly demonstrates the latter situation in which only areas suitable to the insect hold the threat of sleeping sickness of animals.

- 11 B. Hardeweg. 2000. *A guide to economic evaluation of desert locust management projects*, p. 11. University of Hannover (manuscript.)
- 12 IFPRI. 1999. *Livestock to 2020: the next food revolution*. IFPRI Discussion Paper No. 28. Washington, DC.
- 13 Op. cit. (p. 46), note 9.
- 14 IFPRI. 1998. *Pest management and food production*. IFPRI Discussion Paper No. 25. Washington, DC.
- 15 Op. cit. (p. 4), note 11.
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- will produce 100 pigs for consumption. If 50 pigs die from classical swine fever, in order to re-establish the original population size of 100 pigs, only 12.5 pigs can be slaughtered for consumption at the end of two years, which results in a net difference in production of 87.5 pigs.
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ANNEX

TABLE

COUNTRIES AND TERRITORIES USED FOR STATISTICAL PURPOSES IN THIS PUBLICATION

Developed countries	Countries in transition	Developing countries			
		Sub-Saharan Africa	Asia and the Pacific/ Far East and Oceania	Latin America and the Caribbean	Near East and North Africa
Albania	Albania	Angola	American Samoa	Anguilla	Afghanistan
Andorra		Benin	Bangladesh	Antigua and Barbuda	Algeria
Armenia	Armenia	Botswana	Bhutan	Argentina	Bahrain
Australia		Burkina Faso	British Virgin Islands	Aruba	Cyprus
Austria		Burundi	Brunei Darussalam	Bahamas	Egypt
Azerbaijan	Azerbaijan	Cameroon	Cambodia	Barbados	Gaza Strip
Belarus	Belarus	Cape Verde	China	Belize	Iran, Islamic Rep.
Belgium/ Luxembourg		Central African Rep.	Cocos Islands	Bermuda	Iraq
Bosnia and Herzegovina	Bosnia and Herzegovina	Chad	Cook Islands	Bolivia	Jordan
Bulgaria	Bulgaria	Comoros	East Timor	Brazil	Kuwait
Canada		Congo, Rep.	Fiji	Cayman Islands	Lebanon
Croatia	Croatia	Côte d'Ivoire	French Polynesia	Chile	Libyan Arab Jamahiriya
Czech Republic	Czech Republic	Democratic Republic of the Congo	Guam	Colombia	Morocco
Denmark		Djibouti	India	Costa Rica	Oman
Estonia	Estonia	Equatorial Guinea	Indonesia	Cuba	Qatar
Faeroe Islands		Eritrea	Kiribati	Dominica	Saudi Arabia
Finland		Ethiopia	Korea, Dem. People's Rep.	Dominican Republic	Syrian Arab Republic
France		Gabon	Korea, Rep.	Ecuador	Tunisia
Georgia	Georgia	Gambia	Lao People's Dem. Rep.	El Salvador	Turkey
Germany		Ghana	Macau	Falkland Islands (Malvinas)	United Arab Emirates
Gibraltar		Guinea	Malaysia	French Guiana	West Bank
Greece		Guinea-Bissau	Maldives	Grenada	Yemen
Greenland		Kenya	Marshall Islands	Guadeloupe	
Hungary	Hungary	Lesotho	Micronesia, Fed. States	Guatemala	
Iceland		Liberia	Mongolia	Guyana	
Ireland		Madagascar	Myanmar	Haiti	
Israel		Malawi	Nauru	Honduras	
Italy		Mali	Nepal	Jamaica	
Japan		Mauritania	New Caledonia	Martinique	
Kazakhstan	Kazakhstan	Mauritius	Niue	Mexico	

Annex table

Developed countries	Countries in transition	Developing countries			
		Sub-Saharan Africa	Asia and the Pacific/ Far East and Oceania	Latin America and the Caribbean	Near East and North Africa
Kyrgyzstan	Kyrgyzstan	Mozambique	Norfolk Islands	Montserrat	
Latvia	Latvia	Namibia	Northern Mariana Islands	Netherlands Antilles	
Liechtenstein		Niger	Pakistan	Nicaragua	
Lithuania	Lithuania	Nigeria	Palau	Panama	
Malta		Réunion	Papua New Guinea	Paraguay	
Monaco		Rwanda	Philippines	Peru	
Netherlands		Saint Helena	Samoa	Puerto Rico	
New Zealand		Sao Tome and Principe	Singapore	Saint Kitts and Nevis	
Norway		Senegal	Solomon Islands	Saint Lucia	
Poland	Poland	Seychelles	Sri Lanka	Saint Vincent and the Grenadines	
Portugal		Sierra Leone	Taiwan Province of China	Suriname	
Republic of Moldova	Republic of Moldova	Somalia	Thailand	Trinidad and Tobago	
Romania	Romania	Sudan	Tokelau	Turks and Caicos Islands	
Russian Federation	Russian Federation	Swaziland	Tonga	United States Virgin Islands	
San Marino		Togo	Vanuatu	Venezuela	
Slovakia	Slovakia	Uganda	Viet Nam		
Slovenia	Slovenia	United Republic of Tanzania	Wallis and Futuna Islands		
Saint Pierre and Miquelon		Zambia	Tuvalu	Uruguay	
South Africa		Zimbabwe			
Spain					
Sweden					
Switzerland					
Tajikistan	Tajikistan				
The Former Yugoslav Republic of Macedonia	The Former Yugoslav Republic of Macedonia				
Turkmenistan	Turkmenistan				
Ukraine	Ukraine				
United Kingdom					
United States					
Uzbekistan	Uzbekistan				
Yugoslavia	Yugoslavia				

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TIME SERIES FOR SOFA 2001 – CD-ROM

Instructions for use

The State of Food and Agriculture 2001 includes a CD-ROM containing time series data for about 150 countries and the necessary software, FAOSTAT TS, to access and display these time series.

FAOSTAT TS

FAOSTAT TS software provides quick and easy access to structured annual time series databases. Even inexperienced computer users can use FAOSTAT TS, which does not require spreadsheet, graphics or database programs. FAOSTAT TS is fully menu-driven, so there are no commands to learn. Users can browse through and print graphs and tables, plot multiple-line graphs, fit trend lines and export data for use in other programs. FAOSTAT TS is trilingual (English, French, Spanish) and uses a standard menu format.

FAOSTAT TS software is in the public domain and may be freely distributed. The data files accompanying the software, however, are under FAO copyright, and users must attribute FAO as the source. FAO may provide only very limited support to users of this software and the accompanying data and cannot assist users who modify the software or data files. FAO disclaims all warrants of fitness for the software or data for a particular use.

Technical requirements

FAOSTAT TS software requires a PC, DOS 3.0 or later version, 300 KB of available RAM and graphics capability. Graphics support is provided for all common graphics adapters (VGA, EGA, MCGA, CGA and Hercules monochrome).

FAOSTAT TS will print graphs on Epson dot matrix, Hewlett-Packard and compatible laser printers. To use FAOSTAT TS with other printers, users can enable their own graphics printing utility before starting the program. One such utility is GRAPHICS.COM in DOS 2.0 or later version.

Because of its use of DOS graphics modes, if FAOSTAT TS is run under MS-Windows or OS/2, it should be set to run in a full screen DOS session.

Installation

Before running FAOSTAT TS you must install the software and data files on your hard disk. Installation is automated through the INSTALL.BAT utility on the CD-ROM.

- To install from drive F: to drive C:
 - Insert the CD-ROM in drive F:
 - Type F: and press ENTER.
 - Type INSTALL C: and press ENTER.
 - Press any key.

A C:\SOFA01 directory is created and, after installation, you will already be in this directory.

Entering FAOSTAT TS

- To start the FAOSTAT TS software, if you are not already in the C:\SOFA01 directory (as after installation):
 - Change to this directory by typing CD SOFA01 and pressing ENTER.
 - From the command prompt in the SOFA01 directory, type SOFA01 and press ENTER.

A graphics title screen will be displayed, followed by the main menu screen.

If FAOSTAT TS does not start, graphs do not display correctly or the menus are difficult to read, your computer may not be compatible with the default functions of FAOSTAT TS. The use of a command-line option may help. You may try to start FAOSTAT TS with the -E parameter (by typing SOFA01-E) to disable its use of expanded memory. You may also force the use of a particular graphics or text mode by typing its name as a parameter (e.g. -EGA would force the use of EGA mode graphics).

Language choices

- The initial default language for FAOSTAT TS is English. To change the default language to French or Spanish:
 - Go to the FILE menu.
 - Select LANGUAGE using the Arrow key (↓) and press ENTER.
 - Select your choice of language and press ENTER.

The language selected will remain the default language until another is selected.

Navigating the menus

The main menu bar consists of FILE, DATA, GRAPH, TABLE and HELP menus. Most menu options are disabled until you open a data file. Navigate the menus by using the ARROW keys (↑↓↔) and make a selection by highlighting an item and pressing ENTER. To back out of a selection, press the ESC key.

- If you have a mouse, menu items can be selected with the mouse cursor. The left mouse button selects an item and the right mouse button acts as the ESC key. After you have made a menu selection, the menu will redraw and highlight a possible next choice.
 - Several short-cut keys are available throughout the program:

Key	Action
F1	HELP: Displays context-sensitive help text.
ESC	ESCAPE: Backs out of the current menu choice or exits the current graph or table.
ALT+N	NOTES: Displays text notes associated with the current data file, if the text file is available. This text may be edited. Notes will not appear while a graph is displayed.
ALT+X, ALT+Q	EXIT: Exits FAOSTAT TS immediately, without prompting.

Help

- You will see context-sensitive help displayed at the bottom of each screen. Press F1 for more extensive help on a highlighted option.
- Select HELP from the main menu to access the help information. Introductory information on the software, help topics and an “About” summary screen are available from the HELP menu.
- The HELP menu options call up the same windows obtained by pressing the F1 key at any of the menu screens:
 - FAOSTAT TS displays the top-level help page.
 - TOPICS lists the help contents.
 - ABOUT shows summary program information.

Opening a data file

- To display a list of FAOSTAT TS data files:
 - Go to the FILE menu.
 - Select OPEN.

All of the FAOSTAT TS data files in the current directory are displayed. Initially, only SOFA01 will be present. Other FAOSTAT PC data files, version 3.0, can be used with FAOSTAT TS.

- Use the ARROW keys to highlight the file you wish to view and press ENTER to select it. Files are shown with the date of their last revision. You can also highlight your choice by typing the first letters of the file name. The current search string will appear in the lower left corner of the list.
- You can change the default data drive and directory from the file list by selecting the directory or drive of your choice.

If a current data file is open, loading in a new file will return FAOSTAT TS to its defaults (time trend, no trend line, no user-specified units or scalar). Only one file can be loaded at a time.

Once you have made a file selection, all the menu selections are activated.

Selecting a data series

- Use the DATA menu to select or modify a data series or to fit a statistical trend.
- Select a data series by choosing the name of a country and a data element from scrolling menus. The first entry displays a list of country names, the second entry displays a list of data item names and the third displays a list of data element names.

If you type the first letters of a name in a list, the menu selection bar will jump to the matching name. For example:

- Type NEW to skip to New Zealand.
- Press ENTER to select the highlighted name

Displaying graphs and graph options

The GRAPH menu allows you to view the data in chart form. You can display

time trends and table or column profiles. Options under the GRAPH menu change the data series shown as well as its display.

For example, to show a plot of the data selected:

- Go to the GRAPH menu.
- Select DISPLAY.

Many options to modify, save or print a graph are available only while the graph is on-screen. Remember to use the F1 help key for a reminder of your options.

Graph action keys. You have several options when a graph is displayed:

- Press ESC to exit the graph and return to the main menu.
- Press F1 for help on the graph action keys. The help box lists the choices available while a graph is on-screen. You must exit the help box before making a selection.
- Press the ARROW and (↑↓) PAGEUP, PAGEDOWN keys to change the series displayed.
- The plus key (+) allows you to add from one to three additional series to the one displayed. Press the MINUS key (-) to remove a series. To create a multiline chart:
 - Display an initial series.
 - Press the + key to add subsequent series to the chart.
- Press A to display a table of the axis data with statistics. Press T to show a table of the fitted trend data, the residuals and fit statistics (if a trend line is selected, see below).
- The INS key permits you to insert text directly on the graph. While inserting text, press F1 for help on your text options. You can type small or large, horizontal or vertical text.
- To print a graph, press P and select your choice of printer from the menu. The print output is only a screen dump of the display, so the quality is limited.
- To save a graph for later printing or viewing, press S. The graph image will be saved in the common PCX bitmap format. You can use the PRINTPCX program or other software to view or print multiple images later. PRINTPCX also permits you to convert colour PCX images into black and white images suitable for inclusion in a word processing document.

Fitting trend lines

- To fit a statistical function to a data series, select FIT from the DATA menu. The options under FIT allow you to select the type of function, data year limits to include in the fit and a final projection year for a statistical forecast.
- By fitting a trend line (selecting the option under FIT) with a projection (selecting PROJECTION under FIT), a statistical forecast can be plotted. Use the + key to add a new data series to the graph, which can be made with only a few key strokes.

Charting profiles

The options under the GRAPH menu allow you to change the year span or style

of the graph display (options LIMITS and STYLE, respectively), or to switch from a time trend to a table or column data profile (VIEWPOINT). The VIEWPOINT option is an easy means to compare data for a particular year.

Viewpoint

- If you want to change from a time series display to a country or item profile display for a given year, select VIEWPOINT from the GRAPH menu. Select DISPLAY from the GRAPH menu, and the profile will be drawn. The initial profile display is for the last year of historical data. To change the year, use the ARROW (↑↓) keys. Press F1 for help.
- For a tables profile (profile of data across countries), you can either choose the tables to be displayed or let FAOSTAT TS select the top members and array them in order.

A limit of 50 items can appear in one profile. By selecting TOP MEMBERS instead of SELECTED MEMBERS, FAOSTAT TS will sort the values in the file and display a ranking of table or column values.

Viewing tables

- The TABLE menu allows you to look at data in a tabular format and to define subset tables that may be saved and imported into other software packages.
 - Go to the TABLE menu.
 - Select BROWSE DATA to view individual data tables from the current file.
- When viewing tables, a help bar appears at the bottom of the screen. Press PAGEUP or PAGEDOWN to change the table displayed or press ALT+1 or ALT+2 to choose from a list of tables. Use the ARROW keys (↑↓↔) to scroll the columns and rows.

Series data

- The SERIES DATA option under the TABLE menu displays the last data series selected, including summary statistics. This is the series used to plot a graph. To change the series, you must make a new choice from the DATA menu.
- The SERIES DATA screen can also be displayed while you are in a graph by pressing the letter A. If more than one series has been plotted, only the last series is shown. The range of years used for the series and statistics can be adjusted through the LIMITS option under the GRAPH menu.
- To view country or item profile lists and statistics, select VIEWPOINT from the GRAPH. You can quickly see a list of the tables with the greatest values (for example, countries with the highest commodity consumption) by choosing a table profile from VIEWPOINT and selecting the TOP MEMBERS option. Then select SERIES DATA from the TABLE menu to view the list, or select DISPLAY from the GRAPH menu to plot a chart.

Trend data

- If the FIT option has been selected (from the DATA menu) for a time trend,

then the values composing the trend can be displayed with the TREND DATA option. Summary statistics for the original series and for the trend as well as residual values are included. The list scrolls with the ARROW keys, and you can toggle between the axis and trend data with the A and T keys.

Exporting data

- The EXPORT option under the FILE menu allows you to export FAOSTAT TS data into other file formats or to create custom tables for viewing or printing. By selecting EXPORT, you will jump into another set of menus.
- To select the tables and columns you want to view or save, go to the DATA menu. You must mark your choice of options with the + key. To undo all your selections quickly, select RESET MARKS.
- To arrange, view, save or print data, go to the options under EXPORT (in the FILE menu):
 - FAO TABLE creates a table with data from the last four available years.
 - VIEW displays a temporary text file of the data selected. It is a convenient way to view a subset of the tables and columns in a FAOSTAT TS file and can also be used to see the effects of the ORIENTATION or LAYOUT selections before using the SAVE or PRINT option.
 - SAVE displays a list of file formats to let you save your data choices in a file. You will be prompted for a file name. If you need to export FAOSTAT TS data for use with other software, use this menu item. The WK1 and DBF file format selections are not affected by the LAYOUT options (see below).
 - PRINT prints your current table and column selections. Many printers cannot print more than five columns of FAOSTAT TS data. Select VIEW to check the table width before printing.
 - LAYOUT allows you to display years across rows or down columns. The default direction is down columns.
- To get back to the main FAOSTAT TS menu or to clear your selections and create more tables, go the RETURN option.

Making notes

- To read or edit textual information on the current data file, select NOTES from the FILE menu. You can also call up the Notes box by pressing ALT+N at any of the menus. The option NOTES allows you to read or edit text associated with the data file.

DOS shell and exit

The DOS SHELL option under the FILE menu returns you to the DOS prompt temporarily but keeps FAOSTAT TS in memory. This is not the normal way to exit the program. It is useful if you need to execute a DOS command and would like to return to the same data file. The data file itself is dropped from memory and reloaded on return, so default values will be in effect.

Exiting FAOSTAT TS

- To exit FAOSTAT TS:
 - Go to the FILE menu.
 - Select EXIT.

The Alt+X or Alt+Q key combinations are short cuts to exit the program from almost any screen.