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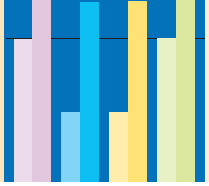

Food insecurity:

when people live with hunger
and fear starvation

The State of

2001

Food Insecurity in the World

About this report

Now in its third issue, *The State of Food Insecurity in the World* reports on global and national efforts to reach the goal set by the 1996 World Food Summit: to reduce by half the number of undernourished people in the world by the year 2015. The crafters of the Summit Plan of Action felt that great progress could be made towards this objective if countries could focus on the following three questions:

- Who are the food-insecure?
- Where are they located?
- Why are they food-insecure?

These three questions form the subject of the first section of this year's report. Entitled Undernourishment around the world, it provides FAO's most recent estimates of the prevalence of undernourishment and the absolute number of undernourished in 125 countries for the period 1997-99. It also compares these latest estimates with those of the base period (1990-92) for the Summit, thereby giving a picture of country performances over the past decade and an important update for the upcoming World Food Summit: five years later. It also examines some of the factors associated with significant national reductions or increases in undernourishment. Finally, it addresses the question of whether access to food is becoming more equal among and within countries.

The section Assessing nutritional status and vulnerability describes practical methods that have either been used in the past or are currently being developed in different countries to identify segments of the population exhibiting physical signs of malnutrition and, subsequently, to analyse the livelihoods of the people concerned so as to address the income risks underlying their vulnerability.

Food Insecurity and Vulnerability Information and Mapping Systems

On behalf of all members of the FIVIMS Inter-Agency Working Group (IAWG), once again I am very pleased to associate the IAWG with this third edition of *The State of Food Insecurity in the World*. IAWG members contributed in many ways to the results contained in this publication, and the information and analyses presented contribute directly to our common FIVIMS objectives. They will:

- increase global attention to problems of food insecurity;
- improve data quality and analysis through the development of new tools and capacity building in developing countries;
- promote more effective and focused action to reduce food insecurity and poverty;
- promote donor collaboration on food security information systems at the global and country levels;
- improve access to information through knowledge networking.

With more than 20 members representing the non-governmental, bilateral and multilateral development communities, the IAWG represents a diverse set of perspectives and interests. What brings us together is our shared commitment to reduce global food insecurity and vulnerability and to attack its multiple causes, which are deeply rooted in human poverty. For effective programming and relevant policy formulation, developing countries and development agencies need reliable, adequately detailed and disaggregated information, identifying who the food-insecure are, where they are located, how they earn their livelihoods and why they are food-insecure. With such information, development partners at all levels can combine their efforts to attack hunger and poverty at their core through sound policies and more responsive interventions.

Most IAWG member institutions were already working to improve food security information systems around the world well before FIVIMS was officially established in 1997. FIVIMS, however, provides a mechanism by which to increase efforts within its member institutions, while at the same time reducing duplication and ensuring that the collective, interagency effort is more efficient and synergistic. To advance reform of the UN system, particular priority is placed on results-driven collaboration at the country level within the United Nations Development Assistance Framework. Despite enormous programmatic and institutional challenges, I am proud to report that we are indeed making significant progress based on our common commitment and solid fieldwork, further enhanced by new computational and communication technologies.

IAWG members congratulate the FAO team on this year's excellent report. It will be an invaluable information and advocacy tool within our respective agencies' programmes. We look forward to contributing even more substantially to future editions.

Peter Matlon (UNDP)
Chair, IAWG-FIVIMS

These patterns of hunger and vulnerability are greatly complicated by continuing severe national shocks from natural and human-induced disasters and from the ballooning menace of the HIV/AIDS epidemic.

The final section of *The State of Food Insecurity in the World 2001*, Action against undernutrition and poverty, provides some illustrative answers to a fourth question: What can be done? Among the actions proposed are the more accurate targeting of food aid, and measures to improve access to clean water – both essential factors for assuring people the basic energy and health to participate in creating a better future for themselves. In addition to these fundamental factors, suggestions are given as to the myriad practical measures that can be taken to improve the livelihoods of rural people, who continue to constitute the vast majority of poor people in most parts of the world.

This report draws on the ongoing work carried out by FAO and its international partners in monitoring the nutritional status of populations worldwide, in analysing the vulnerability of populations and in providing real world examples of how communities can be enabled to better their own lives. As a contribution to the interagency Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) initiative, it illustrates the role that such enhanced systems can play in helping to build a less vulnerable, more food-secure world.

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Foreword

Rallying political will and resources to "get back on track"

The tragedy of hunger in the midst of plenty is still a stark reality in today's world. In virtually every country, there are groups of people who cannot realize their full human potential, either because their diets are inadequate or, because of sickness, their bodies are unable to benefit fully from the food they consume. In the poorest countries, the majority of people are affected by hunger, greatly magnifying the dimensions of other correctable defects in efforts to meet basic human needs.

The State of Food Insecurity in the World monitors the progress made each year towards fulfilment of the basic right of all human beings to live without fear of hunger or malnutrition. This third issue conveys a mixed message: progress has been made in reducing the absolute number of hungry people in the world, but this is not happening fast enough to achieve the 1996 World Food Summit target – that of halving the number of hungry people by 2015.

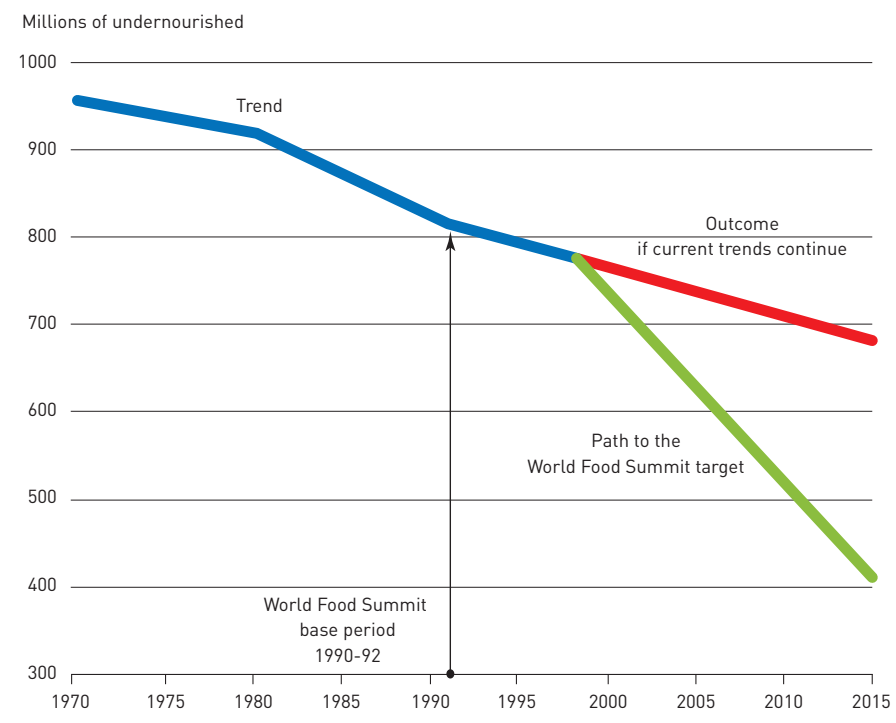
A report on progress towards this goal is especially important in 2001, in view of the follow-up event, the World Food Summit: five years later, called by FAO for November 2001 to encourage national leaders to review as a matter of urgency the rate of improvement in food security and to take corrective action where needed.

Over the past decade, the total number of chronically undernourished in the developing world has fallen by approximately 40 million but the average rate of decline has continued to slow, reaching only 6 million a year, compared with the 8 million reported in the 1999 issue of this publication. Consequently, the annual reduction required to reach the target by 2015 has grown from 20 to 22 million people per year. Hence the gap – between reductions realized and reductions needed – is widening. Continuing at the current rate, it would take more than 60 years to reach the target.

The World Food Summit: five years later will highlight two major issues. The first concerns the fact that the original goal can be met if countries and their development partners have the political will to do so. In other words, countries must eschew the "business as usual" approach and focus on the additional, urgent measures required to address widespread chronic undernourishment. The second issue concerns the availability and use of resources in achieving the Summit target. To start with, resources must be directed to identifying the undernourished more accurately, and subsequently to concrete action aimed at reducing hunger in the short term – crucial steps towards the long-term amelioration of poverty, which so often underlies hunger.

Accordingly, political will and resource mobilization underlie this year's report. *The State of Food*

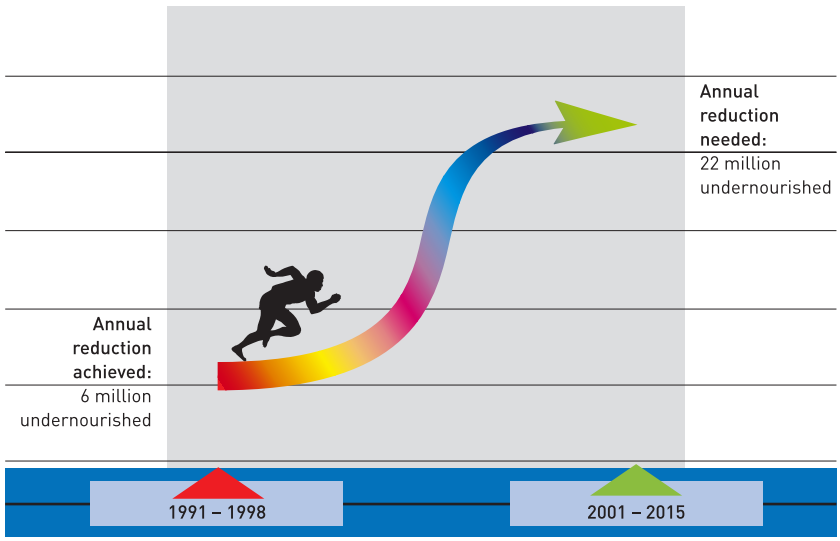
Figure 1a. Number of undernourished people in the developing countries: observed and projected levels relative to World Food Summit target



Insecurity in the World 2001 presents numerous country-level "success stories" of what can be accomplished in reducing hunger and poverty when "best practices" in development are followed and when there is the political will to fight the root causes of undernourishment. The final six articles in this year's report illustrate the great variety of activities, often requiring limited additional financial resources, that can help address hunger and poverty. Once problems are understood at the community level, resources can be focused first on the direct relief and basic service interventions that ensure that people have the health and energy to participate in their own development. Next is the need to invest in improving the productivity and efficiency of the key natural resources sectors, especially those involved in the production of crops, livestock, fish and trees. In doing this, however, the top-down methods of the past must be renounced and, instead, local communities and individuals must be empowered to be their own agents of food security and livelihood development.

Complicating the tasks of fighting hunger and strengthening rural livelihoods is the devastating impact of HIV/AIDS, especially in the worst affected areas such as sub-Saharan Africa. This disease is creating large new vulnerable groups and is rapidly eroding food and livelihood security by removing adults in their prime from the production process. Recent experience in the fight against HIV/AIDS has shown that where the will to act is strong, resources can be effectively mobilized and channelled into practical solutions for people in need.

Figure 1b. The race against hunger: accelerating the pace



The State of Food Insecurity in the World 2001 conveys the vision shared by FAO and its partners: how the international community and national governments can work together to "get back on track", thereby honouring our commitments to meeting the World Food Summit target, then exceeding this intermediate goal and eradicating hunger altogether.

We see ending hunger as a first and vital step in eradicating the deep poverty that continues to afflict so many millions in our world. As long as there is widespread hunger in the world, other poverty alleviation strategies can achieve very little, since the foundation for broad-based development remains fundamentally flawed. This was recognized by the heads of government of the "G8 countries", who declared in their final communiqué in Genoa, Italy, in July 2001: "a central objective of our poverty reduction strategy remains access to adequate food supplies and rural development".

Jacques Diouf
FAO Director-General

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Contents

Undernourishment around the world

Reductions in undernourishment over the past decade

FAO's latest estimates indicate that, in 1997-99, there were 815 million undernourished people in the world: 777 million in the developing countries, 27 million in transition countries and 11 million in the industrialized countries.

For the developing countries, the latest figure represents a decrease of 39 million since 1990-92 (the benchmark period used at the World Food Summit), for which the revised figure is 816 million undernourished.[1] This means that the average annual decrease now stands at about 6 million people.

Clearly, there has been a slowdown in the reduction of undernourished in the world. As a consequence, to achieve the World Food Summit goal of halving the number of undernourished in developing countries by 2015, the average annual decrease required is no longer 20 million but 22 million – well above the current level of performance.

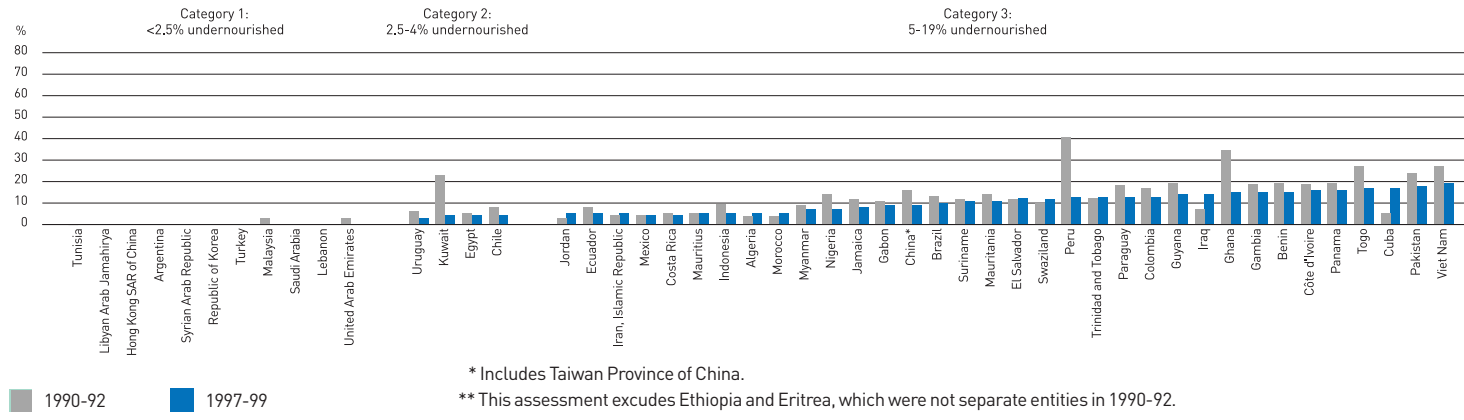
The overall decline in the number of undernourished in the developing regions hides contrasting trends in different countries: only 32 of the 99 developing countries studied recorded a decrease in their numbers of undernourished between 1990-92 and 1997-99. The total reduction achieved by this group amounted to 116 million people. This compares with a total increase of 77 million recorded for the countries in which the number of undernourished rose. Because the first group includes several large countries, such as China, Indonesia and Thailand in Asia and Nigeria in Africa, the total reduction achieved outweighed the total increase in the second, numerically larger group of countries. Hence the net reduction of 39 million (see Figure 3).

Thus, the number of undernourished has increased considerably in the majority of developing countries. (This analysis excludes Ethiopia and Eritrea, which were not separate countries in the early 1990s. It also excludes the nine developing countries in which less than 2.5 percent of the population was undernourished in 1990-92.)

When the number of undernourished is considered as a proportion of a country's total population, instead of in absolute terms, the picture is somewhat different. The proportion actually fell in the majority (58) of developing countries (see Figure 2). However, this finding should not be interpreted too optimistically, since in 18 of these countries the fall coincided with a rise in absolute numbers. The decrease in the proportion of undernourished in these countries has not been sufficient to offset the effect of population growth. Continuing rapid rises in the number of mouths to feed imply further difficulties in meeting the World Food Summit target.

[1] FAO's estimates are revised annually as more information becomes available.

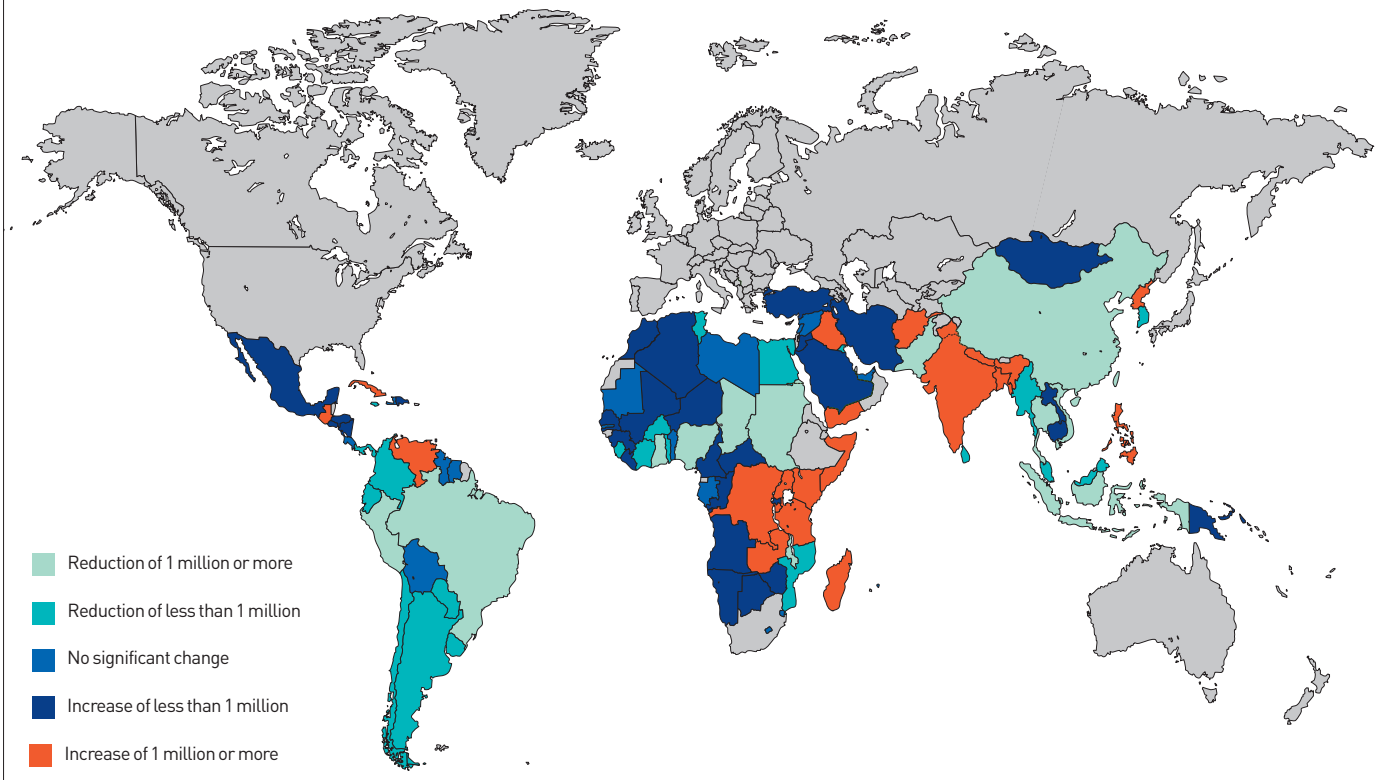
Figure 2. Proportion of population undernourished in developing countries, by prevalence category, 1990-92 and 1997-99



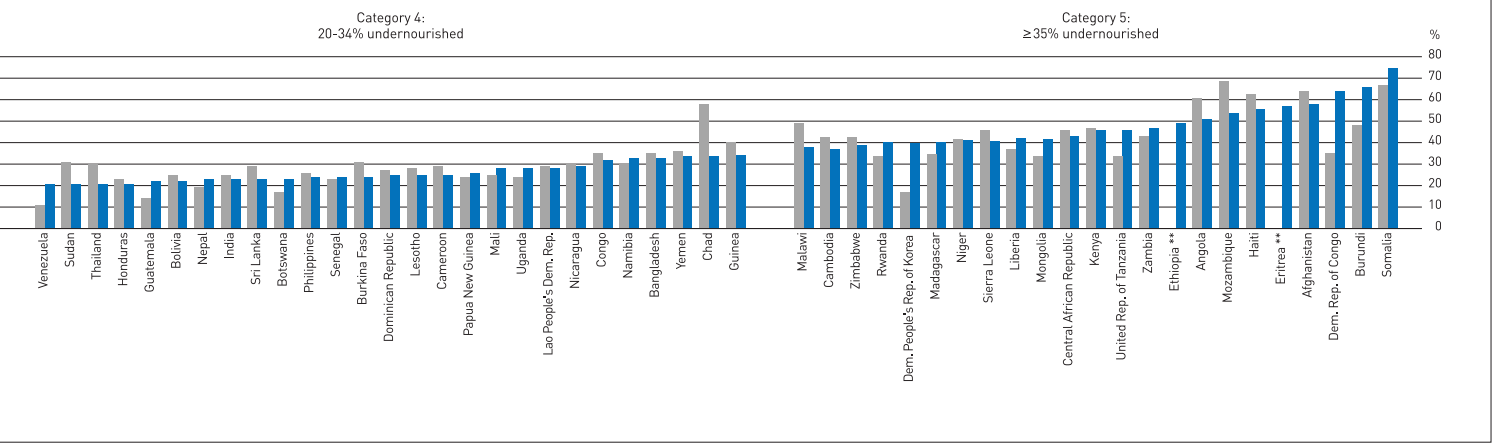
* Includes Taiwan Province of China.

** This assessment excudes Ethiopia and Eritrea, which were not separate entities in 1990-92.

Figure 3. Degree of food deprivation: changes in the number of undernourished between 1990-92 and 1997-99



Sources: FAO estimates.



Individual country performances

The overall progress achieved in decreasing the number of undernourished in the developing world between 1990-92 and 1997-99 hides sharply contrasting trends in individual countries. Some countries have made outstanding progress, while some have moved forward more slowly or stood still. Still others, however, have suffered reverses, in most cases moderate but occasionally severe.

Countries that perform well may do so by following one or more routes. They may have devoted more resources to increasing agricultural production – the best option for the purposes of increasing economic growth and, if small farms and poor consumers are able to participate and benefit, for creating a more equitable society. Alternatively, they may have imported large amounts of food, either purchased on international commodity markets or received as food aid. Countries afflicted by long-standing civil wars or recent short-term shocks may achieve better than anticipated performances by the latter route. In addition, a good performance may reflect a recovery from a previous period of poor performance – for example, a sharp reduction in the proportion of undernourished as agriculture recovers after the end of a civil war. The reverse is also true in the case of negative performances.

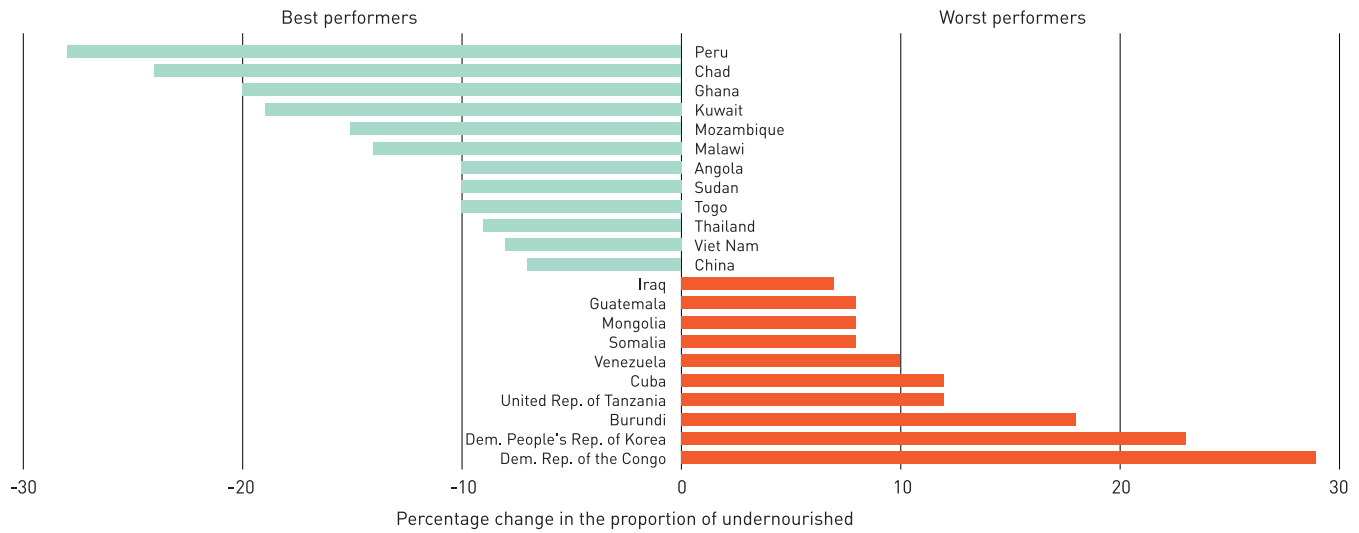
Best and worst performers

All other things being equal, changes in a country's number of undernourished will be proportional to the size of its population – the larger the population, the larger the increase or decrease that may be expected. But population also plays a confounding role in the statistics on undernourishment. While a rise in the proportion of undernourished implies a rise in their absolute number, a decline in the proportion does not necessarily imply a fall in number. A high population growth rate, for example, may result in absolute numbers increasing. Thus, changes in the proportion of undernourished provide a measure of performance that is independent of the influence of population growth.

Analysed on this basis, 12 countries may be singled out as "best performers", i.e. they reduced their proportion of undernourished by more than one percentage point per year from 1990-92 to 1997-99. At the opposite extreme, there are ten countries that may be classified as "worst performers", since their proportion rose by more than one percentage point per year (see Figure 4). The inclusion of some countries on this list at first seems counterintuitive. For example, today it might seem surprising that the Sudan is on the list of best performers. However, the data reflect changes between two periods, one centred on 1991 and another on 1998, so the current drought in the war-torn Sudan may not yet be manifested in the data.

The best- and worst-performing countries are found in all developing regions, including sub-Saharan Africa, where the proportion of undernourished in the total population is highest. In fact,

Figure 4. Countries with the largest reductions or increases in the proportion of undernourished, 1990-92 to 1997-99



seven of the best performers and four of the worst performers are in sub-Saharan Africa. This partly reflects the extreme diversity of production responses to different and rapidly changing agro-ecological conditions and policy environments in the region.

However, in the majority of these African countries, the proportion of undernourished was very high in 1990-92 and, even in the case of best performers such as Chad, Mozambique, Malawi and Angola, the proportion remained high in 1997-99. Because of their high population growth rates (3.2 percent per annum), Mozambique and Angola did not manage to reduce their number of undernourished significantly, despite their good performance. This underscores the role of high population growth in curbing reductions in the number of undernourished.

Although the results are influenced by the absolute size of national populations as well as their growth rates, the number of people added to or subtracted from the total number of undernourished does affect the overall rate of progress. The ten highest-ranking positive and negative contributors in terms of adding or subtracting millions of people to or from the world total are shown in Table 1. A number of comments are in order concerning the changes in numbers at the country level:

- Countries marked with an asterisk in Table 1 also appear on the list of best or worst performers in terms of percentage change over the seven-year period.
- The effect of a substantial population size is illustrated by India, where the percentage of undernourished is estimated to have declined from 25 to 23 percent but the number of undernourished rose by 11 million, owing to rapid population growth.
- The severe impacts of civil war and politico-economic crises are illustrated by the listing of the Democratic Republic of the Congo, the Democratic People's Republic of Korea, Afghanistan and Iraq among the worst performers. In these countries (three of which are classified as worst performers in terms of proportional change) there has been a considerable increase in the number of people suffering from undernutrition and other forms of deprivation. The explanations across these four cases of human tragedy vary, but all involve civil war or extreme problems in the functioning of the political economy.
- Among the 98 countries analysed, the two extremes of performance are represented by China, a country that achieved stunning aggregate economic growth in the 1990s and a socio-economic transformation rivaling that of Southeast Asia in the 1970s and 1980s; and the conflict-stricken Democratic Republic of the Congo, a potentially very rich country which has seen its proportion of undernourished grow from 35 percent in 1990-92 to 64 in 1997-99. It should be noted that, despite China's good performance, the country is still home to the world's second largest number of undernourished people after India.
- The effect of the larger countries is very noticeable when the additions and subtractions are aggregated (in millions) across the 12 subregions, as shown in Figure 5.

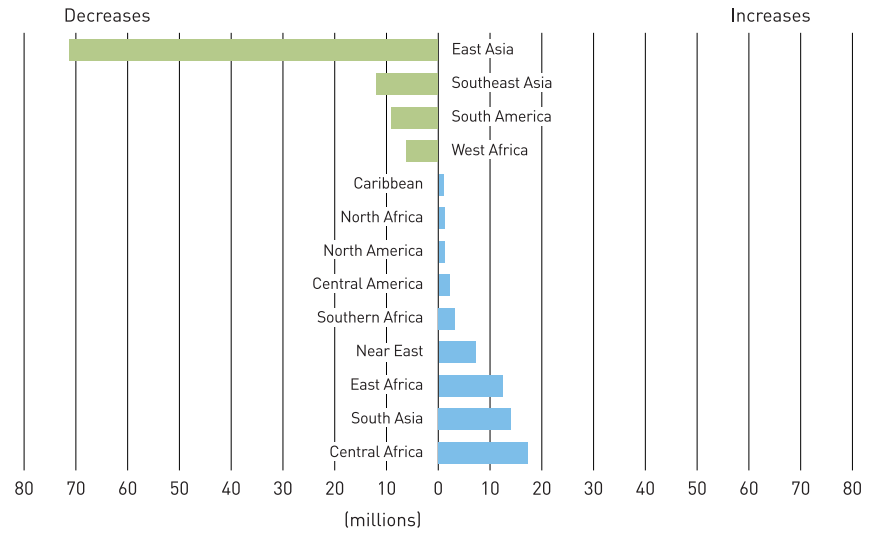
Table 1. Countries contributing most significantly to changes in the number of undernourished, 1990-92 to 1997-99

DECREASES Country	Number (millions)	Percentage of total	INCREASES Country	Number (millions)	Percentage of total
China	76	66	* Dem. Rep. of the Congo	17	22
* Peru	6	5	India	11	14
Indonesia	5	4	* United Rep. of Tanzania	6	8
Nigeria	4	3	* Dem. People's Rep. of Korea	5	6
* Thailand	4	3	Bangladesh	5	6
Viet Nam	4	3	Afghanistan	3	4
Brazil	3	3	* Venezuela	3	4
* Ghana	3	3	Uganda	2	3
Pakistan	2	2	Kenya	2	3
* Sudan	2	2	* Iraq	2	3
All others	7	6	All others	21	27
Total	**116**	**100**	**Total**	**77**	**100**

* Also included in the ten best and worst performers in terms of percentage change.

Undernourishment around the world

Figure 5. Changes in numbers of undernourished by region, 1990-92 to 1997-99



Role of population growth and agricultural development

As already indicated, the majority of developing countries suffered significant increases in their absolute number of undernourished. This is a worrying trend, masked by the much better performances of a few.

Given population growth, reversing the trend requires either faster growth in per capita food availability or more equitable access to food – or a combination of both. The relative importance of these two avenues to reducing undernourishment, however, varies with the specific situation of a country and various prevailing factors at a particular point in time. Where there is severe undernutrition among the very poor, however, governments and their partners in the international community need to intervene directly through a variety of safety net programmes.

Table 2 presents the population, food availability and production growth rates for two groups of countries – those in which the number of undernourished increased significantly and those in which it declined from 1990-92 to 1997-99.

As expected, the first group had a far higher population growth rate and a much lower growth rate in per capita food availability than the group with a decline in numbers of undernourished.

Furthermore, in the first group, per capita food and agricultural production growth rates were both much lower than those of the second group, which highlights the vital role of agricultural development in promoting faster growth in food availability.

Finally, Table 2 also provides information on changes in the domestic and external resources allocated to agriculture, again corresponding to these two country groupings. Domestic resources directed to agriculture are represented by the total net value of capital stock in agriculture, i.e. livestock, tractors, irrigation works, land improvements, permanent crops and so

Table 2. Growth in food supply, production and resources directed to agriculture compared with changes in the number of undernourished

Country grouping	Average annual growth rate from 1990-92 to 1997-99				Change from 1990-92 to 1997-99	
	Total population (%)	Per capita dietary energy supply (%)	Per capita food production (%)	Per capita agricultural production (%)	Net capital stock in agriculture per worker (US$)	External assistance to agriculture per worker (US$)
1. Countries where the number of undernourished *increased* significantly	2.1	0.1	0.4	0.4	-65	-14
2. Countries where the number of undernourished *decreased* significantly	1.4	1.4	3.8	3.4	118	-1

on. The annual change in this value reflects national investment in agriculture. External resources (external assistance) directed to agriculture are the commitments made by the multilateral and bilateral donor agencies that support agricultural development. In countries where the number of undernourished has increased and the growth of per capita food and agricultural production has been very low, capital stock as a ratio of the number of workers in agriculture has in fact decreased, while it has risen in the group where the number of undernourished has decreased. On the other hand, the level of external assistance to agriculture, expressed as a ratio of the number of workers in agriculture, has decreased in both groups – but the decline was larger in the first group. This suggests that this group's poor performance can be attributed to inadequate resources devoted to agricultural development.

The contrast regarding the change in resources directed to agriculture emerges more sharply when the group of best performers are compared with the worst performers (as shown in Table 3).

Table 3. Changes in resources directed to agriculture in the best- and worst-performing country groupings, 1990-92 to 1997-99

Country grouping	Net capital stock in agriculture per worker (US$)	External assistance to agriculture per worker (US$)
Best performers	88	5.3
Worst performers	-158	-31.0

Clusters of variables

In preliminary analyses, two clusters of variables have been identified as being very significantly related to changes in the prevalence of undernourishment:

i) variables that reflect extreme national shocks (as measured by the frequency of food emergencies, loss of civil rights and declines in life expectancy);

ii) variables that reflect growth in agricultural productivity.

In other words, there is a strong inverse relationship between the occurrence of shocks (whether caused by natural or by human-induced disasters) and progress in reducing the number of undernourished, and there is a strong correlation between increased agricultural productivity and reductions in the number of undernourished.

Further reinforcing this balanced view of how undernourishment can be reduced is a recent study by the International Food Policy Research Institute (IFPRI), which examines the relationship between a variety of factors and reductions in the number of underweight children in 63 developing countries between 1970 and 1995. The study indicates that the statistical explanation of lower numbers of underweight children centres on the following proportional determinants:

- level of women's education (43 percent);
- national per capita food availability (26 percent);
- health and environmental factors (19 percent);
- women's status in society (12 percent).

In conclusion, attempts to seek one simple cause for either good or bad performances are not very useful. The power of just a few variables to explain change in highly diverse, and indeed unique, national situations is limited. FAO's analyses show that food production and access to food are important, but they are not the only factors at work. Civil wars and other extreme shocks help to explain the situation in a subset of countries, but the findings here may reflect the presence or absence of food aid as well as the resilience of agriculture sectors under stress. It is possible to speculate that women's education and levels of basic health may be more important in countries with more stable circumstances. It is vital for such analyses to be conducted not merely internationally but within individual countries, using reliable baseline data and deploying the resources necessary to monitor and evaluate changes in key indicators over time.

FAO/22396/R. Faidutti

Women bottling beans

Undernourishment around the world

Towards more equal access to food

A lack of means to gain access to food is a major source of deprivation for poor people, especially in urban centres but also in land-scarce rural areas. Has the world made progress in improving access and reducing the gap between the abundant and varied diets of the rich and the meagre fare of the poor?

Over the past three decades, world food production has grown faster than population. Between 1969-71 and 1997-99, the amount of food available per capita per day rose from 2 410 to 2 800 kcal in the world as a whole, and from 2 110 to 2 680 kcal in the developing countries.
The remarkable growth in food availability achieved in the developing countries more than halved the proportion of undernourished in the total population from 37 percent in 1969-71 to 17 percent in 1997-99.
This decrease was not sufficient, however, to halve the absolute number of undernourished in the developing world, estimated to be 956 million in 1969-71 and still as high as 777 million in 1997-99, FAO's latest three-year average estimate.

Clearly, world food production must continue to grow if the 1996 World Food Summit target of halving the number of undernourished by the year 2015 is to be met. In theory, a smaller increase in production would suffice if its growth were accompanied by more equitable access to food. This could be achieved through redistribution – of food itself, of the means of producing it or of the purchasing power needed to buy it – to those currently on the lower rungs of the food access ladder.

Inequality of access to food can be measured among, as well as within, countries and among households as well as among household members:

- Measuring access among countries provides an indicator that is useful in the international political arena, since it enables countries to position themselves for negotiations in such areas as debt reduction, capital transfers and trade status. It also helps countries assess their relative performance in terms of national agricultural and economic development.
- Measuring equity among households within countries is useful for assessing progress made in overcoming inequities among different population groups, and in identifying regions or social strata that are particularly at risk from undernutrition.
- Regarding equity of food access among household members, there can be enormous variations within countries, influenced by a variety of socio-economic and cultural practices and traditions. In some cases, intrahousehold access is very equitable. When it is not, clear patterns of malnutrition for certain age and gender groups may emerge. This form of inequality can be dealt with by specific resource transfer and/or nutrition education programmes, which must be carefully organized to be consistent

FAO/16216/L.SPAVENTA

Vendors at a fish market display their produce

Table 4. Changes in distribution of dietary energy supply and resulting Gini coefficients between 1969-71 and 1997-99

	1969-71		1979-81		1990-92		1997-99	
DES categories (kcal/capita/day)	Number of countries	Population (%)	Number of countries	Population (%)	Number of countries	Population (%)	Number of countries	Population (%)
Less than 1 900	16	6.9	11	2.2	13	3.0	7	2.7
1 900-2 100	26	41.8	12	20.4	13	4.3	17	3.5
2 100-2 300	35	11.0	42	13.6	23	7.0	21	5.2
2 300-2 500	27	5.9	15	24.8	23	21.2	18	23.1
2 500-2 700	12	5.3	16	3.8	21	7.0	21	3.4
2 700-2 900	8	3.2	19	7.3	15	28.5	18	11.7
2 900-3 100	10	8.2	16	4.1	14	5.0	16	31.5
3 100-3 300	16	7.1	11	9.6	18	11.4	19	5.6
3 300-3 500	8	10.4	12	11.3	7	3.0	12	5.7
3 500 or more	1	0.2	5	2.8	12	9.5	10	7.5
TOTAL	159	100.0	159	100.0	159	100.0	159	100.0
Gini coefficient		**0.116**		**0.105**		**0.091**		**0.089**

with international behavioural and national cultural norms.

The assessment of changes in the inequality of access to food among and within countries – the focus of this section – is undertaken using the Gini coefficient, commonly adopted in distributional analysis. The Gini coefficient theoretically ranges from zero, implying an equal distribution among the units under consideration (countries or households in our case), to 1, implying absolute inequality – in other words, concentration in a single unit. The more the coefficient departs from zero, the more unequal the distribution.

Unequal access among countries

For this report, the Gini coefficient has been derived for inequality of access to food among selected countries classified according to ten per capita DES categories. Calculation of the coefficient was based on the proportion of the world's population in the different categories between 1969-71 and 1997-99 (see Table 4).

The Table shows that access to food among countries is not very unequal: the Gini coefficient is around 0.10. It also shows that there has been a continuous decline in this form of inequality over the last three decades. At these levels of inequality, the declines over 27 years are significant, although they appear to be slight. This reflects the fact that more countries have shifted from lower to middle DES categories than from middle to higher DES categories. For example, between 1969-71 and 1997-99, the number of countries shifting out of the three lowest categories was 32, whereas only 16 shifted into the three highest categories. From this bunching effect, it may be concluded that the growth in world food availability since 1969-71 has indeed been accompanied by a redistribution in favour of countries that previously had a low per capita food availability.

Unequal access among households

Intracountry inequality of access to food is due mainly to differences in income or purchasing power among households. The best and most direct way of assessing this kind of inequality is to look at data on food consumption for households in different income classes. However, few such data sets exist, and those that do are mostly one-off snapshots rather than data series showing changes over time. However,

Undernourishment around the world

Prevalence of undernourishment *vis-à-vis* poverty

FAO's measure of the prevalence of undernourishment is based on the distribution of household food consumption and availability, whereas the measure used by the World Bank to estimate the prevalence of extreme poverty is based on the distribution of household expenditure on consumables. There is a positive and close relationship between food consumption and expenditure on consumables in low-income households. Furthermore, calculations of the inequality in the distribution of household food consumption and availability have in many cases been derived from data on inequality in the distribution of household income and expenditure, so the two separate exercises may be expected to produce similar results. To ascertain whether or not this is so, FAO country estimates of the prevalence of undernourishment have been aggregated to correspond to the World Bank's regional estimates of the prevalence of extreme poverty. The results are in the Table below.

In all but one case, the estimates for extreme poverty are higher than those for undernourishment. The exception is the Near East and North Africa, where the prevalence of extreme poverty is estimated to be only 2 percent compared with 7.7 percent for undernourishment. This anomaly reflects the weaknesses in both of the organizations' approaches when they are applied at low levels of prevalence.

In FAO's estimates, food consumption is expressed in terms of dietary energy, and people in households consuming less than a certain minimum energy requirement are considered to be undernourished. The minimum daily requirement, which takes into account the calories needed to maintain body weight while performing light activity, varies from country to country but is approximately 1 900 kcal per capita, depending on age, sex and average height.

In the World Bank's estimates, expenditure on food and non-food consumables is expressed in terms of the International dollar, adjusted for purchasing power parity (PPP). People living in households with a per capita expenditure of less than PPP $1.08 per day are considered to be living in extreme poverty. The PPP $1.08 poverty line is obtained as the median of the ten lowest national poverty lines of the 33 calculated by the World Bank. National poverty lines take into account the value of the basic food basket, which also involves estimates of energy requirements. These refer to the average requirements, which are approximately 2 200 kcal per capita per day.

Therefore, the international poverty line used by the World Bank for defining extreme poverty relies on a higher food consumption level than that used in the FAO definition of undernourishment. This explains the general tendency for the World Bank's estimates of extreme poverty to be higher than FAO's estimates of undernourishment. It also reinforces the already widely shared belief that the undernourished are found largely among the poorest of the extreme poor. Hence combating undernourishment implies combating the most extreme conditions of poverty.

Prevalence of undernourishment compared with extreme poverty in selected regions

Region	Prevalence of undernourishment (1997-99)	Prevalence of extreme poverty (1998)[1]
	(Percentage of population)	
East Asia	9.7	15.3
South Asia	23.6	40.0
Sub-Saharan Africa	27.8	46.3
Eastern Europe and Central Asia	4.2	5.1
Near East and North Africa	7.7	2.0
Latin America and the Caribbean	10.6	15.6
TOTAL	**15.0**	**24.0**

[1] Source: S. Chen and M. Ravallion. 2000. *How did the world's poorest fare in the 1990s?* World Bank Policy Research Working Paper No. 2409. Washington, DC.

FAO/21032/R. Faiduti

A variety of fruit and vegetables for sale in a covered market

there are data on the distribution of household income and expenditure for a significant number of developing countries. Furthermore, time series of Gini coefficients relating to these data are also available. As unequal access to food among households is determined largely by income inequalities, changes in the latter can serve as a proxy for changes in household access to food.

Comparable data on income distribution were examined for 23 countries in Latin America, Africa and Asia, covering the period 1970-1993.[1] Based on this study, the following observations may be made:

- Intracountry income inequality is much greater (Gini values ranging from 0.25 to more than 0.55) than intercountry inequality in food distribution (approximately 0.09 to 0.12 as in Table 4).
- Across countries, the period-to-period changes in the coefficient are rather small, with no indication of either an increasing or a decreasing trend across all or even a significant minority of countries. In countries that have experienced rapid growth, all income classes tend to move up together, with little change in the distributional pattern.

The share of food in household expenditure declines with rising income. In addition, there are upper and lower limits to food consumption (expressed in kcal), whereas this is not true in the case of incomes. This means that actual changes in access to food, as opposed to income, will tend to be smaller than those that can be detected from the analysis.

It can therefore be deduced that, over time, real changes in the equality of interhousehold food consumption have tended to be very small, if at all perceptible. This is why countries need to organize special programmes to help raise the level of disposable income of people in the lowest income classes, which have the highest rates of undernutrition.

In conclusion, although there has been a consistent decline in the inequality of access to food among countries in the world (see Table 4), no similar trend is discernible among households within the developing countries.

[1] The data were obtained from the World Income Inequality Database (WIID), maintained by the United Nations University of the World Institute for Development Economics Research in Helsinki.

Nutritional status: indicators for action

Anthropometric measurements provide an excellent indication of the nutritional status of vulnerable groups and individuals. They are usually the central component of the nutritional surveillance systems that have evolved over the past 25 years. However, to provide a basis for action, they need to be complemented with other types of information on the reasons why people are underfed.

Improving the nutritional status of all people in all countries is one of the widely agreed objectives of many international conferences and summits held over the past 25 years. This objective is shared by the interagency FIVIMS initiative (see p. iii), established as part of the World Food Summit Plan of Action in 1996. It is known that an insufficient intake of calories (or undernourishment), as discussed in the preceding articles, is one of the primary causes of poor nutritional status and, often, of premature death. However, it is also widely recognized that poor nutritional status (or undernutrition) can also be caused by other factors, including a diet that is insufficiently diverse or deficient in critical micronutrients, and by poor health status, which renders the body unable to absorb or use calories and micronutrients.

As seen in previous issues of this publication, the nutritional status of individuals is most commonly evaluated through the use of anthropometry; that is, by taking body measurements, such as weight and height, which are then compared with averages for well-nourished people in the same age and sex classes. Anthropometric measures may be described as outcome indicators, in that they reflect the end result (in a person) of all the factors that affect nutritional status. There are more complex ways of evaluating nutritional status, particularly with regard to vitamin and mineral deficiencies, but these are generally more cumbersome to use on a broad scale in countries with limited medical facilities and other resources. Systems for collecting the anthropometric data and other information that are used to explain why nutritional status is good or bad, or has improved or deteriorated, are called nutritional surveillance systems.

Here we discuss the most commonly used indicators of nutritional status, including their application within nutritional surveillance systems and improvement programmes:

- At the national level, this information is used to assess the nutritional status of whole populations and how it is changing over time, as well as to channel intervention resources towards specific regions or areas.
- At the community or local level, the information is used to identify the reasons for the poor nutritional status of particular demographic or livelihood groups. Again, it is used to organize appropriate interventions, which may then be aimed at individual households or even individuals within households.

The discussion is supported by specific examples of the achievements made by country programmes that have applied these indicators.

What are the indicators of nutritional status?

Table 5 summarizes the most widely used anthropometric indicators in assessing the nutritional status of children and adults. These indicators all involve the direct measurement of a person's height and weight, followed by a comparison with what is normal or acceptable for their sex and age. The comparison is especially important in the case of children under five, since healthy children are still growing rapidly at this stage of their lives. These indicators of nutritional status have a number of advantages:

- they are a simple and practical way of describing the problem;
- they are useful proxies for a number of constraints to human welfare, such as inadequate access to food and/or the presence of infections and other environmental risks;
- they are strong predictors of the risk of subsequent morbidity, functional impairment and mortality, whether at the level of the individual, a group or a whole population;
- they are appropriate indicators for assessing the success or failure of interventions.

Nutritional surveillance systems vary greatly. Some systems use data collected by professional health workers in clinics; others use information gathered by community residents, specifically trained for this purpose. Some use sampling techniques designed to produce reliable national estimates; still others use more participatory survey techniques conducted at locations felt to be particularly representative, called sentinel sites. The weight/height anthropometric measures are almost always included because they provide very useful information at a relatively low cost. However, a variety of other indicators may be used, including market prices for food, indicators of agricultural production and other livelihood systems, and morbidity and mortality data. The one factor that surveillance systems have in common is that information is collected periodically in order to monitor trends.

Methods used at the national level

National governments and their international development partners need national estimates of nutritional status to identify regions exhibiting worse or better performances than others, to plan the allocation of resources as a consequence and to assess whether progress is being made in overcoming undernutrition.

Anthropometric indicators are incorporated into two basic types of surveillance systems used at the national level: those based on repeated large-

Table 5. Anthropometric indicators commonly used in nutritional surveillance systems

Anthropometric indicator	What it measures	Contexts in which it is used
Children		
Underweight	Underweight (low weight for age) represents both inadequate linear growth and poor body proportions caused by undernutrition	Underweight is the most common indicator collected in growth monitoring systems
Stunting	Stunting or "shortness" (low height for age) measures long-term growth faltering as a result of chronic undernutrition	Stunting is associated with poverty and may be assessed in stable situations to measure changes over time
Wasting	Wasting or "thinness" (low weight for height) as a result of acute undernutrition	Wasting is the indicator most commonly assessed in nutrition surveys in emergencies
Adults		
Body mass index[1]	"Thinness" (low weight for height) as a result of undernutrition	BMI is the indicator used to assess adult nutritional status. It is of particular importance where adults may be equally or more vulnerable to undernutrition than children, for example in emergencies
Low birth weight[2]	Babies are measured, but this indicator is associated with poor nutrition in mothers	Low birth weight is a useful indicator in stable situations, where it can be used to measure changes in maternal malnutrition over time. It is particularly important in Asian countries where maternal undernutrition is common
Elderly		
Body mass index	"Thinness" (low weight for height) as a result of undernutrition	Although there are problems with using the BMI to assess undernutrition in the elderly, it is very useful in emergencies

[1] BMI was covered in *The State of Food Insecurity in the World 2000*, p. 10-12.
[2] Unlike the other indicators, birth weight is measured only once.

scale sample surveys; and those based on the collection of statistics by social or health services.

Repeated large-scale surveys. These are designed to produce statistically representative averages at the country level. Health and related socio-economic conditions are assessed alongside nutritional status, as a basis for improving the planning and evaluation of sectoral investment programmes. In poorer countries with limited institutional capacity and budgetary resources, international agencies often provide assistance to governments in conducting these surveys. In the nutrition and health fields, two major international collaborative efforts of this kind are the Demographic and Health Survey programme, sponsored by the United States Agency for International Development (USAID) and the Multiple Indicator Cluster Survey programme, sponsored by the United Nations Children's Fund (UNICEF). In the socio-economics field, the nutritional status of household members is sometimes recorded in addition to other indicators, for example by the Living Standards Measurement Survey programme, sponsored by the World Bank in a large number of countries. The anthropometric indicators for different countries that were presented in *The State of Food Insecurity in the World 1999* came from this type of national survey. The latest compilation of these national data sets is available on the World Health Organization's Web site at www.who.int/nutgrowthdb/.

Administrative or service statistics. Data on anthropometric indicators are often collected in health clinics and schools. For example, babies taken to clinics are weighed and measured as part of routine growth monitoring or when they visit for specific treatments or vaccinations. These data are often sent to the national capital for processing and further use. Similarly, national school systems may require all students to have their age recorded and their height and weight measured. Clearly, if the use of formal health facilities is highly selective or if only a minority of children attends

school, then the resulting picture of national nutritional status will be severely biased. However, if the vast majority of the national population uses these basic services, then the resulting statistics, if carefully collected and analysed, can give a useful picture – as illustrated in the Box on Costa Rica and Panama.

Methods used at the community or local level

Direct measures to assess the nutritional status of populations are made at the community or local level, even when they are part of a national programme. Here we will focus on two methods using anthropometric and other indicators.

Repeated small-scale surveys. Small-scale surveys with a wide variety of content and a flexible approach can be used at the community or local level over time, both to define the initial dimensions of a problem and to monitor improvement as resources are brought to bear on it (see Box on Ethiopia). Constants in such surveys are the use of standard nutritional status indicators and the collection of additional information that is relevant to understanding both the immediate causes of poor nutritional status and the longer-term causes of the poverty that underlies it.

Growth monitoring. This is the continuous monitoring of the growth (weight and height for age) of children. It can be conducted by professionals in clinics run by the national health service or by trained members of the community in villages. The main objective is to assess the nutritional status of individual children and to mobilize local resources to support nutrition-related activities. Families with children at risk may be given a food supplement and/or nutrition counselling. Children are usually measured monthly.

Costa Rica and Panama: school census data for monitoring progress

Cost Rica began conducting school censuses in 1979 and completed its fifth census in 1989. The data collected showed that stunting had fallen by 45 percent by 1985. This decline is believed to be a valid indicator of improvements in quality of life and reductions in food insecurity in Costa Rica during this period. This contrasts with Panama, where the prevalence of stunting as measured through the school census increased from 19 to 24 percent between 1985 and 1988. This trend is thought to reflect the socio-political crisis and the internal rural-urban migration that was then taking place.

Source: *Food and Nutrition Bulletin*, 1991.

Ethiopia: repeated small-scale surveys help target food aid and assess the "impact" of interventions

Following three successive poor harvests in the North Omo zone of Ethiopia, in April 2000 Concern Worldwide conducted a nutrition survey. The prevalence of wasting was 25.6 percent, of which 4.3 percent was severe. In response, Concern provided therapeutic and supplementary feeding assistance, directed to vulnerable groups, as well as a general ration. Because seed supplies had been consumed, Concern also distributed seeds of key staple crops, including teff, sweet potato, wheat, maize and beans. In addition to identifying the acute need for intervention in specific areas, the survey results gave Concern the necessary information to highlight the whole region of Wolayita as one that required urgent attention. As a result, the region received priority status for food distribution by the World Food Programme (WFP).

A second survey was undertaken three months later. This identified a dramatic improvement in nutritional status (with a 6.4 percent prevalence of wasting and only 1 percent severe wasting). A third survey in October showed that the level of undernutrition had stabilized (with a 7.2 percent prevalence of wasting and 1 percent severe wasting). The improvement was attributed largely to the interventions. The stabilization of undernutrition and the imminent arrival of another harvest allowed Concern to phase out the general ration. The therapeutic feeding programme also stopped in October and supplementary feeding continued only until the large number of beneficiaries had reached their target weight.

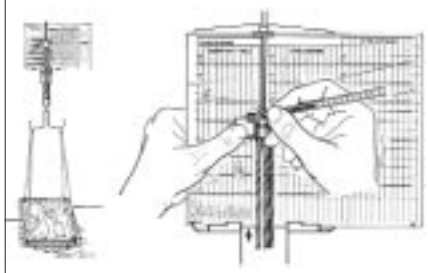
Source: Concern Worldwide, Ethiopia

Growth monitoring used to take place primarily in clinics, where mothers often had to queue, losing the productive time they needed for other tasks. Today, the availability of new types of direct recording scales allows growth monitoring to be carried out in other community locations, not just within clinics. The new scales are more robust and can remain in a central public place in the village, such as a school or village hall. In addition, they are directly connected to the growth chart, facilitating data entry (see Figure 6). Community health workers are well placed to make sure that the most disadvantaged mothers and children use them.

Community-based growth monitoring has been widely supported by UNICEF, international NGOs and, more recently, World Bank-funded nutrition programmes. An important element of this approach is that it empowers communities to act on the nutrition-related information that they themselves have gathered and interpreted. The approach can work very well when community nutrition promoters are properly trained and equipped with adequate resources. It can also provide a more comprehensive coverage of the under-five population compared with a clinic-based approach. The Box on Bangladesh describes a large-scale community-based growth monitoring system and highlights the importance of effective management of such a system.

These examples of the use of nutrition indicators show that, where there is political will and sufficient resources, local communities – working with decentralized government structures – can deal effectively with the immediate causes of poor nutritional status in vulnerable groups (factors such as inadequate energy intake and infections

Figure 6. The direct recording scale



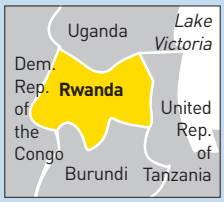
Source: M. Meegan, D. Morley and R. Brown. 1994. In *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 88: 635-637

Bangladesh: improving the quality of community-based growth monitoring

The National Nutrition Programme in Bangladesh includes a monitoring system designed to support decision-making. The system uses data "on the way up"; that is, at the various administrative levels (village, union and *upzila*) before the data are aggregated at the national level. Data on the monthly weight for age of children up to 24 months and on weight gain in pregnant women are collected by Community Nutrition Promoters, women from the community who are trained by contracted NGOs and supervised by community nutrition officers. The data are intended to trigger an appropriate response at each administrative level. For example, villages with more than 5 percent of children with severe undernutrition are identified for special follow-up action by the relevant community or government worker, to ensure that appropriate measures are taken. Also selected for follow-up are villages with less than 80 percent coverage in their growth monitoring or with less than 90 percent of eligible children and women receiving food supplements. The nutrition data are also used to assess the effectiveness of programme inputs. For example, it has been possible to assess the impact of a daily food supplement (equal to 600 kcal) targeted at pregnant women with a low body mass index (BMI). Following their receipt of the supplement, it was shown that these women had better pregnancy weight gain and birth weight of babies than did women with a higher BMI, belonging to higher income groups. As is common in undertakings of this kind, data reliability has been an area of concern in the programme. The problems include mechanical failure of the weighing scales, reading and recording inaccuracies and, in some instances, intentional misrepresentation of the data by community workers wanting to make their performance look better than it is. Having recognized these problems, the programme administrators are implementing quality checks that include "day after" reweighing, improving the quality and reliability of the weighing scales and increasing the level of supportive supervision of the Community Nutrition Promoters.

Source: Shoham, J., Watson, F. and Dolan, C. 2001. *The use of nutrition indicators in surveillance systems.* London, Overseas Development Institute.

Rwanda: monitoring the effectiveness of interventions in emergencies



When hundreds of thousands of Hutu refugees fled Rwanda following the genocide of 1994, four refugee camps were established in eastern Zaire (now the Democratic Republic of the Congo). Nutritional surveys carried out in the camps in August found severe levels of undernutrition (wasting) in 17 to 23 percent of children under five. The response was to supply a general ration of 2 100 kcal per person per day – which should have been adequate to restore a healthy nutritional status. However, repeat surveys conducted in October found that unacceptably high levels of wasting persisted in two of the camps.

The reasons for this became clear when additional data were collected through food basket monitoring, indicating the actual receipt of food aid rations at the household level. It was revealed that, in the two camps, 32 and 29 percent of families, respectively, were receiving less than 1 000 kcal per person per day. This inequitable distribution was strongly correlated with undernutrition, with female-headed households faring the worst.

These findings led to the conclusion that the method of ration distribution needed to be changed. Because of the overwhelming scale and speed of the influx of the refugees, international agencies had used the local administrative structures that existed back in Rwanda to facilitate food distribution. They had distributed food to heads of communes, who were then responsible for allocating rations to households. Commune leaders had favoured some households over others, usually for political reasons. The food basket data, in conjunction with the repeat survey data, helped the agencies lobby for a different distribution system, with food being delivered to smaller groups of households and eventually directly to individual households. After these changes, repeat survey results in December and January showed that levels of wasting had fallen to, and stabilized at, acceptably low rates (2.5 to 5 percent).

Source: J. Shoham, F. O'Reilly and J. Wallace. 2001. Humanitarian crisis and conflict: food assistance and nutritional security issue. *In* E. Clay and O. Stokke, eds. *Food aid and human security*, chap. 6. London, Frank Cass.

that reduce food intake and absorption). But how can these same groups go further and deal with the underlying or root causes of food insecurity? There is broad agreement that achieving this next step requires further local-level investigation into the viability and sustainability of the community's dominant livelihood systems (see the following section on vulnerability profiling in Guatemala).

Nutritional surveillance in emergencies

In general, the same methods of nutritional anthropometry are used in both emergency and ongoing situations. However, in emergencies there is more emphasis on the use of wasting (low weight for height) as an indicator, since the acute problems of access to food that typically occur at such times can lead to rapid loss of weight. There are also critical differences in how the work of nutritional surveillance is conducted, owing to the logistical and security complications typical of emergencies. The actors too may differ: where there is a partial or total breakdown of the government's ability to intervene to provide assistance (most often as a result of civil war), the major relief burden is picked up by international aid agencies rather than national programmes.

The guideline used by many relief organizations is that the emergency provision of blanket and targeted feeding begins when wasting exceeds 20 percent. Often, inadequate resources and lack of time make it impossible to use standard anthropometric indicators and to conduct a comprehensive survey of the population at risk during emergencies. In these circumstances, other, less accurate but more rapidly measured indicators are used, such as mid-upper arm circumference, while still applying a reasonably reliable sampling strategy to cover the population groups that can be reached.

Other, non-anthropometric indicators can also be used in nutritional surveillance in emergencies. The Box on Rwanda is an example of how complementary information collected in a refugee population helped identify inequity and correct the lack of accountability in a food distribution system.

Pathways to food security: options for the poor in Guatemala

Poverty is a key determinant of food insecurity. Finding out about the livelihood systems of poor people is an essential first step in identifying the options they have for improving their lot. The profiling of vulnerable groups is a useful way of doing this, as experience in Guatemala shows.

At the World Food Summit in Rome in 1996, leaders identified three key questions that need to be answered in order to guide action:

- Who are the food-insecure?
- Where are they located?
- Why are they food-insecure?

Vulnerable group profiling is a method developed by FAO to help countries find the answers to these questions. This method, which was described in detail in *The State of Food Insecurity in the World 2000*, is based on the assumption that food-insecure people are found within larger population groups that are exposed to various vulnerability factors, such as low income, insecure land tenure or a deteriorating natural resource base. Through the identification and characterization of homogeneous vulnerable groups, it is possible to determine, within each group, who the food-insecure are, where they are located and why they are food-insecure. It is also possible to identify the options open to different groups for improving their incomes and other aspects of their circumstances that contribute to food security.

This section presents information from a set of profiles that have been prepared for vulnerable groups in Guatemala, together with suggestions for new pathways that could lead these people out of vulnerability and into a better future.

The vulnerable groups

In Guatemala, vulnerability and food insecurity are predominantly rural phenomena. Roughly three-quarters of the population is rural, and nearly two-thirds of these people are vulnerable or food-insecure. In urban and peri-urban areas, the proportion of vulnerable people is about 10 percent; many in this category are new rural migrants seeking a better life.

Figure 7 shows the six vulnerable groups that have been identified in Guatemala and the proportion of the national population belonging to each. Four of the groups consist of small-scale farmers, distinguished from one another on the basis of differences in their agro-ecological environments and their patterns of labour migration. These four groups, together with artisanal fishermen on the Atlantic and Pacific coasts, comprise 45 percent of the national population. Temporary workers in Guatemala City and its periphery account for the other 2.5 percent of the population classified as vulnerable.

Each vulnerable group is found in a specific geographic region with specific agro-ecological conditions, production patterns and social structures. The maps in Figures 8, 9 and 10 indicate these regions, together with their population density and land morphology. The characteristics of each region contribute to the groups' vulnerability but also offer opportunities for change.

The national context

Based on a 1994 census, the population of Guatemala in the mid-1990s was approximately 8 million. Newly released data indicate that the number may now be more than 11 million. In addition to rapid natural population growth (2.5 percent per year in the period 1981-94), large numbers of people who had fled to neighbouring countries to escape civil conflict have been returning, particularly since the signing of peace accords in 1996.

A high proportion of the total population (42.8 percent) consists of indigenous peoples. These predominate in the mountainous western region, where they constitute about 70 percent of

Figure 7. Share of vulnerable groups in the national population

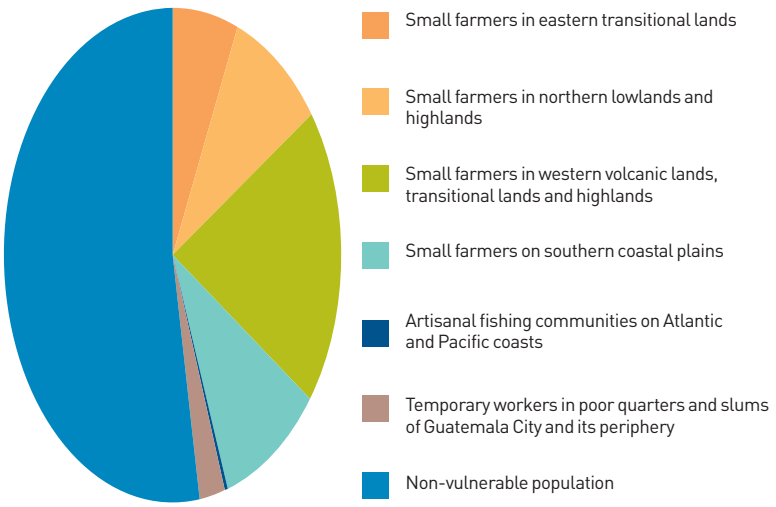
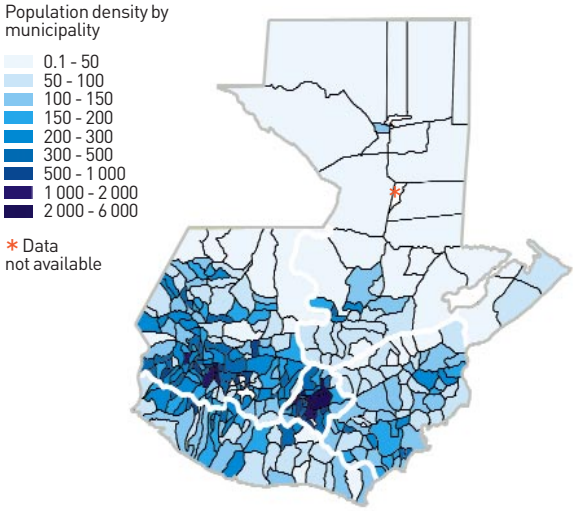


Figure 8. Geographical regions where vulnerable groups live

Figure 9. Population densities of geographical regions



the population. But pockets of indigenous peoples, growing maize on small plots of land and working artisanally or selling their labour, can be found in nearly all parts of the country.

Seasonal migration of small-scale farmers seeking work as agricultural labourers on large plantations has long been a characteristic livelihood system for many of Guatemala's rural poor. Now, other large-scale population movements are extending the agricultural frontier, often in unsustainable ways. In addition to obtaining land through official resettlement programmes, many people who were displaced by the conflict are now seeking to return to their original homes or finding new places to settle on their own. Economically marginalized people with no other options are also cutting down trees and opening up new land for maize cultivation, mainly at higher altitudes on the plateau and in the northern tropical rain forest of the Petén.

Maize cultivation is culturally as well as economically significant. Among indigenous peoples throughout Central America, maize represents regeneration and new life. Most men attach great importance to their role as maize growers and will go to great lengths to find a small plot of land on which to cultivate some maize, no matter what else they do to secure a livelihood for their families.

Figure 10. Land morphology of geographical regions

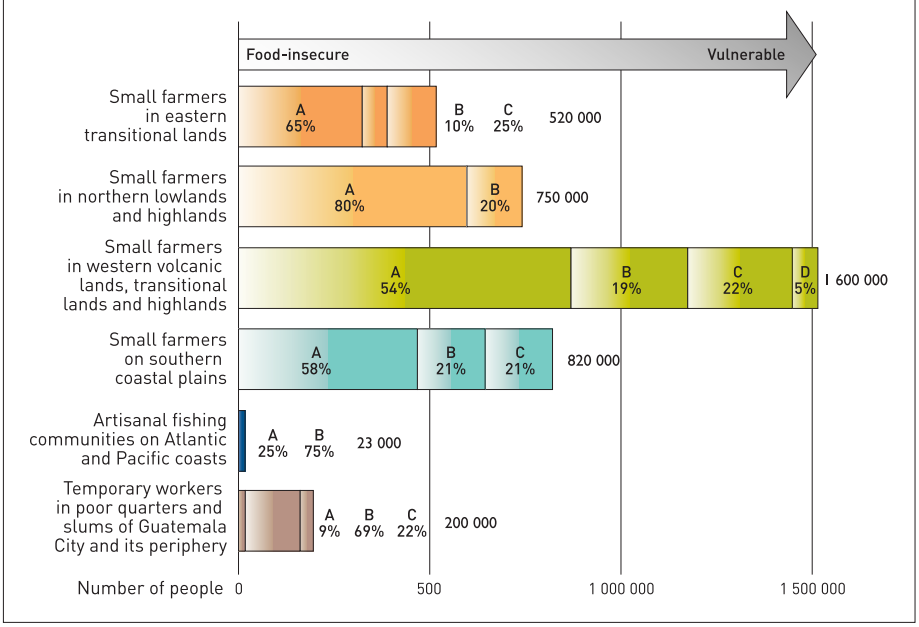
Typically, maize is cultivated on very small plots (*minifundia*), while commercial agriculture is practised on large plantations or estates (*latifundia*). Landownership of the *latifundia* is unambiguous, but small-scale farmers rarely own their land outright. Even those who have been granted title deeds cannot be sure that their land titles will be honoured in the courts. Many small plots are found on communal lands that are managed either by customary law or by the municipal authorities. Small-scale farmers may be given use rights on traditional communal lands, or they may rent from the municipality, or they may simply clear and cultivate unsettled land. Some practise sharecropping on land belonging to a large estate.

Illiteracy among rural men averages around 60 percent, while among women it is about 80 percent. This reflects a major difference in gender roles, whereby women are ascribed the role of "silent helper".

The profiles

The following pages profile the different vulnerable groups of food-insecure people in Guatemala. Within each group, homogeneous subgroups can be distinguished, some more food-insecure than others (see Figure 11). The profiles provide information about the geographical environments, dominant livelihood systems and main problems faced by these groups and subgroups. This characterization forms the basis for identifying opportunities to improve the livelihoods and food security of each subgroup.

Figure 11. Continuum of food insecurity and vulnerability within each vulnerable group



Small farmers in the eastern transitional lands

Geographical environment. The eastern transitional lands lie in the watershed of the Motagua River. At altitudes of 500 to 1 500 m, where most vulnerable small-scale farmers live, the climate is hot and dry and prone to frequent drought; soils are very poor.

Intensive export agriculture (bananas, coffee and horticulture) is practised on large estates on the lower slopes and nearby valley floors, which have ready access to the Atlantic. Construction is a growth industry in the expanding towns of the region.

Livelihood systems of vulnerable people. Small-scale farmers cultivate maize and beans for home consumption, combined with some fruits and vegetables for local markets, and they sell their labour to the large estates. Because of small plot size, low yields and very low wage rates for agricultural labour, these farmers often do not produce or earn enough to meet minimum basic needs.

Ten percent of the people in this subgroup are members of families with little or no land of their own and who cultivate communal lands or practise sharecropping at altitudes above 1 500 m (subgroup A). Sixty-five percent belong to families with less than 0.25 ha (4 *manzanas*) of land at altitudes below 1 500 m (subgroup B). Twenty-five percent are members of families without land, who migrate seasonally, renting land in the valleys or in the northern region for growing maize (subgroup C).

Opportunities. Much of this region is occupied by large estates, so obtaining access to additional land is not feasible for most small-scale farmers. Those in subgroup A have essentially the same options as those in the western zones (see relevant section on the next page). Choices open to farmers in subgroup B include:

- the introduction of agroforestry to improve yields and incomes from existing small plots;
- the introduction of small-scale irrigation in some locations to improve yields and allow the cultivation of an additional dry season crop.

To take advantage of these options, farmers need access to extension services, improved seeds or seedlings, better market information and credit. They also need to increase their bargaining power, possibly through the formation of farmers' associations.

Families in subgroup C can seek vocational training for the young to meet the growing demand for semi-skilled labour in the agro-export industries and for carpenters, woodcarvers, blacksmiths and mechanics. There are also opportunities for staff in domestic service.

Small farmers in the northern lowlands and highlands

Geographical environment. The northern lowlands consist of a largely virgin tropical rain forest (0 to 500 m), which accounts for nearly half the national territory; they are sparsely populated, with cattle ranching being the main

productive activity. The northern highlands form a much smaller forested perimeter (500 to 2 000 m) on the southern fringe of the region.

Large numbers of internally displaced and economically marginalized people, as well as post-conflict returnees, are now moving in. Many landless families from the eastern transitional lands also move north into this region for short periods to grow maize.

Livelihood systems of vulnerable people. New settlers and seasonal migrants practise slash-and-burn agriculture, cultivating the land for a year or two and then moving on. Owing to the fragility of the environment (steep slopes prone to erosion in the upper parts and low soil fertility in cleared rain forest areas), the sustainability of agriculture is at risk. In addition, the rapid advance of the agricultural frontier threatens the remaining forest, together with the biodiversity and ecosystems it sustains. Immigrants apply cultivation techniques from their regions of origin, which are not necessarily appropriate to the new environment, and they cut trees to sell as timber. The near total lack of land rights also encourages farmers to overexploit the resource base before moving on.

Twenty percent of this region's inhabitants belong to landless families now temporarily settled in either the lowlands or the highlands (subgroup A). Eighty percent belong to families with smallholdings who have claimed land but hold no legal title. Many families in both subgroups try to send at least one male family member to the capital city or to Mexico or the United States to find work (subgroup B).

Opportunities. Very important Mayan archaeological sites, combined with the natural beauty and biodiversity of the tropical rain forest, provide an opportunity to develop a major ecotourism industry, linked to the establishment of protected conservation areas. This would involve:

- investment in biodiversity conservation and management;
- the training of local groups to manage protected areas and service the tourist industry;
- the promotion of new regulations to protect the national forest.

Training in "conservation-by-use" of forest resources to generate additional income could provide immediate benefits to small farmers in both subgroups

Small farmers in the western volcanic lands, transitional lands and highlands

Geographical environment. The western volcanic lands, transitional lands and highlands constitute the plateau of Guatemala. Altitudes range from 500 to 4 000 m; roads are few and there is little access to basic social services. The region is densely populated, with very high rates of deforestation and consequent soil erosion on the steeper slopes.

Livelihood systems of vulnerable people. The higher altitudes of the plateau are inhabited mainly by indigenous people, who cultivate one or two crops of maize and beans each year during the rainy season and migrate to work on the sugar and coffee plantations in the south for the rest of the year. They also cut and sell timber as a source of supplementary income. In some locations wheat, potatoes and vegetables are also grown. Families with no other options are migrating to the northern region. As is the case in other areas, many try to send at least one family member to Mexico or the United States. At the lower altitudes, agriculture is more diverse, with greater opportunities for market participation.

Fifty-four percent of this region's people are members of families with little or no land in marginal areas with very steep slopes (subgroup A). Nineteen percent are members of families with less than 4 000 m^2 (1 to 10 *cuerdas*) on less steep slopes (subgroup B). High rates of illiteracy, very poor housing, poor hygiene and care practices, and cultural attitudes that favour maintaining the traditional maize-based livelihood system are common in these two subgroups. These people have a distrust of formal organizations, stemming from the period of conflict. However, indigenous leadership is influential and there is a strong NGO presence in many areas.

Twenty-two percent are members of families with 4 000 to 6 000 m^2 (10 to 15 *cuerdas*) and the opportunity to grow some crops for market (subgroup C). Five percent are members of families with diversified agricultural activities in the valleys and the skills required to find employment in the growing environmental protection services sector (subgroup D).

Opportunities. No agroforestry systems have yet been developed for adaptation to altitudes above 1 500 m – consequently, they are urgently needed. Other immediate possibilities for improving the lives of these highland peoples include:

- the introduction of improved post-harvest technologies for maize;
- the establishment of protected habitats for migratory bird species;
- investment in handicrafts production adapted to international market requirements;
- community-based ecotourism;
- training in conservation-by-use of forest resources;
- the introduction of shaded coffee and high-value spice trees.

Clear mountain spring water represents an important natural resource in the plateau and could be exploited through:

- the sale of water to downstream

municipalities, to industrial users and for hydropower;
- the development of micro or small-scale irrigation in suitable areas for the production of non-traditional fruits and vegetables for export.

Small farmers on the southern coastal plains

Geographical environment. The plains of the Southern Pacific coast, at 0 to 500 m, have generally good soils and flat terrain, with some undulating hills. There is a good road network and access by sea to markets in Mexico and Central America.

Agriculture is dominated by large estates and ranches producing for export, mainly sugar cane, banana and livestock on the plains and coffee in the hills. Throughout the region, small-scale farmers cultivate marginal land susceptible to flooding. Floods frequently cause substantial crop losses, especially of maize.

There has been a sharp reduction in the demand for agricultural labour because of the contraction of the coffee market and mechanization of the sugar estates. In addition, local small-scale farmers selling their labour face strong competition from migrants from the plateau.

Post-conflict returnees of indigenous origin have been resettled in organized communities under the "mixed cultural heritage" programme. Many of them prefer to grow maize, despite good opportunities to grow a wider range of crops. Local conflicts between settled farmers and returnees over access to land and government services are frequent.

Mangrove areas on the coast have been an important source of timber, but the resource is being increasingly overexploited.

Livelihood systems of vulnerable people. Fifty-eight percent of the inhabitants of this region belong to families without land and mainly depend on selling their labour to gain a livelihood; some also rent land to grow maize. These people may migrate to the capital, to the coffee and banana plantations in nearby departments or to Mexico or the United States in search of work (subgroup A). Twenty-one percent belong to families with one-sixteenth to one-quarter of a hectare (1 to 4 *manzanas*) of poor land producing maize for their own consumption and leaving their communities for short periods to work on the estates (subgroup B). A further 21 percent are families with one-sixteenth to one-quarter of a hectare (1 to 4 *manzanas*) of good land, producing maize and other crops for market; typically, at least one family member also sells agricultural labour locally from time to time. A large number of these families are resettled returnees (subgroup C).

Opportunities. Small-scale farmers in subgroup A could benefit from a livestock improvement programme to generate income. The programme should focus on small livestock, such as poultry, pigs and goats.

Options for small-scale farmers in subgroups B and C include:
- the introduction of irrigation technology to provide flood control and allow additional crops to be grown;
- the development of fruit crops that are in demand internationally: citrus, piña, mango, plantain, banana, guayaba, anona and guanaba.

Artisanal fishing communities on the Atlantic and Pacific coasts

Geographical environment. Artisanal fishing communities on the Atlantic coast live in conditions of physical isolation (settlements are located along a strip of sand dividing the ocean from the swamps). The habitat is extremely poor, with a total absence of basic services such as clean water, sanitation, health care, electricity, gas and transport. There are no organized groups or cooperatives.

The fish resource base in the Atlantic is declining as a result of the growing number of fishermen and the intensive extraction of the manjua plankton on which the fish feed. Artisanal fisheries in the eastern mangrove swamps are now part of a nature reserve. Because of restrictions on their rights to exploit wild foods in the mangrove reserve and lack of access to cultivable land, fishing families subsist almost entirely on the fish they catch; only a few own chickens or pigs.

On the Pacific coast, artisanal fishing communities coexist with settled agriculture and industrial fishing fleets. Various fish species of high commercial value are found in the Pacific, and the marketing infrastructure is well developed. Artisanal fishermen, who use boats with small engines, are at a disadvantage compared with their industrial counterparts, not only in terms of equipment but also because their access to services and markets is more limited.

Livelihood systems of vulnerable groups. In most artisanal fishing communities, a few of the "better off" community members own the boats and nets while most men work as crewmembers and receive a portion of the catch for consumption and local sale. Women are responsible for processing and selling fish on the local market, or – on the Pacific coast – to traders.

Twenty-five percent of artisanal fishing families belong to isolated communities with no access to land. They live on the Atlantic coast, mainly in the mangroves to the east but also north of Rio Dulce (subgroup A). Men in this subgroup fish with unmotorized dugout canoes and nets, while small children search for shrimp in the swamps. The catch is eaten or sold locally. The other 75 percent

belong to communities scattered along the Pacific coast, with access to small amounts of productive land and opportunities for seasonal work on ranches and estates (subgroup B). Many of the boats owned by this subgroup are motorized, and a substantial proportion of the catch is sold in larger markets along the coast.

Opportunities. Programmes targeted at the specific needs of artisanal fishing communities on the Pacific coast (subgroup B) can help them modernize. Possible actions include:

- a carefully designed microcredit programme that would allow groups to purchase engines and fishing equipment, including ice boxes for maintaining seafood quality;
- training in the use of simple tools and techniques for improving traditional practices used by women for fish cleaning, drying and salting, as well as for the preparation of fish and maize tortillas for the local market;
- the development of marine-based industries (prawns, tropical fish, and the production of fish flour for animal feed and glue).

For artisanal fishing communities on the Atlantic coast (subgroup A), opportunities include:

- the increased involvement of artisanal fishermen's families in conservation activities;
- the development of aquaculture (shrimps, mussels and tilapia);
- the training of young people for work in the mining and forest industries and in agro-export businesses.

Temporary workers in the poor quarters and slums of Guatemala City and its periphery

Geographical environment. Temporary workers in Guatemala City face considerable instability and risk. Although they have migrated from other regions to better their conditions, many remain irregularly employed. The slums and poor quarters where they find housing are unsanitary and subject to frequent flooding. Social safety nets are non-existent, with the exception of some targeted food aid programmes and the activities of religious organizations.

The degree of food insecurity of these irregularly employed workers generally reflects the length of their stay in the urban/peri-urban area. With time, their situation tends to improve, together with the quality of their homes, ownership status, income levels and stability and access to social and human capital. However, as long as their employment status remains uncertain, they remain vulnerable.

Livelihood systems of vulnerable groups. All family members work, including children. However, family income, generated through a number of diversified marginal activities, remains extremely low and uncertain; it is used almost entirely for house rental and the purchase of food. Children, often abandoned without care, are particularly vulnerable to food insecurity, disease and unscrupulous exploitation.

Nine percent of people in this subgroup belong to families headed by women with many children, often from different fathers. They usually live in new slums and are regarded as irresponsible, even disreputable. Not only do they suffer from unpredictable income but they are also subject to social discrimination and isolation which, in turn, aggravate their children's disadvantaged circumstances. Most of these families are extremely poor and chronically food-insecure (subgroup A).

Sixty-nine percent belong to families with a temporary worker renting a parcel of land or a tiny rudimentary house in more established poor quarters. An erratic income is generated mainly by the men, but it is quite often wasted on alcohol and drugs (subgroup B).

Twenty-two percent belong to families with at least one member engaging in more or less regular wage labour, usually settled in poor quarters but relying on a more stable family framework and lifestyle. However, food quality may be sacrificed in order to purchase a house on credit or pay for children's education (subgroup C).

Opportunities. Day care centres would create opportunities for women to work more regularly and would directly benefit vulnerable children in subgroups A and B.

Women and youth in all subgroups could benefit from:

- the development of the local containerized micromanufacturing industry;
- training in skills for urban jobs.

Recent shocks to food security

Droughts, floods, cyclones, extreme temperatures, earthquakes and conflicts continue to threaten progress towards food security in many developing countries.

These countries bear the brunt of the world's natural disasters and suffer disproportionately because they lack the means both to be prepared for them and to rebuild livelihoods in their wake. Governments that are already economically beleaguered must divert scarce resources to alleviate the effects of drought, floods or earthquakes, thereby thwarting their long-term efforts to improve food security and stimulate economic progress. When human conflict compounds the misery of natural calamity, advances towards freedom from hunger are further hindered.

From October 1999 to June 2001, 22 countries were affected by droughts, 17 experienced floods and hurricanes, 14 were involved in civil strife or war, 2 were hit by earthquakes and 3 endured exceptionally cold winters. Each disaster leaves a characteristic trail of damage in its wake, requiring a different response in each particular case. All too often, action taken has been too little and too late.

Drought conditions build up gradually, making it easier to predict consequent patterns of hardship; even so, early warning does not necessarily guarantee concerted or timely international action. Floods, cyclones, severe storms and, above all, earthquakes put the affected people at the mercy of spontaneous international reactions to their plight. Inhospitable climates cause hardship at the best of times, but when unexpected extremes of temperature occur, the results may be almost as severe as those from other disasters, placing great strain on fragile economies. Although relatively few new outbreaks of civil strife or war have occurred during the period under review, upsurges in long-standing civil wars continue to displace millions of people internally and to scatter hundreds of thousands across borders as refugees, despite the deployment of international peacekeeping forces.

Africa

A severe drought, which began in 1999 and continued into 2000, devastated crops and livestock across eastern Africa, leaving millions of people in desperate need of food assistance. In Ethiopia and Kenya, where large numbers of livestock were lost, people died of starvation, while Eritrea, Somalia, the Sudan, Uganda and the United Republic of Tanzania also felt the impact of the drought.

Despite early warnings from FAO's Global Information and Early Warning System (GIEWS), the international response to the impending food emergency was slow to begin, and mass starvation was only narrowly averted. In January 2001, the UN launched an interagency appeal for US$353 million to help the countries of the Horn of Africa recover from the effects of the drought but, as of April 2001, donors were still reluctant to respond. According to a UN regional humanitarian coordinator, the response for Kenya, one of the worst affected countries, produced only 3 percent of the requested amount by that time.

In southern Africa, unprecedented floods in February and March 2000 struck central and southern Mozambique, seriously damaging or destroying infrastructure and causing extensive crop and livestock losses. Again, international assistance was slow at first, but it later gathered pace, enabling the country to avert a major catastrophe. Although Mozambique is one of the poorest countries in the world, it had been making steady economic progress since the end of its civil war in 1992. Unless substantial international assistance is provided, the modest economic gains made in recent years will be reversed, and the hopes of achieving the goals set by the World Food Summit in 1996 will be dashed.

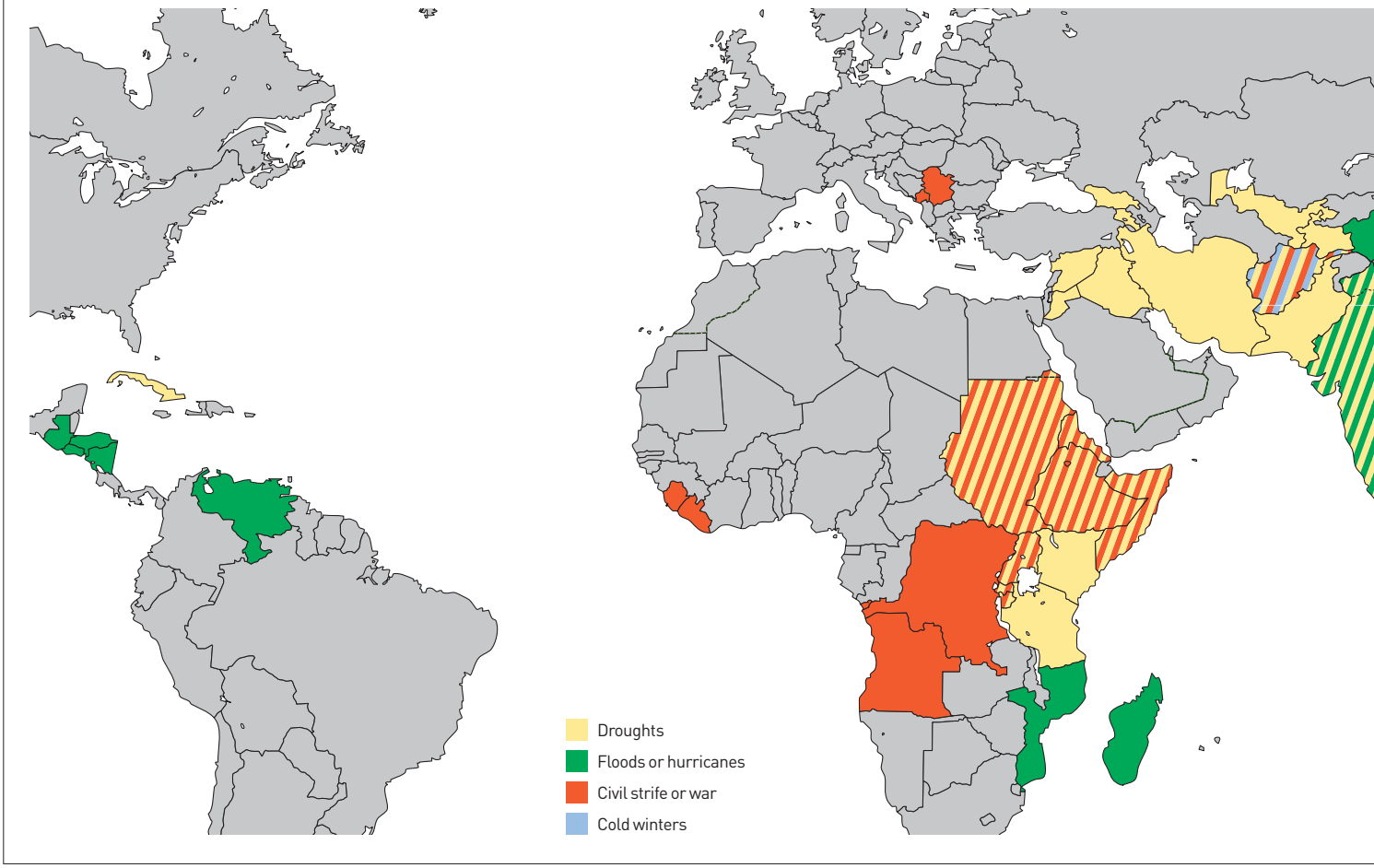
Two major cyclones and a tropical storm pounded Madagascar in early 2000, causing serious flooding and loss of life, the displacement of more than 10 000 people and extensive damage to the country's infrastructure. In all, 1.14 million ha of crops were affected, with an estimated 200 000 ha totally lost to floods. In addition to heavy losses in food crops, major export crops of coffee, vanilla and cloves were severely damaged. Madagascar, like Mozambique, is a poor country that had been making some progress in recent years as a result of economic reforms.

To add to the sum of misery, conflicts and their aftermath, protracted civil wars in particular have continued to cause suffering for millions of people in Africa. In Sierra Leone, despite the deployment of a UN peacekeeping force, the displacement of rural people continues. Up to 1.2 million internally displaced people in rebel-controlled areas were beyond the reach of humanitarian agencies in late 2000, and their nutrition and health status is cause for great concern. For some time, Sierra Leone has been heavily dependent on international food aid owing to the constant disruption of domestic food production activities.

In Angola, an escalation of the 25-year civil war has resulted in the displacement of more than 2.7 million people, the majority of them suffering from malnutrition and disease. A similar situation prevails in the Democratic Republic of the Congo. According to UN statistics, at least one-third of the country's population or 16 million people, are malnourished, largely because of constant population displacements. Elsewhere in sub-Saharan Africa, fighting continues in Burundi, Liberia, the Sudan and Uganda.

Landmines have also become a serious threat to life for rural

Figure 12. Countries recently affected by natural and human-induced disasters



communities, both during and after conflicts. In Eritrea, for example, many of the 1.5 million people displaced from the best farmland in the country by the war with neighbouring Ethiopia are reluctant to return to their home areas for fear of being killed by landmines.

Asia

In Central Asia, a total of 4 million people in the countries worst affected by drought – Armenia, Georgia and Tajikistan – now require assistance. The drought has also affected Jordan, Iraq and the Syrian Arab Republic for two consecutive years; small-scale farmers and herders have been particularly severely hit and are in urgent need of food aid.

In Afghanistan, the drought decimated crops and livestock across the country, and deaths from starvation were reported. The situation has been aggravated by the escalation in the long-running civil war and an extremely harsh winter, with people moving in masses from rural areas to the cities and across borders in search of food and shelter. There have been reports of deaths caused by the freezing temperatures, especially in western and northern areas.

In the Islamic Republic of Iran, the drought in 2000 was a continuation of one of the worst droughts in 30 years, severely affecting 18 of the country's 28 provinces. The country had to import almost 7 million tonnes of wheat in 1999/00, making it one of the world's biggest wheat importers. In Pakistan, the drought devastated crops in the western province of Baluchistan and the southern province of Sindh. In India, the worst drought in 100 years hit the State of Gujarat, leaving more than 18 000 villages with serious water shortages. Other states affected

include Rajasthan, Madhya Pradesh and Andhra Pradesh.

Bangladesh, Cambodia, China, India, the Lao People's Democratic Republic, Nepal, Thailand and Viet Nam were among the countries to suffer from the effects of such disasters as floods, cyclones, tropical storms and earthquakes. In Cambodia, another of the world's poorest countries, the worst floods in 40 years resulted in several hundred deaths and large-scale destruction of crops, infrastructure, property and lines of communication. In India, the worst affected country, severe floods devastated the States of Himachal Pradesh, Bihar, West Bengal and Assam. Also in India, the State of Gujarat suffered an earthquake that caused tens of thousands of deaths.

In Mongolia, two consecutive (1999/00 and 2000/01) winters of extreme cold, with temperatures falling as low as -50°C, destroyed 3.6 million head of livestock, more than 10 percent of the national herd. Over one-third of the country's population, mainly nomadic herders, rely entirely on livestock for their livelihood and income. A large proportion of the population has, therefore, become impoverished and highly food-insecure and will remain so for several years until their herds are fully rebuilt.

Temperatures in January 2001 fell to their lowest levels in 50 years in the Democratic People's Republic of Korea, exacerbating the precarious situation of people already weakened by years of food scarcities, shortages of electricity and fuel for heating and limited access to health services.

Numbers of people affected by disasters

Worldwide, the numbers of people estimated to be affected by food shortages as a result of disasters have varied from 52 million in October 1999 to 62 million in October 2000 and 60 million in April 2001.

Latin America

In Central America, crop production was seriously affected by a string of natural disasters, including a prolonged dry spell, hurricane Keith and earthquakes. El Salvador suffered a succession of earthquakes in January and February 2001, which killed more than 1 000 people and caused extensive damage to housing and communications infrastructure. Although major food crops had been harvested, the vital coffee sector was seriously affected.

In South America, heavy rains and drought forced the Government of Bolivia to declare most of the country a disaster area in February 2001, prompting food assistance from the international community.

Long-term strategies needed

Predictive models of climate change support the impression of an increase in the incidence, intensity and geographic spread of droughts and floods. As demonstrated above, some of the world's lowest-income countries are the most severely affected.

Timely international assistance can often avert mass starvation and help mitigate the worst economic effects. Beyond such emergency relief, further assistance is needed for rehabilitation and reconstruction. However, if these disasters are on the increase, as the international scientific community believes, then long-term strategies are essential to help countries adapt to them in the short term and to reverse the trend towards global warming over the medium to long term. In addition to the reduction of greenhouse gas emissions, the preventive measures needed include reforestation, soil and water conservation (at the watershed level) and the adoption of drought-tolerant crops. Safety nets for the worst affected regions and strong early warning systems are also important.

HIV/AIDS: a crisis like no other

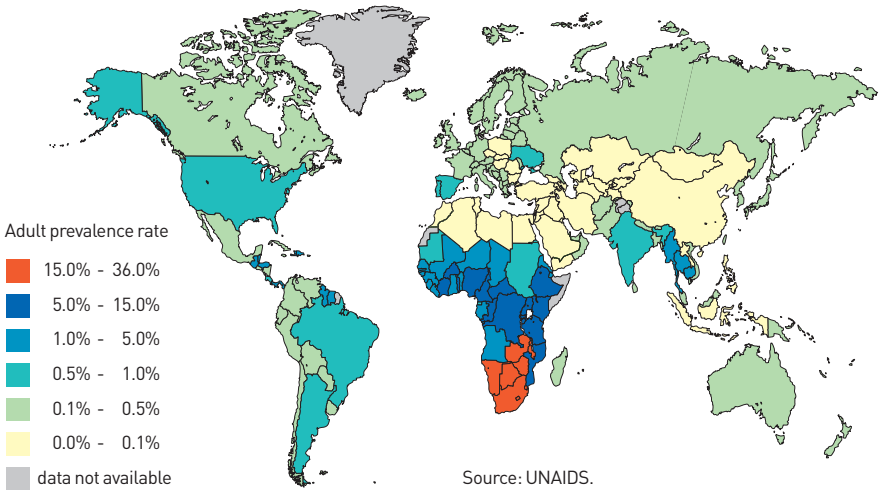
While the HIV/AIDS epidemic is still essentially perceived and dealt with as a health issue, for millions of households and entire communities and regions devastated by disease and death, access to food has become a major priority.

It is currently estimated that some 36 million people worldwide are infected with the human immunodeficiency virus (HIV), 95 percent of whom live in developing countries. Assuming that each case of HIV directly influences the lives of four other individuals, a total of more than 150 million people are already affected by the disease. There were 5.3 million new HIV infections worldwide during 2000, when nearly 3 million people died as a result of acquired immunodeficiency syndrome (AIDS). Tragically, the prevalence of the disease is still increasing. India and South Africa, each with more than 4 million people infected, have the largest populations living with HIV/AIDS. Regionally, the magnitude of the epidemic is greatest in sub-Saharan Africa, where more than 25 million people live with HIV/AIDS. Biological and social factors make females more vulnerable than males, especially in adolescence and youth. In many places, HIV infection rates are three to five times higher among young women than in young men.

The epidemic is advancing with frightening speed. Southern Africa, where the disease is most prevalent, gives a taste of things to come for other regions unless effective preventive action is taken. In Botswana, for example, in 1984 less than 1 percent of adults were infected but, by 2000, the prevalence rate had soared to 35 percent.

The disease commonly strikes the most productive members of society, with critical effects on agriculture as well as on all other aspects of economic and social development. Both rich and poor may succumb, but the poor are more vulnerable to its effects. HIV/AIDS prolongs and deepens poverty over time, stripping households of their assets and depleting human and social capital. These characteristics mean that the disease simultaneously undermines both the production of food and economic access to it – dealing a double blow to food security.

Figure 13. Estimated number of people living with HIV/AIDS worldwide, 1999



The impact on food security and nutrition

The effects on food security and nutrition are felt:

... At the household level. Classically, a downward spiral in the welfare of an HIV/AIDS-affected household's welfare begins as soon as the first adult falls sick. This results in less ability to carry out work on food production and processing, and increased time and money spent on health care, with further negative effects on food-related activities. Children may be forced to discontinue their schooling because the household needs their help and can no longer afford school fees. When the first adult dies, additional expenditures are incurred for the funeral and the productive capacity of the household is permanently impaired. Socio-cultural practices may further aggravate the household's problems, for example when a surviving wife cannot maintain access to the land of her deceased husband. A driving force behind the spread of AIDS, such forms of gender inequality can lead to a greater degree of deprivation among women in AIDS-affected societies.

In the next stage, the partner of the first adult may become sick, problems intensify and accumulate and the downward spiral accelerates. The household may find itself without cash reserves; often it becomes indebted and is forced to sell livestock and other productive resources. The household slides into destitution. Traditional systems of mutual support become exhausted, with relatives unable to care for the children of parents who have died. Eventually, the household is reduced to impoverished elderly people and children.

For a poor person infected with HIV/AIDS, malnutrition and disease form

a vicious circle. An inadequate diet increases the risk of secondary infections and hastens the progression of HIV/AIDS. This in turn results in a further deterioration of nutritional status. In contrast, the healthier and more balanced diets typically enjoyed by wealthier people help them to resist the disease and maintain a certain quality of life. After HIV infection, the onset of AIDS and of secondary infections is delayed in individuals with a good nutritional status.

... At the community level. There are several ways in which HIV/AIDS affects agriculture and food production at the community level. The first and most obvious is the toll on the labour force. FAO estimates that, in the 25 most affected countries in Africa, 7 million agricultural workers have died of AIDS since 1985 and 16 million more deaths are likely in the next two decades. The labour force is expected to shrink by 10 to 26 percent in the ten countries with the most serious epidemics.

Commercial farming is just as badly affected as small-scale subsistence-based farming, since migrant workers are particularly prone to infection. Crucial labour for weeding and harvesting may become scarce. The morbidity and mortality of employees increase the social and health costs incurred by the business, which may lose skilled and experienced workers. The decline in productivity and competitiveness may result in decreased employment opportunities and severe knock-on effects for other local businesses, such as input suppliers.

Just as food producers and processors are affected, so also are the institutions that support them. Agricultural research and extension services, like those for health and education, are disrupted as staff fall ill and die. Provision of care to sick family members, attendance at funerals and the observation of mourning periods further reduce the productive time of the remaining staff.

When many households in a community are affected by HIV/AIDS, traditional safety mechanisms for the care of orphans, the elderly, the infirm and the very poor are overwhelmed and may well collapse altogether. People have no time or money left to devote to community organizations. The widespread loss of active adults disrupts mechanisms for transferring knowledge, values and beliefs from one generation to the next. Agricultural skills disappear because children are unable to observe their parents working. In Kenya, for example, only 7 percent of households headed by orphans are reported to have an adequate knowledge of agricultural practices. All these problems can inflict lasting damage on the community's ability to produce and buy food.

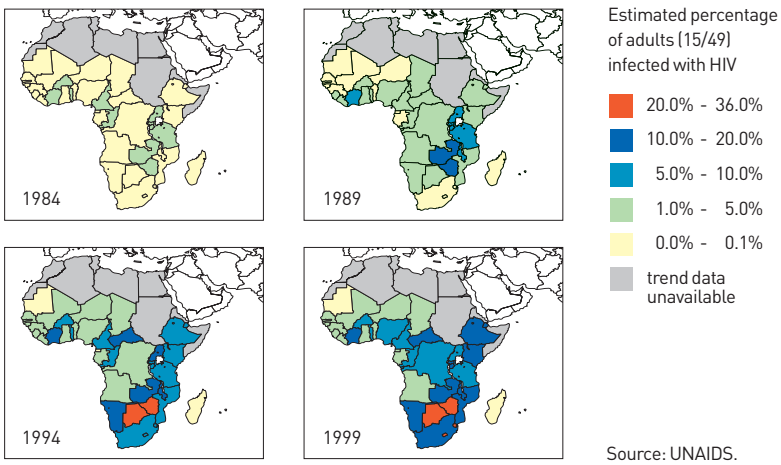
... At the national level. Household and local impacts build up progressively, so that the life of the entire nation is affected. Key decision-makers and highly skilled professionals at the national level are lost. In countries with high prevalence rates, many central government departments are no longer able to provide services as planned. The increased burden on government health budgets diverts funds away from productive investments, such as agricultural services, inputs and credit.

National food supplies decline, leading to a rise in food prices which hits poor people the hardest. The breakdown of commercial enterprises may undermine the country's capacity to export and hence to generate foreign exchange earnings and jobs – with a further impact on access to food among the poor.

Urgent action needed

HIV/AIDS represents a daunting humanitarian and development challenge. Yet experience from several countries shows that this challenge can be met and that the epidemic can be stemmed. For example, in Uganda the infection peaked during the early 1990s, with an estimated 15 percent of the population affected. Ten years later, levels of infection have been halved following the adoption of a strategy of prevention that benefited from a high

Figure 14. The spread of HIV/AIDS in Africa, 1984-99



Source: UNAIDS.

degree of political commitment and broad public participation. Similarly, projected infection rates in Thailand for 2000 have fallen to 0.9 million from the level of 1.4 million projected in 1994. These successes show that society is not powerless to turn the epidemic around and that some countries have lessons to teach about the approaches and solutions that work. Dealing with the epidemic requires an integrated approach, combining prevention and mitigation strategies:

- The starting point is strong advocacy, geared to raising the awareness of policy-makers, civil servants, professionals, opinion leaders and the general public. Society at large must acknowledge the HIV/AIDS problem and accept responsibility for addressing it. Dynamic leadership and political commitment at all levels are imperative.
- Participatory programmes that simultaneously address the food, health and care issues associated with HIV/AIDS are needed to help affected communities cope with the epidemic. Such programmes

A narrow escape

Mulenga grew up in a small rural town in Zambia. Her father was a shopkeeper selling inputs to farmers in the nearby villages. Her mother worked as a nurse in the district hospital. Mulenga's parents were not married, but they had lived together for some years. When her mother was transferred to a hospital several hundred kilometres away, their relationship came under pressure and, after a while, they split up. As time passed, both parents went through a series of more casual relationships. This was in the late 1980s, when people had not yet heard about HIV. Mulenga was still small and, when her mother had left, she stayed with her father, who looked after her as best he could.

Mulenga was bright and did well at school. When she was about 13, her father, with the meagre income he made from the shop, managed to send her to secondary school. This was about the time when his health started failing. He became thin and was often ill. Mulenga's mother had also not been well for some time, but Mulenga was unable to see her regularly as it was too expensive for her to travel. Especially now that her father's health prevented him from working, it became more and more difficult for them to make ends meet and soon school fees were beyond reach. Not long after her 14th birthday, Mulenga's mother died. She was devastated by the news. So was her father, who started spending the little money they had left on drink. He realized that what was happening to him was the same as had happened to Mulenga's mother.

Hardly a year after Mulenga's mother had died, her father also died of AIDS. Alcohol had quickly worsened his condition. He had lost his appetite and fallen very ill. As he could not work any longer, he had been forced to close the shop and sell the building.

Mulenga was now on her own. At the age of 15, she was considered grown up by local standards and was supposed to be able to look after herself. Her father's relatives had come to the funeral and had taken all his possessions. She was left with nothing, apart from a promise that she could stay for a while in a small shack in the back of the yard of one of her father's friends. How to make ends meet was her daily worry. When her father had become very ill and unable to get out of bed anymore, she had stopped school entirely to look after him. To get by, she was now doing odd jobs, but her lack of education meant there were few good opportunities. Men would ask Mulenga out for a drink and she would agree, hoping to earn a place in their favour and so get a job. But young and inexperienced as she was, she would be lured into sleeping with them. She knew about the risk of contracting HIV, but had lost all hope and felt powerless to change what was happening to her. She could see no other way of making ends meet.

Times were hard for everybody and when Mulenga realized that finding a steady job was unlikely, she started going out with travellers who were staying in town and whom she would meet at night in local bars. She would sleep with them and get a little money in exchange. Older girls had told her about how they had travelled to the capital where there was much more money to be had. But she could see that, although they had come back with money, they were not looking well.

Searching for a glimmer of hope, Mulenga joined a youth group which received support from a local development organization. The group members met every week and talked about their lives, their problems and their hopes. There she heard the stories of other people who had gone through similar troubles. From their discussions, she learned that there were other ways of coping and she decided to enrol in a training course that was offered to the group. Once she had graduated, she planned to apply for a small loan to re-establish the shop her father had run. Since the shop had closed, the farmers from the surrounding villages had had to spend more time and money travelling to the next town to find the inputs they needed. Some had even abandoned their plots. Through the youth group, Mulenga had seen an opportunity to start her life anew.

need to target men and women, old and young, in ways that respond to their particular needs both for information and assistance. They may also provide opportunities to initiate discussion in areas where HIV/AIDS is stigmatized.

- HIV/AIDS considerations need to be mainstreamed in agricultural and development policies and programmes, which must consider ways of preventing the spread of the disease and mitigating its effects.

What information is needed to combat HIV/AIDS-related food insecurity?

Combating the food insecurity associated with HIV/AIDS must be based on a good understanding of both the factors that contribute to the spread of the disease and the impacts resulting from it. To guide decisions on where, when and how to intervene to meet these two intertwined objectives, basic information is needed on:

- patterns of spread in affected communities;
- clear identification of groups most at risk of infection;
- impact on the nutritional status and livelihoods of affected populations;
- the types of intervention that are both feasible and cost-effective.

For families, the immediate impact of HIV/AIDS is on the health and nutritional status of the individual infected. A second stage of impact concerns the ability of the affected household to produce and/or buy food under conditions of reduced labour or income, and a greater demand for resources for health care and social support.

Assessing the spread of the epidemic. Understanding the magnitude of the epidemic in affected communities requires information on the spread of the disease. The health sector clearly plays a leading role in generating this information. Both the formal health sector and traditional community care systems can be good sources for key prevalence indicators, including attendance rates of patients at health centres and overall mortality and morbidity rates for associated conditions, such as wasting, diarrhoea, tuberculosis and pneumonia.

Identification of groups most at risk of infection. A good understanding of the social epidemiology of the disease – who becomes infected and why – is important in designing measures to reduce the spread of the epidemic. The local community and its partners must understand the roles played by at-risk groups such as: i) migrant workers who spend long periods away from their home and family; ii) workers and tourists who travel widely; iii) teenage girls and young women with little or no means of support; and iv) those who work as prostitutes or use their services. Given the obvious gender issues above, information on the status of women and on their ability to access economic resources, information and reproductive health services is also essential. Similarly, fighting the epidemic also requires frank approaches to understanding and dealing with delicate issues such as sexual attitudes and practices, including, for example, the use of condoms.

Understanding and monitoring impacts on nutritional status and livelihoods. The impact of the epidemic on nutrition and food security depends on how affected communities and households secure their livelihoods and the coping strategies they employ to deal with the economic and care aspects of HIV/AIDS. For monitoring, information is needed on: i) main livelihood systems (especially labour force and agricultural productivity issues) and coping mechanisms; ii) the capacity of governmental and other local institutions (including NGOs and traditional healers) to provide services; iii) demographic changes (such as dependency rates, gender balance); and iv) all the above seen within the dynamics of specific community or livelihood groups. Participatory assessments can help identify impacts on food availability and access, incomes, care and feeding practices, and on nutritional status. Community-based food and nutrition information systems can provide a basis for raising awareness and for planning, monitoring and evaluating interventions. Information to assess and monitor the cumulative impact on food supplies and economies will also be needed.

Feasible and cost-effective interventions. The monitoring and evaluation of HIV/AIDS interventions are essential. Stakeholders at all levels must receive the results in order to make informed decisions on the often cruel choices between care for the sick and dying and the support needed to end the disease spread and provide for survivors.

Information needs concerning the HIV/AIDS epidemic should be related to interventions to mitigate its spread and to alleviate the negative impacts on its victims. Information systems should build on and be integrated into existing ones, and they should involve stakeholders at all levels. The strengthening of existing food and nutritional surveillance systems to enable them to assess the consequences of HIV/AIDS on food security is needed. However, given the heavy burden that this crisis is placing on many governments, external assistance will often be needed.

Action against undernutrition and poverty

Redirecting food assistance to those who need it most

The World Food Programme (WFP) has launched a new approach to the provision of its assistance. The two essential ingredients of this Enabling Development initiative are closer targeting of specific geographic areas and the underpinning of food aid with rural development activities.

WFP assistance has traditionally been directed to support the development policies of recipient governments or areas judged to be vulnerable to food shortages on the basis of their climate and geography. Typically, food was distributed to regions subject to drought or flooding. Recently, however, a more sophisticated understanding of the causes of inadequate nutrition as well as new tools to gather and analyse data have enabled food-related assistance to be channelled more accurately to the people who most need it. New ways of working at the local level allow beneficiaries to assume ownership of food assistance activities, thereby helping to ensure that the gains achieved are sustained.

The new approach

The new approach recognizes that diverse factors combine to produce different kinds of food insecurity. Recent studies have shown how poverty, illiteracy, malnutrition and environmental degradation can be direct causes, as well as direct effects, of food insecurity. Moreover, although people in areas prone to drought or flooding may be vulnerable to food shortages, as shown in conventional analyses, they have sometimes developed successful strategies for coping with these recurrent threats and so do not necessarily suffer from food insecurity. On the other hand, some disadvantaged members of a community may suffer chronic food insecurity, even in regions where a favourable climate and good soils ensure that there are usually food surpluses.

To achieve food security, three conditions must be satisfied: food must be available in sufficient quantities, taking into account domestic production, commercial and food aid imports and national stocks; household livelihoods must be adequate to provide people with access to food supplies; and the supplies available must satisfy the specific dietary and health needs of all members of the community.

Vulnerability analysis and mapping (VAM) tools can translate these insights into sound plans and effective action. As part of WFP's strategy to focus its Enabling Development initiative on the most food-insecure areas and people, the VAM Unit, with support from the Canadian Impact Grant Facility, has identified the best practices available for vulnerability analysis. Instead of concentrating on crop failures and other disasters, the new methods can help to identify:

- who is food-insecure or vulnerable to food insecurity;
- why those people are food-insecure or likely to become so;
- where the food-insecure and vulnerable people live.

New country programmes are being designed with more accurate geographic, sectoral and beneficiary targeting. These enable WFP and its partners first to reach the regions and people most in need and then to design and plan activities so as to address the real causes of their food insecurity.

Applying the new approach

A good example of this approach in action is provided by Nepal. WFP was previously involved in two projects in the country: one was in support of a national education programme, and the other entailed the construction and rehabilitation of national rural infrastructure (tracks and trails). When the Nepal Country Office set out to recast its programme in line with the Enabling Development initiative, a major review of existing projects and a comprehensive vulnerability analysis were carried out. The result was a new programme with the following objectives:

- concentrate resources on areas with the highest incidence of food-insecure people;
- focus on the most insecure populations (the hungry "poor") within these areas;
- carry out activities that address community needs and the root causes of food insecurity.

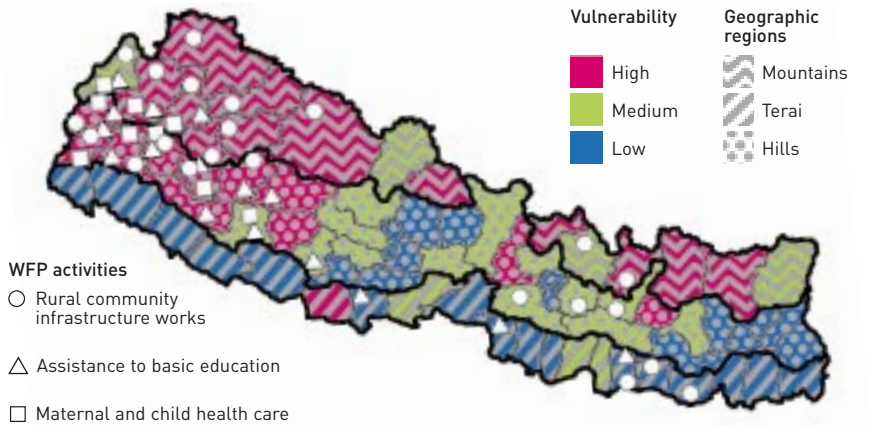
This line of action means a change in both the areas and the people targeted for assistance. It will shift the focus of WFP activities progressively from the food-producing Terai area of the plains to the western mountains, which have the worst access to food and the most severe food insecurity. Participatory methods will then be used to ensure that the most food-insecure communities, and more specifically households and individuals, will benefit from the employment generated and the assets created by WFP activities.

Linked activities

During the next five-year programme (2002-2006), WFP will support three distinct but linked types of activity in infrastructure development, education and nutrition. By concentrating these activities in the same geographic areas, it aims to build up physical and human capital in tandem and so achieve the maximum possible impact on food security.

Initially, the programme will support a range of self-help activities to improve community infrastructure. These will underpin subsequent education and nutrition activities and promote an enabling environment for other development activities. In the short term, the aim is to alleviate temporary and seasonal food shortages in food-deficit households by creating community-based employment. In the longer term,

Figure 15. Vulnerability status of districts in Nepal



Vulnerability analysis and mapping as part of FIVIMS

WFP's Vulnerable Analysis and Mapping (VAM) Unit has been a close collaborator with FAO in the interagency Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) initiative. While FIVIMS provides guidance on norms and standards for use by national information and mapping systems, the VAM Unit supports the application of these common approaches at the country level.

The stronger the collaborative national information effort, the less need there is for intervening international and bilateral agencies to mount their own information collection efforts. This should prevent duplication and minimize the amount of information needed to support effective operational planning and intervention.

the food security of these households should be improved through the construction of small roads and trails to improve access to markets and through the creation of community assets that stimulate food production. Such assets could include structures for small-scale irrigation or for the control of flooding and soil erosion. Groups of needy households will build the community infrastructure though food-for-work arrangements and will subsequently own and maintain the structures.

The Government of Nepal will provide technical support for these infrastructure works, while the German Agency for Technical Cooperation (GTZ) will provide project planning and monitoring advice as well as training of technical staff. District Development Committees (also trained by GTZ) will approve projects and coordinate local planning. Local NGOs and consultants will help to mobilize groups and train their members. Gender action plans will empower women, enhancing their social status and alleviating the poverty of households that depend on women's income. Women's representation in local implementation committees should rise from 30 to 50 percent, giving more voice to their needs and opinions.

In the food-for-education activity, WFP will work with Nepal's Primary School Nutritious Food Programme (PSNFP), while the World Health Organization (WHO) will provide technical assistance for a de-worming programme. The PSNFP will also take responsibility, under the new Maternal and Child Health Care activity, for delivering food to the district level, at which point the Village Development Committees take over. WFP will also provide supplementary food, either as a component of the United Nations Children's Fund's (UNICEF's) Decentralized Planning for the Child Programme, or accompanied by technical assistance from the Nepal-German Reproductive Health Project.

Increased effectiveness

As WFP programmes continue to benefit from the more accurate targeting provided by vulnerability analysis, as in the case of the Nepal, so their effectiveness will be increased. Since the Enabling Development initiative was adopted in May 1999, 80 percent of new programmes have benefited from hunger and vulnerability analyses. All development proposals submitted to WFP's Executive Board now include food-assisted interventions designed to enable development in situations where food insecurity is the major constraint. Food aid alone is now used only where extreme poverty prevents access to food. Each improvement in programme planning and execution brings the World Food Summit objectives a little closer to realization.

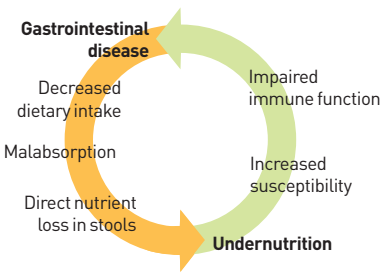
Supplying safe drinking-water for all

Ready access to water that is safe for a range of domestic uses, especially drinking, washing and cooking, is vital for good health and for food security. It is also important for overall economic development. Progress is being made in bringing safe water to rural and urban populations – but there is still a long way to go.

Women in rural Africa and Asia still walk an average distance of 6 km to the nearest water source. This is time that could be spent on more productive or profitable activities such as the family's crop or livestock enterprise. Often, their only source of water is a stagnant seasonal pond, a polluted river or a poorly maintained well. Such sources are often contaminated with germs – bacteria, parasites and viruses – that can cause diarrhoea. Diarrhoea is the major symptom of gastrointestinal infections and is the leading killer of small children in most developing countries. It undermines food security directly, by preventing the body from absorbing nutrients, and indirectly, by sapping people's ability to work and increasing the time and money spent on health care.

Contaminated water is not the only factor implicated in diarrhoea. Inadequate sanitation and hygiene practices also play an important part. A comprehensive strategy to overcome these three interrelated problems has enormous potential for reducing the burden of disease and thereby contributing to food security in the developing world. The essential elements of such an approach are the provision of more and better-quality water and the introduction of suitably designed hygienic latrines, combined with vigorous and sustained health education programmes at the community level.

Figure 16. Relationship between gastrointestinal disease and undernutrition



The undernutrition-diarrhoea complex

The relationship between undernutrition and diarrhoea can best be characterized as a vicious circle: undernutrition debilitates children and increases both their susceptibility to gastrointestinal infections and the severity and duration of these infections. In turn, the infections undermine their hosts' nutritional and immune status by decreasing appetite and dietary intake, reducing the intestinal absorption of macronutrients and increasing the loss of electrolytes and micronutrients through urine.

Many deaths resulting from diarrhoea are caused by a single bacterium, *Shigella dysenteriae*. Children infected with *Shigella* often suffer from severe, bloody diarrhoea. The transmission of diarrhoea-causing germs, including *Shigella*, occurs by the faecal-oral route. The germs pass from the body of an infected person in their excreta, then later enter the body of an uninfected person through the mouth, either via the water they drink or via the consumption of food contaminated by dirty hands or by cleaning or cooking in dirty water. Water is, therefore, a crucial link in the chain of transmission of the organisms that cause diarrhoea.

The scale of the problem

The undernutrition-diarrhoea complex is among the major causes of childhood morbidity and mortality in the developing world. Of the nearly 12 million children under the age of five who died in 1995, about 70 percent were affected by one (or more) of just five conditions: malaria, measles, acute respiratory infections, undernutrition and diarrhoea. The death rate among undernourished children suffering from diarrhoea is far higher than among their better nourished counterparts.

Displayed in the Box above are some statistics that describe the links between diarrhoea, mortality and access to safe water and sanitary equipment. They make grim reading. Despite nearly half a century of intensive development efforts by the international community, a combination of population growth and, in some regions, deepening poverty means that the challenges are still far from being met.

Diarrhoea: one of the world's five big killers

- 1.1 billion people, or one-sixth of the world's population, lack access to safe drinking-water
- 2.4 billion people lack access to any kind of sanitation equipment
- 1 billion episodes of diarrhoea occur annually among children under five in the developing world
- 3 million deaths occur annually as a result of diarrhoeal diseases
- 2.2 million of those who die as a result of diarrhoeal diseases, 90 percent of whom are children, die of diarrhoea associated with inadequate water supply and sanitation

Designing interventions

Clearly, considerable improvements could be achieved by intervening to improve food security via improved water

supply and sanitation. The aim of such interventions should be to ensure a sufficient year-round supply of safe water within easy walking distance. To be effective, however, this basic facility must be accompanied by adequate sanitation and personal hygiene practices, both in individual households and in the entire community. Interventions should target the poor, since they bear the greatest burden of water-related diseases. The focus should be on both urban and rural communities, although it is in urban areas that the largest and fastest-growing numbers of people suffering the consequences of unsafe water and inadequate sanitation are to be found.

A comprehensive approach should tackle the underlying causes of diarrhoea-related food insecurity. It may be complemented by the use of oral rehydration therapy (ORT), which has been shown to be a highly effective way of treating children suffering from diarrhoea and can be made readily available in the community at a low cost. However, although ORT saves lives, it does not prevent children from being reinfected.

Safe, fresh water can be provided in the following two major ways:

- An easy, low-cost intervention is to improve the facilities for collecting and storing rainwater. For example, the water that falls on tin roofs can be collected in pipes and diverted, either to a clean container or to a larger water tank. Containers should be covered to prevent children from putting their hands in the water. Domestic animals should also be kept away, and always watered separately from humans. Rainwater collection can be highly effective, especially when relatively large tanks are installed at the community level. In areas where rainfall is too scarce or erratic, however, other interventions are necessary.
- More expensive is the provision of water at the community level through the construction of boreholes or wells, which usually requires the intervention of the government, donor agencies or NGOs. Boreholes and wells must be equipped with suitable pumps that can be maintained locally, and wells must be protected from surface runoff, which is a source of contamination.

Guinea: boreholes make a lasting difference

Twenty years ago, an estimated 30 percent of rural people in Guinea were obliged to walk more than 2 km to reach a water source. In many villages, the under five-year-old death rate from water-borne disease, including diarrhoea, was unacceptably high.

In 1985, the Islamic Development Bank (IDB) was asked to fund the provision of water points in three of the country's poorest districts. With an IDB loan of US$6.4 million, the Service national d'aménagement des points d'eau (SNAPE), in collaboration with two German consulting firms, sank boreholes and installed pumps in 350 villages.

Nine years later, an IDB team returned to Guinea to evaluate the project and found that the project had produced substantial social and economic benefits. Women were quickly and easily able to collect and use clean, fresh water all year round, devoting the time they saved to other work. Thanks to a public awareness campaign run by SNAPE, the burden of diarrhoeal diseases among small children had been significantly reduced. An effective policy of pump maintenance and replacement, supported through village water committees, meant that virtually all the pumps were still working.

Source: K. Allaoui, IDB, personal communication.

A potential beneficiary

Eliza Fenlas, mother of three children, lives in Inhambane, one of Mozambique's driest provinces. She spends five hours a day trekking 24 km to fetch 20 litres of water. She looks forward to the day when her area will benefit from a safe water programme, aware that a well near her home would make a big difference to her life. Besides having more readily available water for drinking, cooking and washing, Eliza will have more time for her household chores and for farming. Most important, she is hopeful that safe water will put an end to her seven-year-old son's chronic diarrhoea.

Source: WHO. 2001. *Water for health: taking charge.* Geneva.

India: fundamental and sustainable improvements

WaterAid, an NGO based in the United Kingdom, is dedicated to the provision of safe water and sanitation to the world's poorest people. The WaterAid India Office works with 70 indigenous NGOs on projects in five Indian States (Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra and Orissa), installing borewells and handpumps and promoting good hygiene practices in poor communities.

When a participatory assessment was conducted in 1999 to evaluate the long-term impact of WaterAid-supported projects carried out between 1991 and 1993, it was found that fundamental and sustainable improvements had been achieved in people's health and livelihoods. Among the most important improvements were the reduction of diarrhoeal episodes and increased school attendance among children, together with decreased time and labour required by women for fetching water.

Source: WaterAid. 2001. *Looking back: the long-term impacts of water and sanitation projects.* London.

Both options depend on the existence of a plentiful supply of clean, fresh groundwater, which must not be overdrawn if the supply is to be maintained.

The building and proper use of clean family latrines is an important measure that can reduce the risk of diarrhoea. Latrines should be sited at least 15 m away from people's living area and downhill from any water supply, such as a spring, stream, pond or well. Entrances and openings should be covered tightly to prevent the latrine from becoming a breeding place for flies and other disease vectors.

In addition to the provision of clean water and latrines, the main factor in reducing diarrhoea lies in behavioural change. The simple act of washing hands with soap and water before meals and after using latrines can reduce infections by one-third. Other good hygiene practices that need to be more widely promoted include the boiling and/or chlorination of water used for cooking or washing, breastfeeding rather than bottle feeding, and the appropriately timed introduction of safe and nutritious complementary foods. Experience has shown that all these practices can be encouraged through public education campaigns, but that such campaigns must be periodically repeated if their impact is not to fade over time.

Investment in improved water systems

Much has been learned from experiences in the provision of water supplies at the community level. Following are some key principles for ensuring that rural water programmes are effective and sustainable:

- Programme implementation must be participatory. Involvement of the entire community is essential for ensuring that institutions such as village water committees receive broad support, and hence for the sustainability of any programme. Experience shows that people are prepared to observe the simple rules and practices concerning proper use of the village water point, provided they have been actively involved first in formulating, and subsequently in assessing the effectiveness of interventions.
- Village water committees, launched and sustained through public awareness campaigns, can be effective instruments for ensuring that pumps are maintained, repaired and eventually replaced. The costs can be met through a committee-administered fund, to which all water users contribute. Villagers must realize the importance of keeping up their contributions to this fund, against the day when the pump may have to be replaced.
- Local repairers need to be trained and equipped to service pumps regularly. A national network of spare part suppliers is essential for ensuring easy access to parts as soon as these are needed. Both these conditions are more easily met when standard pump models from manufacturers with a strong national presence are installed. The use of standard models also encourages the sharing of knowledge and experience among neighbouring villages.

In conclusion, implementing integrated programmes that combine the provision of safe water with the introduction of adequate sanitation facilities and hygiene practices can bring about a sustained reduction in the morbidity and mortality caused by diarrhoeal diseases. Their widespread adoption could make a sizeable contribution to reducing the number of undernourished people in developing countries.

Seeds of success

Increasing seed security is crucial to reducing poverty and hunger. There are many low-cost ways in which governments and the international community can support resource-poor farmers as they organize themselves to multiply and disseminate the seeds of new and traditional crop varieties.

Improving farmers' access to good-quality seed of productive, well-adapted crop varieties is one of the key means by which the development community can help to improve the food security and well-being of poor rural people.

The genetic quality or inheritance of a variety sets the upper limits on the yield that can be achieved. It is also the main determining factor in how a plant responds to fertilizers and other inputs intended to increase productivity as well as to stresses such as drought, poor soils and pest attacks. The physical and physiological quality of seed determines its viability and strongly influences the successful establishment of the crop.

Seed insecurity is strongly correlated with rural poverty and food insecurity. Yet few developing countries have adequately addressed the need to improve their national seed supply systems. The seed of most food crops grown by resource-poor farmers is not produced by private companies or the public seed sector; instead, farmers themselves save a quantity of seed from each harvest to sow their next crop. Under normal conditions, this provides an element of household food security. However, when unfavourable growing conditions result in poor yields, food stocks are squeezed and it is difficult for hungry households not to eat their seed stock. The result may be a chronic shortage of seed throughout the farming community. And when natural or human-induced disaster strikes, seed

Bean seeds provided by international donors

FAO/17657/G.Diana

Advantages of quality seeds

- ***Better genetic quality.*** The genetic composition of the seed is fundamental to the success of the crop, determining both yield potential (the maximum yield under optimal growing conditions) and the crop's tolerance to stresses such as drought, waterlogging, frost, low soil fertility and attacks by diseases and pests.
- ***Better germination.*** If farmers know that their saved seeds are not of good quality and expect only a proportion of the stock to germinate, they will plant a greater quantity than normal to compensate – for example 80 kg of doubtful seed instead of only 50 kg of good quality seed. The 30 kg difference could either have been eaten or sold for income.
- ***Reduced labour.*** Farmers expecting poor germination may also put several seeds in a pocket, so they can subsequently transplant seedlings from pockets in which more than one emerged. If seed is of good quality, they do not have to perform this labour-intensive activity and can devote more labour to other urgent tasks, such as weeding. A lack of labour for weeding is one of the main factors keeping crop yields low in resource-poor farming systems.
- ***More vigorous seedlings.*** Good seed germinates at the right time and produces seedlings that are strong enough to withstand adverse conditions when they emerge. Young stems are able to break the soil, the young root systems are strong enough to support the plants, and the first leaves do not wither in the sun or heat.
- ***Fewer disease problems.*** A number of crop diseases can be carried inside or on seed and may negatively affect germination or vigour and damage the growing crop. Good-quality seed should be disease-free. Strong seedlings are also more likely to resist infection by diseases already present in the soil.

stocks may run out altogether, as they are either destroyed or else have to be eaten to stave off hunger.

Public and private sectors

New varieties of the food crops grown by poor farmers are usually developed by plant breeders in the public sector, but the governments of many developing countries lack the resources to multiply and distribute adequate quantities of seed. The private sector, on the other hand, is unwilling to invest in supplying a market that offers low profit margins, especially with seeds that farmers can subsequently multiply and store for themselves.

Under the right circumstances, seed shortages can provide an opportunity to introduce new varieties and crops and to

Colombia: integrated research and development at the village level

Farmers in southern Colombia's Cauca province are benefiting from a new kind of village institution: the Comité de Investigación Agrícola Local (CIAL), the local agricultural research committee.

The CIAL concept arose from local farmers' wishes to conduct their own research to evaluate innovations. It was initially developed and tested by the International Centre for Tropical Agriculture (CIAT), but the CIAL model has since been adopted by research institutes, NGOs and universities in several Andean and Central American countries. A CIAL has four or more members elected by the local community – a president, secretary, treasurer and extension officer – all of whom act as researchers on topics agreed democratically by the local community. The research is funded by a small grant, which is usually donated by the external agency facilitating the CIAL process.

In their early stages, most CIALs conduct research to improve the yields of staple food crops, such as maize and beans. Seeds of improved varieties, usually obtained through the supporting agency, are thus an important input into the research process. The CIALs test new varieties and make recommendations to the local community on which varieties represent an improvement over traditional landraces.

Although their primary purpose is to conduct research, many CIALs develop into successful small-scale seed enterprises, each serving the area surrounding its home village. Seeds are sold at a high enough price to recapitalize the village research fund, if not to make a profit. Farmers are able to buy seed in the confidence that it is of good quality and of a variety suited to their needs. Besides acting as a channel for the dissemination of improved varieties, CIALs often serve as a focal point for other activities of benefit to the local community, such as applying for additional allocations of land or restocking the village shop with input supplies.

Source: A. Ashby, A. Braun, T. Gracia, M. del Pilar Guerrero, L. Hernández, C. Quirós and J. Roa. 2000. *Investing in farmers as researchers: experiences with local agricultural research committees in Latin America.* Cali, Colombia, CIAT.

Afghanistan: food for seed

In Afghanistan, FAO and WFP have collaborated in a successful food-for-seed programme. Improved seed varieties are multiplied by contract farmers and exchanged by the programme for WFP food wheat, at a ratio of 1:1.25. The seed procured is then cleaned, treated with fungicide to protect it against soil-borne disease, and bagged before being redistributed to contract farmers for further multiplication. Fertilizer is also supplied to contract farmers.

The programme is assisted by NGOs and implemented through local farming communities. Procuring seed directly from farmers contributes to the strengthening of local skills as well as increasing seed production and the adoption of new varieties.

Yakawlang district of Bamyan province, where the programme has been particularly active, is a remote, high-altitude region of central Afghanistan, prone to frequent fighting. In 1997, in response to an impending famine, 1.4 tonnes of seed, together with fertilizer supplies, were delivered to the district. Twenty-eight farmers were contracted and the seed was sown. In the autumn of 2000, some 550 tonnes of seed (mostly derived from the initial sowing) was procured and redistributed to farmers, not only in Yakawlang but also in five adjoining districts in two adjacent provinces, Ghor and Uruzgan.

Source: FAO. 2000. *Annual Report: Seed Component. Food security through sustainable crop production* (AFG/96/004). By N.S. Tunwar.

build a better seed supply system. Where subsistence-based production still predominates, open-pollinated varieties maintain farmers' freedom to save their own seed and will therefore continue to be popular. This will apply to most grain crops and to large areas of the countryside in several regions. However, in areas with good access to urban markets, even small-scale farmers may see a shift to modern hybrids as an attractive option because of their high yield potential. In this case, private sector companies are the main seed suppliers.

Wheat and maize are the two main food crops in which the private sector currently plays an important role. However, food crops such as groundnut and pearl millet, which have export or other commercial potential, offer scope for greater private sector involvement in the future. In a few countries, including India, a strong private seed supply sector has already developed for certain staple crops, such as pearl millet.

Meeting emergency needs

When emergencies occur, the existence of a system for multiplying and distributing quality seeds is essential for restoring food security. In such situations, international humanitarian agencies, research centres and stations, extension services and local farmers' groups commonly work in partnership. Much has been learned in recent years about the need to target introductions accurately under emergency conditions, despite the need for speed. Appropriate crop varieties that are likely to be adapted to local agro-ecological conditions need to be identified, either in the specific country or in other countries with similar growing conditions. Once found, they must be evaluated by researchers, farmers and consumers to make sure that they really are adaptable to local growing conditions and are acceptable to local tastes. Finally,

Somalia: building on a traditional market

A recent study of the seed sector in southern Somalia found that relief seed distributions immediately following the conflict in 1992 were much appreciated, but that farmers have since been able to access seed through the informal seed system. This system consists of a network of small-scale traders, predominantly women, who buy fresh seed from farmers after harvest, store it separately from grain to ensure that it retains its viability, then sell it back to farmers for cash at the start of the next season.

In 1998, the Cooperative for Assistance and Relief Everywhere (CARE) initiated a community-based project to produce sorghum seed with farmers who had access to irrigation along the lower Shabelle River for supply to farmers in rainfed areas. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) supplied foundation seed of six improved sorghum varieties, which was then multiplied by farmers with the support of local NGOs working with CARE. Three varieties performed exceptionally well, and a total of 400 tonnes of "certified" seed was produced.

The next challenge was how to market this seed. Similar schemes have relied on humanitarian agencies to purchase seed for free distribution to farmers, but if farmers were able to access seed through the informal system, there would be little reason to continue with free distribution. It was decided to find out if women traders would be interested in the activity. Their response was enthusiastic; they were sold small (1 kg) seed packs by the project on the understanding that they could return any not sold after three months, provided the packs had not been opened. Within two weeks, the traders operating at Baidoa, a major market town in southern Somalia, had sold 4 800 packs. Many more were sold through markets in other towns and villages.

This experience teaches several important lessons. First, the project organized the sale of small seed packs in this way as an experiment to test the market for seed of new varieties. It showed that farmers are willing to purchase small amounts of seed of new or unfamiliar varieties and that the informal system can be an excellent mechanism for disseminating such good-quality seed rapidly. Second, the experience has also shown the importance of research on seed systems. The understanding, derived from research, of how farmers traditionally access seed allowed an intervention to be designed that would strengthen the traditional system rather than undermine it. Third, humanitarian agencies and other organizations working in the seed sector need to respond quickly and flexibly to changing conditions. Just as seed needs to be supplied in bulk rapidly as soon as an emergency occurs, so also should such distributions promptly cease once the emergency is over. Continuing large-scale free distributions can threaten the livelihoods of small-scale seed traders.

Source: C. Longley. R. Jones, M.H. Ahmed and P. Audi. 2001. *Seed sector study of southern Somalia*. Report to EC Somalia Unit, Nairobi.

extension and NGO field staff need to be trained to bring appropriate agronomic practices as well as improved storage and processing methods to the attention of the farm households concerned.

Helping communities help themselves

Once an emergency situation has passed, or wherever the formal private sector remains weak, the best way of encouraging quality seed production and dissemination is to support the development of small-scale community-level seed enterprises. These may take a variety of forms, consisting of women's groups, church groups, farmers' associations, schools or even village-level research committees. As yet, such enterprises meet the needs of only a tiny proportion of farmers, but anecdotal evidence suggests that they are becoming increasingly active, filling the vacuum left by the formal public and private sectors. Significantly, many private concerns are reaching out to the public sector for support in the form of foundation seed of new varieties and training in seed production. There is potential therefore for these enterprises to become an important catalyst for the widespread adoption of improved varieties.

Community-based seed production enterprises are the building blocks of an emerging bottom-up private seed sector in many developing countries. An enabling policy and institutional environment is essential to ensure that they continue to establish and flourish. Access to credit, microfinance, a high-quality yet user-friendly national seed service and the encouragement of outreach activities in public sector research organizations are some of the policy instruments that should ensure success. It is particularly important to motivate plant breeders and other researchers to disseminate new technology rather than merely develop it.

Zambia: community-based organizations ensure speedy adoption of new varieties

In Zambia, the main agricultural activity of CARE's Livingstone Food Security Project has been the introduction of drought-tolerant crops through a community-based seed bulking and distribution scheme. The crops covered initially were maize, sorghum and cowpea. Related agronomic information, seed handling and post-harvest storage were included in the extension messages shared with farmers.

In the pilot season of 1994/95, some 330 farmers participated, almost entirely on an individual basis. The seed groups in each village were federated to form a Village Management Committee (VMC). For the 1995/96 season, 180 VMCs representing 1 208 seed groups or about 6 800 participating farmers were established. Each season, more groups were added as more households joined the scheme. Eventually, it became necessary for the VMCs to federate in their turn to form Area Management Committees, which serve the interests of several adjacent villages. A further expansion of the scheme increased the number of participating farmers to 9 600 in 1996/97 and to more than 12 000 in 1997/98.

Repayment terms were agreed on in advance of seed distribution. Each farmer received enough seed to sow about 0.25 ha (either 5 kg of maize, 4 kg of sorghum or 3 kg of cowpea). The rate of repayment was a sufficient quantity of seed for each remaining member in the group to plant an equivalent area the following season, in addition to one portion of seed entrusted to CARE for allocation to a farmer in a new group. Depending on the group's size, this could add up to about four times the loaned amount. The scheme's rapid expansion has been aided by two factors: the high priority that farmers attach to drought-tolerant crop varieties and the strategy of using community-based organizations.

Source: FAO. 1999. *FARMESA: A case study on community-based seed supply systems* (GCP/RAF/334/SWE). By G. Mitti.

The strength of informal seed systems often depends on key individuals in the community who are known for their seed management skills. The first step is to identify these individuals as a basis for understanding the local system and subsequently strengthening their activities and spreading their skills.

There are many models of successful seed multiplication and dissemination to choose from and no single model is universally applicable. However, at both the national and international levels, increased resources are needed to make sure that good seeds – which are the very foundation of food security – reach all the world's resource-poor farmers, and not just a tiny minority as at present.

Propagating prosperity

Improved methods for cultivating starchy staple crops should help to restore food security and improve rural livelihoods. A combination of new technology and new forms of farmers' cooperation is revolutionizing the way these crops are propagated and disseminated in some of the world's poorest farming communities.

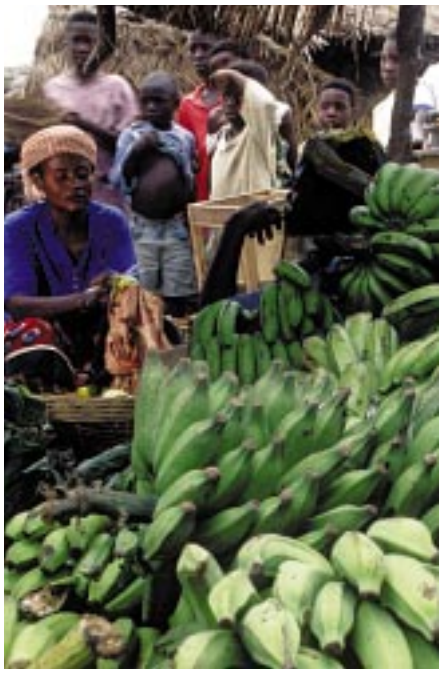
Ghana was one of the countries highlighted in *The State of Food Insecurity in the World 2000* as having made remarkable progress in reducing undernourishment. When per capita food intake rose from 1 790 to more than 2 600 kcal per day, much of this success was attributed to farmers' adoption of high-yielding cassava varieties. Developments elsewhere in Africa include the use of tissue culture to provide clean banana planting material in Kenya, and the adoption of disease-free "seed" potato tubers, which have more than doubled average yields in Uganda. Cassava cultivation is also helping the Democratic Republic of the Congo to restore food supplies after years of war and economic disruption.

These different success stories have one thing in common: they concern crops that are vegetatively propagated. Cassava is traditionally propagated with stem cuttings, and bananas from suckers cut from around the base of the parent plant. When people talk of "seed" potatoes, they refer to small tubers used to start the new crop.

Vegetative planting material confers some advantages. Each plant is genetically identical to the parent plant and to its siblings, so the traits of good varieties are easily maintained by farmers and the new crop stand tends to be relatively uniform. Furthermore, the relatively substantial food reserves carried by the planting material can help to establish the crop in the face of drought, pest attacks or other adverse conditions. Indeed, the rugged, undemanding nature of several vegetatively propagated crops has made them vital food reserves in areas with poor soils and in times of environmental stress or civil strife. On the other hand, under good growing conditions, crops such as banana, plantain, potato, sweet potato and cassava can produce impressive quantities of energy-rich food: fresh weight yields of 20 to 40 tonnes per hectare are readily attainable.

The downside is that pests and diseases are also readily propagated – from one season's crop to the next, or from one field to the next – along with the planting material. Viral diseases in particular are carried in the tissue of the planting material and their transmission may not even be recognized by farmers as an avoidable problem. Moreover, genetically identical stands of a crop are all equally susceptible to any new disease strains that may appear. And when planting material needs to be replaced in a hurry – for instance, after a pest epidemic or when war or famine has resulted in its widespread loss – propagation can be painfully slow. Vegetative planting material is also bulky and expensive to transport.

Fortunately, with new technologies and action enabling farmers to help themselves, these obstacles are being overcome. As a result, crops such as banana, potato and cassava are starting to play an increasingly important role in reducing food insecurity.



FAO/18425/P. Cenini

Banana bunches in a market stall

Tissue culture raises banana yields and incomes in Kenya

In the highlands of Kenya, almost every farm household has a small banana orchard. Bananas are important both for food and for cash, providing the women who grow and market them with a small but much needed source of income to pay for household necessities. Because of the decline of coffee, the traditional cash crop, many families are becoming more dependent on bananas for their livelihood. At the same time, however, banana yields are declining, mainly because of the buildup of pests and diseases. Weevils, nematodes and viruses are all transferred from infested orchards with the basal shoots or "suckers" used to establish new plants.

These problems are being addressed through a dynamic partnership that brings together the country's public sector biotechnology researchers, its nascent private sector biotechnology industry and innovative farmers. The partnership began in 1997, when the Kenya Agricultural Research Institute (facilitated by the International Service for the Acquisition of Agribiotechnology Applications) launched a project on bananas.

The project's central technical ingredient is tissue culture or micropropagation, a set of techniques used to multiply pest- and disease-free planting materials. Small pieces cut from

Action against undernutrition and poverty

A project beneficiary

Esther Gachugu was one of the demonstration farmers and an early adopter of the tissue culture technology. Her family's modest banana plot has been transformed into a profitable enterprise, yielding the equivalent of up to US$300 from a single day's sale of fruit in Nairobi. Esther has become a convincing advocate of the new technology, training other farmers in all aspects of its use. Among her investments is a new kitchen which allows her to feed her family in comfort.

Source: F. Wambugu. 2001. *Modifying Africa: How biotechnology can benefit the poor and hungry, a case study from Kenya*. Nairobi.

Esther Gachugu and her son

a clean shoot-tip of a desirable variety are grown in a sterile artificial medium in the laboratory to produce numerous tiny plantlets. These are carefully hardened off in greenhouses to produce plants that can be grown outdoors. If established in pest- and disease-free soil and carefully nurtured through their critical period of establishment, tissue-cultured banana plants are much more productive than conventionally propagated varieties. Starting afresh with tissue-cultured planting materials also provides an opportunity to introduce new, high-yielding varieties with resistance to destructive fungal diseases such as fusarium wilt and black sigatoka.

The project's first step was to learn from experience in South Africa, where public sector research had laid the foundations for what is today a thriving private sector business, the export of mass-produced tissue-cultured plantlets. South Africa's Institute of Tropical and Subtropical Crops generously provided its expertise in propagation techniques to Kenyan institutions, while a private South African company, DuRoi Laboratories, supplied the first planting materials for field evaluation in Kenya. South Africa's model of public-private partnership was replicated in Kenya by involving a private Kenyan company, Genetic Technologies Ltd (GTL), to ensure the mass production of plantlets, using the techniques developed through public research.

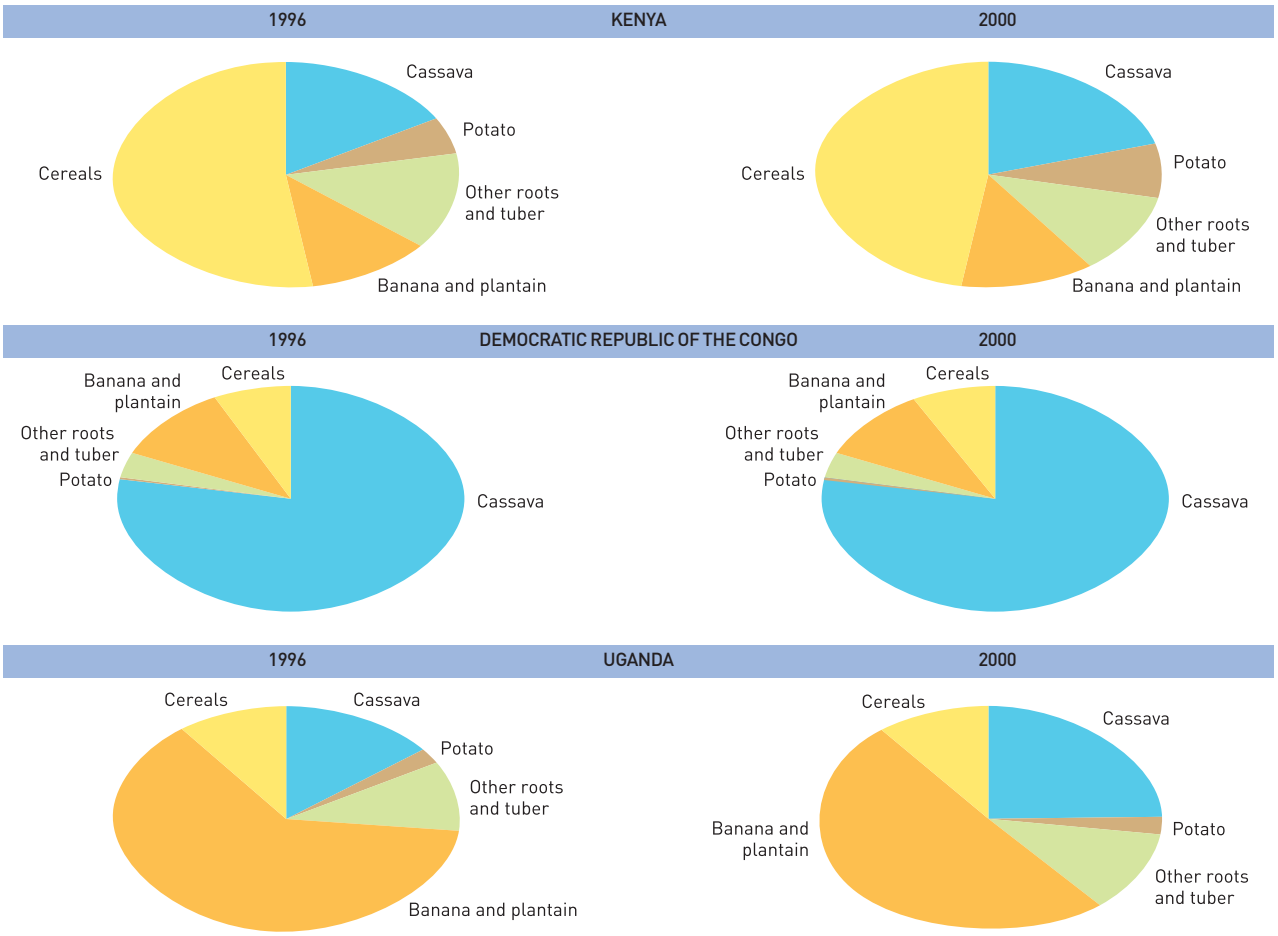
Next, tissue-cultured plantlets were tested for their acceptability in the farming community, using a group of 150 "demonstration" farmers in Kenya's four main banana-producing areas. These farmers received their initial supply of tissue-cultured plantlets free of charge and were formally trained in how to manage them. The high yields they achieved elicited great interest in the wider community, prompting the project to aim for mass production and dissemination. At this point there was a setback, however, since few farmers were able to afford the investment of US$200 needed to buy enough plants to benefit in terms of output and income.

This problem has now been overcome by forming microcredit groups. Based on the successful Grameen Bank model developed in Bangladesh, groups of about 20 to 40 farmers are able to pool their resources to acquire truckloads of plantlets from GTL. Group members are jointly accountable for loans taken from a revolving fund, and they work together and share management information.

For farmers who have made a success of the new technology, the payoff has been considerable. The heavier and more predictable fruiting of the tissue-cultured bananas has made the fruit easier to market commercially, while the formation of farmers' groups, initially to obtain credit, has empowered the growers in their marketing efforts. Farmers are able to sell in bulk, directly into urban markets such as Nairobi, instead of in small quantities to intermediaries. Investments in irrigation technology and improved soil fertility, initially undertaken to help establish the banana plantlets, have improved the productivity of entire farms. The new varieties have proved popular with consumers, and their resistance to pests and diseases assures their popularity with growers.

The demand for tissue-cultured plantlets of banana and other crops has provided new jobs in the growing biotechnology sector, while the increased production of bananas should in due course stimulate the development of processing industries. If this is achieved, an innovation in planting material technology will have catalysed the transformation of a neglected subsistence crop into a new source of prosperity.

Figure 17. Contribution of the major vegetatively propagated crops to total crop prodution



Communities take better care of their seed potatoes in Uganda

Farmers in Kabale district, in the cool highlands of southwestern Uganda, supply food for some of the densest rural populations in the world – about 370 people per km^2. Growing potatoes is a relatively recent innovation here, but the crop has rapidly become a vital source of both food and cash. Unfortunately, there is no formal system for maintaining seed quality and, in the absence of a strong body of local traditional knowledge, farmers have developed their own ad hoc practice. This simply consists in selling the largest tubers for cash, eating the medium-sized ones and keeping the smallest tubers as planting material for the next crop. The outcome has been the buildup of diseases, especially viruses such as potato leaf roll virus. Yields have become erratic and have declined overall.

In 1995, with support from the national and international research community, a group of about ten farmers formed the Uganda National Seed Potato Producers' Association, an initiative which was to prove critical in solving the problems stemming from current practices. The Association has since grown to 19 members – 7 women and 12 men – and has so far provided some 267 tonnes of improved seed potatoes to 3 570 households, benefiting almost 33 000 people in 73 communities.

Disease-free local potato varieties and new varieties from the International Potato Center in Peru are multiplied at

Placing cassava on a communal drier

FAO/19318/R. Faiduti

research stations of Uganda's National Agricultural Research Organization. The Association then organizes the remultiplication of clean seed at the community level. Training in integrated production and pest management techniques, which can help to keep the new crops disease-free, is a vital complementary component of the programme. This is provided by the regional technical support network, the Programme régional d'amélioration de la pomme de terre et de la patate douce en Afrique Centrale et de l'Est (PRAPACE). Meanwhile, an effort to improve storage practices helps to take better care of the extra seed potatoes produced. Over 60 diffused light stores, each with a capacity of 5 tonnes, have been installed, reducing seed potato losses from 40 to 26 percent.

The combined effect of using better planting materials, introducing new varieties and adopting improved production techniques has allowed farmers in Kabale district to more than double their yields – and, what is more, has restored their confidence in the potato as a staple food and as a source of household income.

Cassava will help the Democratic Republic of the Congo back on its feet

Through years of civil war and the disruption of trade and agriculture, the tough cassava plant has been one of the staple crops that have fed the people of the Democratic Republic of the Congo. No crop really "thrives on neglect", but cassava comes the closest to it, almost always managing to produce a yield despite drought, poor soils, pests and diseases and virtually a total lack of inputs and management. However, no new cassava materials have been introduced in this country for several years, so pests and diseases have spread unchecked. Most dangerously, a particularly destructive form of cassava mosaic disease is spreading from the Great Lakes region of Central Africa, reducing cassava yields almost to zero at the advancing front of the epidemic.

Tissue culture has played a vital role in tackling the problem, but in a different way to the banana case discussed above. In the Democratic Republic of the Congo, it provided the cheapest and most effective means of transporting clean planting materials to the country from the Nigeria-based International Institute of Tropical Agriculture. Some 200 elite cassava clones have now been flown into the country for evaluation by farmers. However, the major challenge still lies ahead: to multiply and distribute enough resistant cassava material to counteract the mosaic virus epidemic. A project has been established by FAO and the Government of the Democratic Republic of the Congo, under which 1 million metres of stem cuttings per year of four resistant and locally adapted varieties will be multiplied and disseminated.

The first round of multiplication has already begun at three locations, using rapid propagation techniques which, although less sophisticated than tissue culture, offer major advances over traditional procedures for taking cuttings, both in terms of increasing the rate of propagation achieved and ensuring disease-free planting material. Some 300 000 m of stem cuttings should be ready for distribution by October 2001. A further eight locations will then be brought into the multiplication effort. The farmers' groups and extension agents who will be involved at these locations are already being trained. At the third stage, farmers' associations and community groups will take over responsibility for multiplication and distribution, while field schools will play a vital role in building farmers' knowledge of the integrated production and crop protection techniques that will help to maintain productivity in the longer term. Such investment in human capital is vital if improved planting materials are to make their full contribution to averting food insecurity and improving livelihoods.

Improving fish safety and quality in Africa

Conventional wisdom holds that domestic food security declines when fish exports rise. This can happen in inland waters, where the fishing area is limited, but it need not be the case in offshore fisheries, as African experiences show.

World trade in fish and fishery products has grown rapidly over the past 20 years, rising in value from US$8 000 million in 1976 to US$52 900 million in 1999. Fish exports have become a major source of foreign exchange earnings for developing countries, which now account for roughly 50 percent of the international fish trade.

To sustain or expand their share in fish exports, many developing countries have placed fish safety and quality at the centre of their trade development and promotion policies. The international development community has been assisting in the establishment of the control systems needed to meet the food safety and quality regulations imposed by importing countries.

How does improving the safety and quality of fish products for export contribute to domestic food security? It is sometimes argued that promoting fisheries exports from developing countries could have the opposite effect, endangering the nutritional status of poor people because of the possibility of a decline in domestic supplies.

On the contrary, domestic food security can benefit from export trade in various ways. First, at the macroeconomic level, the earnings from exports of high-value fishery products, such as lobsters or shrimps, may be reinvested in large quantities of less expensive food, which then becomes available to nutritionally vulnerable people. At the microeconomic or household level, an increase in fish exports creates jobs and raises incomes for poor people, who then have more to spend on food. This is especially the case in fisheries sectors where a large proportion of the fleet is artisanal, i.e. managed by individual fishermen who operate on a small scale. Furthermore, improvements in the food safety and quality of fish exports spill over to domestic supplies because the same facilities, equipment and people are employed in both sectors. In addition, because interventions to enhance food safety and quality serve to prevent post-harvest losses and may allow a larger area to be fished, the quantity of fish products available to consumers may also rise, resulting in downward pressure on prices.

FAO/17114/M.Marzot

Transporting a tuna fish

Africa's experiences

Africa provides positive case studies of these mechanisms at work. During the 1990s, Africa's fish exports rose by 10.2 percent per year – far faster than its fish imports, which grew by only 2.3 percent. Consisting mainly of higher-value fish, exports are now worth about US$2.1 billion annually, more than twice as much as imports (US$1 billion).

Several countries have used the

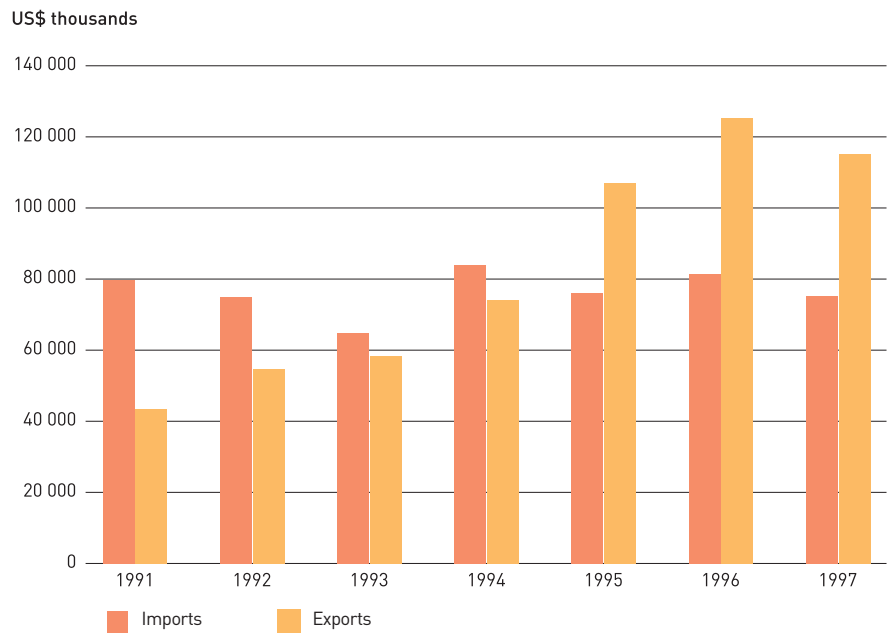
What is the HACCP system?

The Hazard Analysis Critical Control Point (HACCP) system was originally developed in the 1970s to ensure food safety for astronauts participating in the United States' space programme. It has since become the world's preferred system for assessing and improving food safety. Following are the seven HACCP principles:

- Conduct a hazard analysis
- Determine the critical points at which control measures are needed
- Establish the critical limits that determine acceptable or unacceptable standards
- Establish a system to monitor critical control points
- Establish corrective action to be taken when monitoring indicates that a critical point is not under control
- Establish procedures to verify that the system is working effectively
- Document procedures and keep records appropriately.

Guidelines for applying HACCP systems have been adopted by the Codex Alimentarius Commission, the body responsible for implementing the Joint FAO/WHO Food Standards Programme. The guidelines are widely used as a basis for training programmes.

Figure 18. Total value of fish exports and imports in sub-Saharan Africa, 1991-97



revenues generated by these exports to import less expensive foods. Egypt and Nigeria import low-value fish species such as herring, sardine and mackerel. Exporting countries with a small domestic market for fish import other foods, such as poultry and dairy products. In Mauritania, for example, which has little arable land, such imports are vital for food security.

With assistance from FAO and other development agencies, many African countries have introduced fish inspection and quality assurance (FIQA) programmes, which are now mandatory for all countries exporting to the European Union (EU) and other parts of the developed world. These programmes are preventative (designed to avoid losses throughout the food chain) in contrast to the end-product testing systems used by importing countries. The industry takes responsibility for implementing the programme, while government inspection agencies monitor activities and regulate exports accordingly. The major tool used in FIQA programmes is the Hazard Analysis Critical Control Point (HACCP) system.

Originally applied by countries in the North, HACCP systems used in fisheries need to be adapted to the different conditions found in Africa and other developing regions. For example, bacterial spoilage patterns of tropical fish are different from those of cold or temperate water fish, requiring specific control measures. Likewise, many fish-processing operations are performed manually in developing countries, so more emphasis needs to be placed on personal hygiene, whereas in the developed world operations are largely mechanical, requiring more emphasis on the sanitation of equipment.

In the 1980s, FAO worked with national and other partners to provide training in the development and application of appropriately adapted HACCP systems in African countries. Morocco was the first country to benefit, and the model developed there has been diffused in other countries.

A major technical innovation in improving the safety and quality of fish products in sub-Saharan African countries was the development of a system for chilling fish on board small boats. In the early 1980s, insulated containers for ice were designed to fit the narrow dugout canoes or pirogues used by small-scale fishermen, while small plants for manufacturing ice were developed onshore. These technologies not only prevented spoilage but greatly increased the area that could be fished, since boats were able to remain at sea for five to six days, instead of the 24 hours or less that had been possible previously. As a result, catches by small-scale fishermen have increased dramatically and losses have been greatly reduced.

African countries have seen their investments in fish safety and quality pay handsome dividends. To export fish for human consumption to the EU, they must be entered on its List I, including countries deemed to have an effective FIQA programme in place. Of the 54 countries currently on this list, 13 (nearly one-quarter) are African. Among them are Senegal and Mauritania, whose contrasting cases show the range of situations under which food security can benefit as fish exports rise.

A tale of two sectors: Senegal and Mauritania

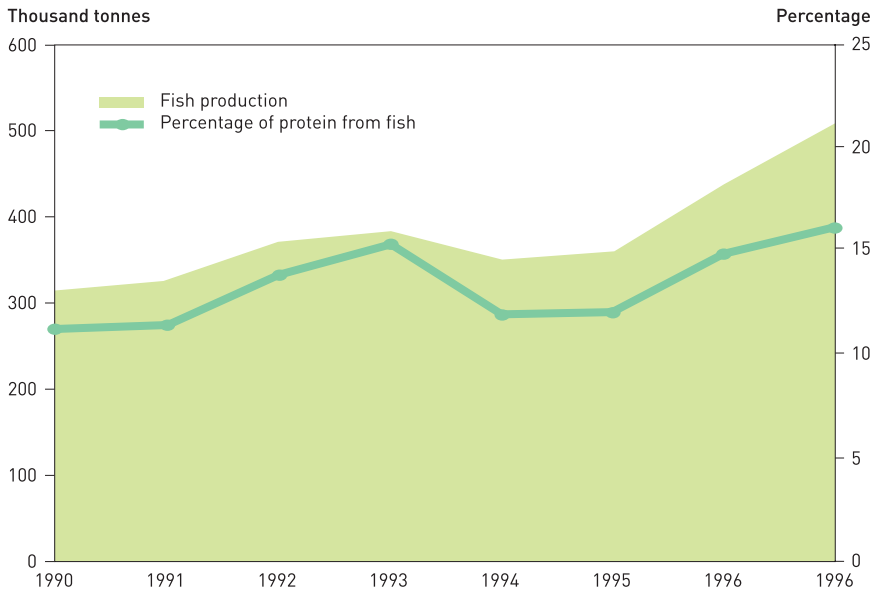
Fish is a traditional food in Senegal, which has a long-established fisheries sector and was also among the early adopters of a FIQA programme. Having requested international assistance in 1988, Senegal launched its new programme in 1990 and, by 1998, had increased its annual fish production by 35 percent, from 315 000 tonnes to 427 000 tonnes. Nearly one-third of the 1998 total (140 000 tonnes), was exported, earning the country about US$299 million in hard currency. Over the same period, the domestic consumption of fish rose from 25.3 kg to 36.3 kg per capita per year. That compares with a world annual average of 16 kg per capita. About 400 000 to 600 000 people are now employed in Senegal's fisheries sector, 80 percent of which is artisanal.

In Mauritania, fish consumption is relatively low and the fishing industry is nascent. The annual catch landed by Mauritanian fishermen has risen steadily in recent years to its current level of around 85 000 tonnes. Most of the catch is exported to Japan and the EU, generating an estimated US$135 million in hard currency earnings. In a poor country consisting largely of desert, fish has become the principal source of wealth and is often referred to as *l'or bleu* (blue gold).

In March 1996, the EU imposed a ban on fish imports from Mauritania for safety and quality reasons. The result was a devastating loss of earnings, estimated to be US$16 million for the fishing industry and representing 70 percent of the government's revenues. The ban was lifted as early as July of the same year, however, after the country had initiated a FIQA programme. The rapidity with which the programme was established, together with its early success in restoring exports, owed much to high-level commitment from government and national institutions which, with the assistance of the international community, were able to draw on the experience of Morocco and Senegal to fine-tune the programme to Mauritania's needs.

In Senegal, domestic fish consumption has risen in parallel with exports while, in Mauritania, total protein intake has risen, reflecting the use of the hard currency derived from fish exports to import other forms of animal protein.

Total fish production, protein consumption and fish protein consumption in two West African countries



Zambian boy revisited

Last year's issue of *The State of Food Insecurity in the World* reported on the diet of seven-year-old Mumba, who lives with his family in Zambia's Luapula Valley. Since then, the prospects for household food security and nutrition in the area have substantially improved thanks to an FAO project.

In January 1997, FAO and the Government of Zambia began implementing an integrated five-year project to improve household food security and nutrition in the Luapula Valley. The project is funded by the Belgian Survival Fund.

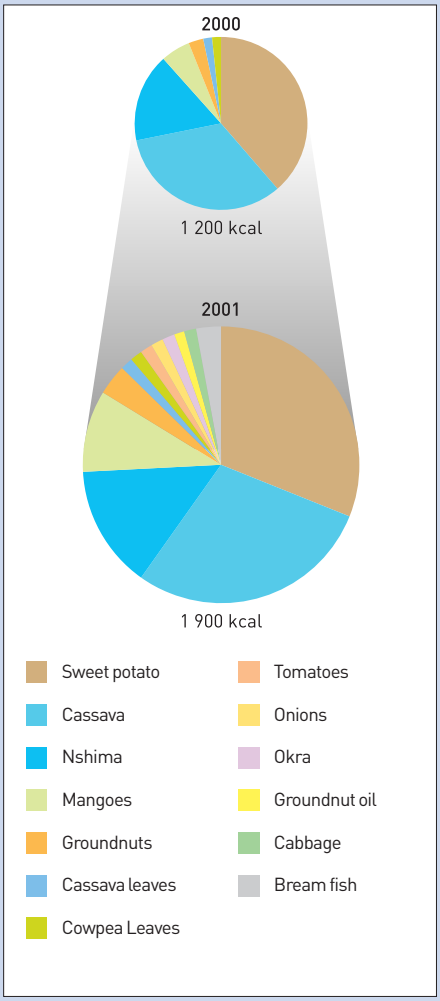
Despite efforts to develop its agriculture, infrastructure and community services, Luapula Province remains one of the poorest parts of Zambia. Many households are chronically food-insecure and a large proportion of the population is nutritionally vulnerable. This has a severe impact on children's health. In 1997, 59 percent of children under five years of age were stunted, 3 percent were wasted and 29 percent were underweight.

Micronutrient deficiency diseases, especially vitamin A deficiency and iron deficiency anaemia, are also widespread, with 50 percent of children under five having a mild to moderate deficiency of serum-retinol and 76 percent suffering from anaemia.

Malnutrition is higher in the rainy season because staple foods such as cassava and maize are in short supply at this time and there is a high incidence of malaria and diarrhoea. With heavy demands made on them by agricultural work, mothers lack the time to ensure their children receive proper care and nutrition.

The majority of poor households do not have adequate farmland or fishing equipment, have little cash income and lack access to agricultural extension and health services. Many low-income households cannot afford to send their children to school.

Diversity in Mumba's diet, 2000 and 2001



The diets described in these charts are not necessarily representative of an average or usual intake. Rather, they are estimations of foods and nutrients for a single day of the year. Project monitoring information suggests that enhanced food availability at the household and community levels is likely to have led to the improved nutritional intakes described above. A comprehensive assessment is to be carried out in Luapula towards the end of 2001.

Higher yields of key food staples

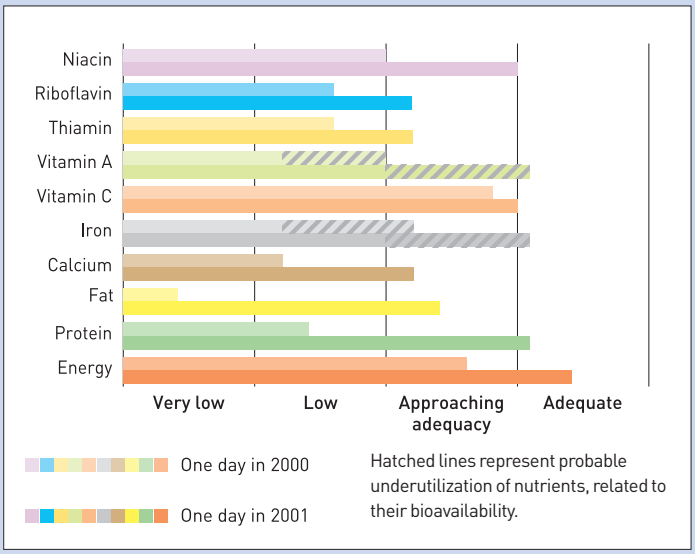
Under the project, Mumba's family has received disease-free cuttings of a cassava variety that matures in 18 months instead of the usual 36 required by local varieties. They have also received seed of a groundnut variety that produces higher yields than their traditional variety. During the last season, the production of both crops increased and the family was able to keep enough good planting material and seed for the next season. The harvest is now sufficient for home consumption throughout the year, with a small surplus available to sell in the local market. The proceeds enable Mumba's parents to buy other commodities and to pay previously unaffordable school fees and medical expenses.

New source of vitamin A

Mumba's parents are participating in a self-help group, which has purchased higher-yielding and cold-tolerant tenera oil-palm seedlings, imported from Costa Rica and raised in central nurseries by the Ministry of Agriculture. The first fruit bunches have already started to develop on the trees planted on the edge of the wetlands, where enough water is available all year for the trees to grow well and set fruit. The women in the self-help group are keen to start processing the fruits from the new trees, as they contain nearly twice as much oil as the local variety.

The group has already learned about improved techniques for processing the palm fruits immediately after harvesting. As well as being less laborious and time-consuming, these techniques avoid fermentation, which gives the oil a strong flavour that is not liked in Luapula. At the end of the process, salt dissolved in water is added, which improves the taste and shelf-life of the oil. Before storing, the oil is dried, since any moisture left will considerably reduce its shelf-life. If it is stored in clean containers and kept in a

Two days of Mumba's diet compared



Mumba's wet season diet has improved considerably since last year. His energy intake is adequate for his age, size and level of activity. Both his protein and carbohydrate intakes are in the adequate range. Thanks to the higher-yielding groundnuts and more food purchases enabled by the family's increased income, Mumba's fat intake has improved greatly. Nevertheless, it still falls short of his needs, a situation that should be remedied when the oil-palms begin producing. His intakes of vitamin A, vitamin C and iron are better because of the increased amount of fish, meat, fresh fruits and vegetables in his diet. Nevertheless, Mumba's vitamin A utilization continues to be compromised by his low fat intake, while his iron bioavailability is low because of the high proportions of mineral-binding components in his diet. Other likely nutrient deficiencies include calcium, thiamin and riboflavin. This indicates that the high proportion of starchy staples in his diet should be substituted with other varieties of foods.

cool, dark place, the oil – which is deep red in colour and an excellent source of pro-vitamin A – keeps longer and has a better odour and taste than oils produced using traditional processing methods.

A year-round vegetable supply

Mumba's father and other farmers have started a dry season vegetable garden on a plot close to the wetland. They work as a group and have been trained to use a treadle pump to irrigate the garden with water from shallow wells or directly from a nearby lake. They now grow a variety of local vegetables that were previously only available during the rainy season, including amaranthus, pumpkin leaves, okra and African eggplant, as well as exotic vegetables such as rape, cabbage, tomatoes and onions. Fresh vegetables are now available throughout the year and, apart from enriching the family diet with valuable micronutrients, they also provide a good source of income.

Better storage and preservation

Through practical demonstrations and discussions with the agricultural extension worker, the family has also learned how to improve the storage of their harvest. The self-help group to which Mumba's mother belongs has built an improved storage bin. Stored seeds of maize, groundnuts and beans are now better protected from rodents, insects, moulds and other pests. The family no longer needs to sell all its produce immediately after harvest (when prices are lowest) for fear of losses, and are able to keep enough food to meet its needs during the "hungry season". Mumba's mother has also learned about improved methods of drying vegetables and fruits, such as mangoes, which are plentiful during the rainy season and would otherwise perish. A simple solar dryer, built with locally available materials, helps the fruit to dry faster and, therefore, to retain more pro-vitamin A.

Getting the best from food through nutrition education

Mumba's mother and father have participated in cooking demonstrations and nutrition education sessions organized by agricultural extension and community health workers. They have learned how important it is for the boy's health and for his physical and mental development to consume a wide variety of foods from both cultivated crops and plants gathered in the wild. They have also learned about the importance of including fish and meat in the family's meals, especially for the children, who need extra protein, energy, iron and vitamins for growth. They now understand that local vegetables are not just poor people's food, but a good and cheap source of essential nutrients. Cooked with palm oil or oil-rich groundnuts, the vegetable relish adds nutritional value and variety to the diet and helps to keep both children and adults well fed and healthy.

The way ahead

Commitment, followed by resources and action

The World Food Summit: five years later is almost upon us. World leaders will again assemble in Italy, as they did in 1996 and 1974. What do we have to tell them?

In the five years since the Rome Declaration and the World Food Summit Plan of Action were adopted, some progress has been made in reducing the developing world's undernourished population, both in absolute numbers (with a decline of approximately 40 million) and as a proportion of the total population (falling from 20 to 17 percent).

However, as was seen in the first two articles of this report and confirmed in the data tables (p. 51-57), progress has been very uneven from country to country. While the total number of undernourished has declined, the majority of countries have seen their numbers rise. As many readers will doubtless point out, the primary interest should not be aggregate statistical indicators. What really matters is the action being taken to reduce food deprivation and poverty at the country level. Assuming a threshold figure of 5 percent of a population being undernourished, then 93 out of a total of 125 developing and transition countries listed in the data tables can be said to have a food deprivation problem.

How is this problem perceived in each of these countries? Is there a manifest national commitment to deal with the problem as an urgent priority? Is it possible to know whether national leaders take this issue seriously? There are certain indicators that can help us gauge a nation's response to food insecurity.

First, let us start with the numbers of undernourished as estimated by FAO. How are these numbers perceived at the country level? Is the estimate thought to be too high and, if so, on what basis? It is always encouraging, as well as useful, when countries put forward alternative figures that have stronger empirical foundations, since this demonstrates that they are grappling with the problem. It would in fact be very appropriate if all countries were to set their own national targets for halving undernourishment by 2015.

Next, if the FAO estimate (or an alternative) is plausible, who are the people who are undernourished and where in the country do they live? Does the country concerned know about its poor and hungry? Does it characterize them in terms of livelihoods, environment and any special risks they face, such as drought or disease? Does it know why these groups suffer from chronic food deprivation? Is it willing to construct an operationally useful set of vulnerability profiles?

Finally, what resources are being used to treat both the symptoms and the more fundamental causes of undernourishment and poverty? Is food aid available? Are there other safety net programmes, including mechanisms that provide cash assistance? Are long-term research and development efforts under way to increase and sustain the productivity of the natural resource base? Are educational programmes in place to improve health and hygiene practices? Are these investments adequate to bring an end to the problems faced? If not, what additional resources can be mobilized and is the country taking action to mobilize them? How can local communities contribute to filling the "resource gap" and is government (and the international community) supporting their efforts?

The aim of these questions is to assess a country's commitment to overcoming hunger and deprivation. What each country actually needs to do will depend on specific national circumstances. As has been said in past years, there is no single formula to follow. The examples of "taking action" in *The State of Food Insecurity in the World* this year have covered a variety of interventions that can have a significant impact. These interventions show how much can be done, if the political will and the resources are there. They also show that eliminating hunger is not just a moral imperative; it also makes economic sense – increasing productivity, raising incomes, creating jobs and adding to the demand for goods and services throughout the economy.

FAO continues to believe that the goal of halving the number of undernourished people in the world by 2015 can be achieved, if countries and their development partners make this their objective. It has become clear, however, that the resources needed to accomplish this task are not being made available when and where they are most needed. In some cases, this is because countries are in the midst of a civil war, which dramatically increases the number of the hungry and effectively blocks all but minimal assistance. In other cases, external partners have refrained from doing all they might, because of past corruption and misuse of resources in recipient countries. However, these factors do not explain the whole picture of inadequate responses. It is the hope of FAO that the World Food Summit: five years later will allow all its partners to renew their commitment to overcome hunger and poverty and to follow up their pledge by increasing the flow of resources devoted to this aim.

Glossary

Anthropometry
Use of human body measurements to obtain information about nutritional status.

Body mass index
A ratio of weight for height often used to estimate body fat. It is obtained by dividing a person's weight (kg) by the square of their height (m). BMI is not appropriate for the assessment of growing children, frail and sedentary elderly individuals, or women who are pregnant or breastfeeding.

Degree of food deprivation
A measure of the overall food insecurity situation in a country, based on a classification system that combines prevalence of undernourishment, i.e. the proportion of the total population suffering from a dietary energy deficit, and depth of undernourishment, i.e. the magnitude of the undernourished population's dietary energy deficit.

Dietary energy deficit
The difference between the average daily dietary energy intake of an undernourished population and its average minimum energy requirement.

Dietary energy intake
The energy content of food consumed.

Dietary energy requirement
The amount of dietary energy required by an individual to maintain body functions, health and normal activity.

Dietary energy supply
Food available for human consumption, expressed in kilocalories (kcal) per capita per day. At the country level, it is calculated as the food remaining for human use after the deduction of all non-food consumption (exports, animal feed, industrial use, seed and wastage).

Dollar purchasing power parity
The purchasing power of a country's currency in relation to the US dollar; the number of units of a given currency required to purchase a basket of goods and services valued at US$1 in the United States.

Food insecurity
A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active, healthy life. It may be caused by the unavailability of food, insufficient purchasing power or the inappropriate distribution or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory.

Food security
A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Gini coefficient
An aggregate numerical measure of income inequality ranging from 0 (perfect equality) to 1 (perfect inequality). The higher the value of the coefficient, the higher the inequality of income distribution; the lower the value, the more equitable the distribution of income.

Growth monitoring
Growth monitoring is one aspect of nutritional surveillance. Anthropometric measurements (weight, height, arm circumference, etc.) are taken on an ongoing basis to track a child's growth progress over time, usually through the use of a growth chart. Anthropometric measurements allow the compilation of growth indices such as wasting, stunting, underweight – commonly used for children – and body mass index (BMI) – increasingly used for adults.

Kilocalorie (kcal)
A unit of measurement of energy: 1 kcal = 1 000 calories. In the International System of Units (ISU), the universal unit of energy is the joule (J). 1 kcal = 4.184 kilojoules (kJ).

Low birth weight
Newborn infants who weigh less than 2.5 kg at birth.

Macronutrients
Used in this publication to refer to the proteins, carbohydrates and fats that are required by the body in large amounts and that are available to be used for energy. They are measured in grams.

Malnutrition
An abnormal physiological condition caused by deficiencies, excesses or imbalances in energy, protein and/or other nutrients.

Micronutrients
The vitamins, minerals and certain other substances that are required by the body in small amounts. They are measured in milligrams or micrograms.

Glossary

Mid-upper arm circumference
The measurement of the arm circumference at the level of the mid-upper arm by applying a circumference measuring tape; an indirect measure to assess two important components of the body: fat and fat-free mass (these are important because body fat is the main storage form for fats, whereas fat-free mass – usually muscle – is a good indicator of the protein reserves of the body).

Minimum dietary energy requirement
In a specified age/sex category, the amount of dietary energy per capita that is considered adequate to meet energy needs for light activity and good health. For an entire population, the minimum energy requirement is the weighted average of the minimum energy requirements of the different age/sex groups in the population. It is expressed in kcal per capita per day.

Nutritional status
The physiological state of an individual that results from the relationship between nutrient intake and requirements and from the body's ability to digest, absorb and use these nutrients.

Nutritional surveillance systems
Nutritional surveillance systems are data collection systems which, on an ongoing basis, systematically collect, analyse, interpret and disseminate data on food- and nutrition-related outcomes, i.e. anthropometric indices for use in the planning, implementation and evaluation of nutrition action programmes.

Overnourishment
Food intake that is continuously in excess of dietary energy requirements.

Overweight and obesity
Body weight that is above normal as a result of an excessive accumulation of fat. It is usually a manifestation of overnourishment. Overweight is defined in this publication as BMI >25-30 and obesity as BMI >30.

Stunting
Low height for age, reflecting a sustained past episode or episodes of undernutrition.

Undernourishment
Food intake that is continuously insufficient to meet dietary energy requirements.

Undernutrition
The result of undernourishment, poor absorption and/or poor biological use of nutrients consumed.

Underweight
Low weight for age in children, and BMI <18.5 in adults, reflecting a current condition resulting from inadequate food intake, past episodes of undernutrition or poor health conditions.

Vegetative propagation
Plant propagation materials, excluding true botanical seed, that result in the production of genetically identical crop plants.

Vulnerability
The presence of factors that place people at risk of becoming food-insecure or malnourished, including factors that affect their ability to cope.

Vulnerable group
A group of people with common characteristics, a high proportion of whom are food-insecure or at risk of becoming food-insecure.

Wasting
Low weight for height, generally the result of weight loss associated with a recent period of starvation or disease.

Tables

Table 1. Population, per capita dietary energy supply and prevalence of undernourishment in developing countries and countries in transition

Region/subregion/country	Total population		Per capita dietary energy supply		Number of people undernourished		Proportion of undernourished in total population	
	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99
	(millions)		(kcal/day)		(millions)		(percentage)	
DEVELOPING WORLD	**4 050.0**	**4 565.5**	**2 540**	**2 680**	**816.3**	**777.2**	**20**	**17**
ASIA AND THE PACIFIC	**2 812.1**	**3 119.8**	**2 530**	**2 710**	**564.8**	**497.1**	**20**	**16**
EAST ASIA	**1 241.1**	**1 330.9**	**2 720**	**3 020**	**197.6**	**126.9**	**16**	**10**
China [3] *	1 169.5	1 253.8	2 710	3 040	192.6	116.3	16	9
Dem. People's Rep. of Korea [5]	20.3	21.9	2 490	2 080	3.4	8.8	17	40
Hong Kong SAR of China [1]	5.8	6.6	3 230	3 190	0.1	0.1	—	—
Mongolia [5]	2.3	2.5	2 060	2 000	0.8	1.0	34	42
Republic of Korea [1]	43.3	46.1	3 000	3 050	0.8	0.7	—	—
OCEANIA	**3.9**	**4.6**	**2 220**	**2 180**	**0.9**	**1.2**	**24**	**26**
Papua New Guinea [4]	3.9	4.6	2 220	2 180	0.9	1.2	24	26
SOUTH EAST ASIA	**444.8**	**501.7**	**2 480**	**2 660**	**77.6**	**65.9**	**17**	**13**
Cambodia [5]	10.0	12.4	1 870	1 980	4.3	4.6	43	37
Indonesia [3]	185.6	206.4	2 690	2 900	16.7	12.0	9	6
Lao People's Dem. Rep. [4]	4.2	5.0	2 110	2 150	1.2	1.4	29	28
Malaysia [1]	18.3	21.4	2 780	2 930	0.6	0.4	3	—
Myanmar [3]	41.3	46.5	2 640	2 790	3.9	3.2	9	7
Philippines [4]	62.5	72.7	2 270	2 330	16.0	17.2	26	24
Thailand [4]	55.5	61.2	2 200	2 410	16.9	12.9	30	21
Viet Nam [3]	67.5	76.1	2 260	2 500	18.0	14.2	27	19
SOUTH ASIA	**1 122.4**	**1 282.6**	**2 330**	**2 400**	**288.8**	**303.0**	**26**	**24**
Bangladesh [4]	112.7	131.8	2 070	2 120	39.2	44.1	35	33
India [4]	861.3	976.3	2 370	2 430	214.6	225.3	25	23
Nepal [4]	18.6	22.0	2 380	2 290	3.5	5.0	19	23
Pakistan [3]	112.5	133.9	2 330	2 480	26.5	24.4	24	18
Sri Lanka [4]	17.2	18.6	2 210	2 350	5.0	4.3	29	23
LATIN AMERICA AND CARIBBEAN	**442.2**	**496.7**	**2 710**	**2 830**	**58.6**	**53.6**	**13**	**11**
NORTH AMERICA	**84.8**	**95.8**	**3 130**	**3 150**	**4.3**	**5.0**	**5**	**5**
Mexico [3]	84.8	95.8	3 130	3 150	4.3	5.0	5	5
CENTRAL AMERICA	**28.7**	**34.4**	**2 400**	**2 380**	**4.9**	**6.4**	**17**	**19**
Costa Rica [3]	3.1	3.8	2 700	2 770	0.2	0.2	6	5
El Salvador [3]	5.2	6.0	2 480	2 490	0.6	0.7	12	12
Guatemala [4]	9.0	10.8	2 400	2 230	1.3	2.3	14	22
Honduras [4]	5.0	6.1	2 310	2 370	1.1	1.3	23	21
Nicaragua [4]	3.9	4.8	2 210	2 240	1.2	1.4	30	29
Panama [3]	2.4	2.8	2 360	2 460	0.5	0.4	19	16
CARIBBEAN	**28.5**	**30.9**	**2 420**	**2 320**	**7.3**	**8.8**	**26**	**28**
Cuba [3]	10.7	11.1	2 880	2 450	0.5	1.9	5	17
Dominican Republic [4]	7.2	8.1	2 260	2 320	1.9	2.0	27	25
Haiti [5]	7.0	7.9	1 800	1 930	4.5	4.5	63	56
Jamaica [3]	2.4	2.5	2 570	2 740	0.3	0.2	12	8
Trinidad and Tobago [3]	1.2	1.3	2 670	2 700	0.1	0.2	12	13

(continued)

Tables

Table 1. (continued)

Region/subregion/country	Total population		Per capita dietary energy supply		Number of people undernourished		Proportion of undernourished in total population	
	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99
	(millions)		(kcal/day)		(millions)		(percentage)	
SOUTH AMERICA	**300.1**	**335.6**	**2 650**	**2 820**	**42.1**	**33.4**	**14**	**10**
Argentina [1]	33.0	36.1	3 000	3 170	0.7	0.4	—	—
Bolivia [4]	6.7	8.0	2 170	2 220	1.7	1.7	25	22
Brazil [3]	150.3	166.1	2 790	2 970	19.3	15.9	13	10
Chile [2]	13.3	14.8	2 610	2 860	1.1	0.6	8	4
Colombia [3]	35.7	40.7	2 440	2 580	6.1	5.3	17	13
Ecuador [3]	10.5	12.2	2 510	2 700	0.9	0.6	8	5
Guyana [3]	0.7	0.8	2 390	2 560	0.1	0.1	19	14
Paraguay [3]	4.3	5.2	2 390	2 570	0.8	0.7	18	13
Peru [3]	22.0	24.8	1 980	2 550	8.9	3.1	41	13
Suriname [3]	0.4	0.4	2 570	2 610	0.0	0.0	12	11
Uruguay [2]	3.1	3.3	2 670	2 840	0.2	0.1	6	3
Venezuela [4]	20.0	23.2	2 470	2 280	2.3	4.8	11	21
NEAR EAST AND NORTH AFRICA	**321.3**	**376.7**	**3 010**	**3 010**	**25.1**	**32.5**	**8**	**9**
NEAR EAST	**200.6**	**238.8**	**2 950**	**2 910**	**19.7**	**26.5**	**10**	**11**
Afghanistan [5]	14.6	20.8	1 720	1 800	9.3	12.1	64	58
Iran, Islamic Rep. [3]	59.9	68.1	2 900	2 930	2.7	3.5	4	5
Iraq [3]	17.8	21.8	2 650	2 420	1.2	3.0	7	14
Jordan [3]	3.4	4.7	2 860	2 810	0.1	0.2	3	5
Kuwait [2]	2.1	1.8	2 360	3 140	0.5	0.1	23	4
Lebanon [1]	2.8	3.4	3 210	3 230	0.1	0.1	—	—
Saudi Arabia [1]	15.8	18.9	3 000	2 960	0.3	0.4	—	—
Syrian Arab Republic [1]	12.8	15.4	3 220	3 330	0.2	0.2	—	—
Turkey [1]	57.2	64.6	3 530	3 490	0.9	1.2	—	—
United Arab Emirates [1]	2.1	2.5	3 030	3 170	0.1	0.1	3	—
Yemen [4]	12.2	16.9	2 020	2 040	4.4	5.7	36	34
NORTH AFRICA	**120.7**	**137.9**	**3 120**	**3 180**	**5.4**	**6.1**	**4**	**4**
Algeria [3]	25.4	29.2	2 940	2 930	1.3	1.7	5	6
Egypt [2]	57.4	65.5	3 200	3 320	2.6	2.4	5	4
Libyan Arab Jamahiriya [1]	4.4	5.1	3 250	3 290	0.0	0.0	—	—
Morocco [3]	25.1	28.8	3 070	3 030	1.4	1.8	5	6
Tunisia [1]	8.3	9.3	3 180	3 340	0.1	0.0	—	—
SUB-SAHARAN AFRICA	474.5	572.4	2 120	2 190	167.7	194.0	35	34
CENTRAL AFRICA	**62.8**	**77.6**	**2 090**	**1 890**	**22.9**	**39.7**	**36**	**51**
Cameroon [4]	11.9	14.2	2 190	2 260	3.4	3.6	29	25
Central African Republic [5]	3.0	3.6	1 920	1 970	1.4	1.5	46	43
Chad [4]	6.0	7.4	1 790	2 140	3.5	2.5	58	34
Congo [4]	2.3	2.8	2 120	2 170	0.8	0.9	35	32
Dem. Rep. of the Congo [5]	38.5	48.4	2 110	1 710	13.7	31.0	35	64
Gabon [3]	1.0	1.2	2 450	2 520	0.1	0.1	11	9
EAST AFRICA	**166.1**	**198.6**	**1 940**	**1 960**	**73.2**	**85.5**	**44**	**43**
Burundi [5]	5.7	6.2	1 890	1 660	2.8	4.1	48	66
Eritrea [5]	n.a.	3.4	n.a.	1 710	n.a.	2.0	n.a.	57
Ethiopia [5]	n.a.	59.9	n.a.	1 810	n.a.	29.6	n.a.	49
Kenya [5]	24.3	29.4	1 880	1 930	11.5	13.4	47	46
Rwanda [5]	6.4	6.4	2 110	2 020	2.2	2.6	34	40
Somalia [5]	7.2	8.1	1 660	1 550	4.8	6.0	67	75

Table 1. (continued)

Region/subregion/country	Total population		Per capita dietary energy supply		Number of people undernourished		Proportion of undernourished in total population	
	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99
	(millions)		(kcal/day)		(millions)		(percentage)	
Sudan [4]	25.4	29.8	2 170	2 370	7.9	6.3	31	21
Uganda [4]	17.8	22.0	2 280	2 190	4.2	6.2	24	28
United Rep. of Tanzania [5]	27.0	33.5	2 100	1 930	9.1	15.5	34	46
SOUTHERN AFRICA	**71.0**	**85.1**	**1 940**	**2 020**	**34.1**	**36.7**	**48**	**43**
Angola [5]	9.9	12.4	1 740	1 880	6.0	6.3	61	51
Botswana [4]	1.3	1.5	2 380	2 280	0.2	0.3	17	23
Lesotho [4]	1.7	2.0	2 240	2 310	0.5	0.5	28	25
Madagascar [5]	12.3	15.1	2 080	2 000	4.3	6.1	35	40
Malawi [5]	9.6	10.7	1 880	2 120	4.8	3.8	49	35
Mauritius [3]	1.1	1.1	2 890	2 950	0.1	0.1	6	6
Mozambique [5]	14.1	17.6	1 710	1 920	9.6	9.5	69	54
Namibia [4]	1.4	1.7	2 130	2 090	0.4	0.6	30	33
Swaziland [3]	0.8	0.9	2 610	2 550	0.1	0.1	10	12
Zambia [5]	8.3	9.9	2 000	1 940	3.6	4.7	43	47
Zimbabwe [5]	10.5	12.2	2 010	2 080	4.6	4.8	43	39
WEST AFRICA	**174.7**	**211.0**	**2 380**	**2 590**	**37.6**	**32.1**	**21**	**15**
Benin [3]	4.8	6.0	2 360	2 500	0.9	0.9	19	15
Burkina Faso [4]	9.3	11.0	2 160	2 290	2.8	2.6	31	24
Côte d'Ivoire [3]	13.0	15.4	2 440	2 570	2.5	2.4	19	16
Gambia [3]	1.0	1.2	2 440	2 570	0.2	0.2	19	15
Ghana [3]	15.6	18.5	2 110	2 550	5.4	2.7	35	15
Guinea [4]	6.4	7.9	2 080	2 200	2.6	2.7	40	34
Liberia [5]	2.1	2.5	2 140	2 080	0.8	1.0	37	42
Mali [4]	9.0	10.7	2 300	2 240	2.2	3.0	25	28
Mauritania [3]	2.0	2.5	2 600	2 690	0.3	0.3	14	11
Niger [5]	8.0	10.1	2 000	2 010	3.3	4.2	42	41
Nigeria [3]	88.5	107.9	2 530	2 810	12.0	7.6	14	7
Senegal [4]	7.5	9.0	2 290	2 280	1.7	2.1	23	24
Sierra Leone [5]	4.1	4.2	2 000	2 080	1.9	1.7	46	41
Togo [3]	3.5	4.2	2 270	2 510	0.9	0.7	27	17
COUNTRIES IN TRANSITION	**n.a.**	**413.2**	**n.a.**	**2 910**	**n.a.**	**26.5**	**n.a.**	**6**
COMMONWEALTH OF INDEPENDENT STATES	**n.a.**	**284.5**	**n.a.**	**2 790**	n.a.	**22.7**	n.a.	**8**
Armenia [5]	n.a.	3.8	n.a.	2 160	n.a.	1.3	n.a.	35
Azerbaijan [5]	n.a.	7.9	n.a.	2 130	n.a.	2.9	n.a.	37
Belarus [1]	n.a.	10.3	n.a.	3 210	n.a.	0.1	n.a.	—
Georgia [3]	n.a.	5.3	n.a.	2 400	n.a.	1.0	n.a.	18
Kazakhstan [3]	n.a.	16.3	n.a.	2 610	n.a.	1.7	n.a.	11
Kyrgyzstan [3]	n.a.	4.8	n.a.	2 730	n.a.	0.5	n.a.	10
Republic of Moldova [3]	n.a.	4.3	n.a.	2 720	n.a.	0.4	n.a.	10
Russian Federation [3]	n.a.	146.8	n.a.	2 860	n.a.	8.1	n.a.	6
Tajikistan [5]	n.a.	6.0	n.a.	1 980	n.a.	2.8	n.a.	47
Turkmenistan [3]	n.a.	4.5	n.a.	2 660	n.a.	0.4	n.a.	9
Ukraine [3]	n.a.	50.5	n.a.	2 830	n.a.	2.6	n.a.	5
Uzbekistan [2]	n.a.	24.1	n.a.	2 910	n.a.	0.9	n.a.	4
BALTIC STATES	**n.a.**	**7.6**	**n.a.**	**3 000**	**n.a.**	**0.3**	**n.a.**	**3**
Estonia [2]	n.a.	1.4	n.a.	3 080	n.a.	0.1	n.a.	4
Latvia [2]	n.a.	2.5	n.a.	2 930	n.a.	0.1	n.a.	4
Lithuania [2]	n.a.	3.7	n.a.	3 010	n.a.	0.1	n.a.	3

(continued)

Tables

Table 1. (continued)

Region/subregion/country	Total population		Per capita dietary energy supply		Number of people undernourished		Proportion of undernourished in total population	
	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99	1990-92	1997-99
	(millions)		(kcal/day)		(millions)		(percentage)	
EASTERN EUROPE	**n.a.**	**121.1**	**n.a.**	**3 160**	**n.a.**	**3.6**	**n.a.**	**3**
Albania [3]	3.3	3.1	2 550	2 680	0.5	0.3	14	10
Bosnia and Herzegovina [2]	n.a.	3.7	n.a.	2 930	n.a.	0.2	n.a.	4
Bulgaria [3]	8.7	8.1	3 290	2 800	0.2	0.9	3	11
Croatia [3]	n.a.	4.7	n.a.	2 540	n.a.	0.7	n.a.	15
Czech Republic [1]	n.a.	10.3	n.a.	3 240	n.a.	0.1	n.a.	—
Hungary [1]	10.3	10.1	3 620	3 410	0.0	0.1	—	—
TFYR Macedonia [3]	n.a.	2.0	n.a.	2 860	n.a.	0.1	n.a.	5
Poland [1]	38.2	38.6	3 330	3 340	0.3	0.3	—	—
Romania [1]	23.1	22.5	3 020	3 260	0.7	0.3	3	—
Slovakia [1]	n.a.	5.4	n.a.	3 080	n.a.	0.1	n.a.	—
Slovenia [1]	n.a.	2.0	n.a.	3 020	n.a.	0.0	n.a.	—
Yugoslavia [3] **	n.a.	10.6	n.a.	2 910	n.a.	0.5	n.a.	5

Notes:
The figures in parentheses refer to the prevalence category based on the proportion of population undernourished in 1997-99:
[1] <2.5% undernourished.
[2] 2.5-4% undernourished.
[3] 5-19% undernourished.
[4] 20-34% undernourished.
[5] 35% or more undernourished.
Key:
n.a. not available.
— prevalence <2.5%.
* Including Taiwan Province of China.
** Serbia and Montenegro.
Sources:
total population: *UN World Population Prospects*, 2000 revision; dietary energy supply and undernourished in total population: FAO estimates.
The Table does not include countries for which there were insufficient data.

Table 2. Growth of population, per capita dietary energy supply, and food and agricultural production for developing countries in the 1990s, classified by change in number of undernourished

Region/subregion/country	Average annual growth rate, 1990-92 to 1997-99 (percentage)			
	Total population	Per capita dietary energy supply	Per capita food production	Per capita agricultural production in total population
INCREASE				
ASIA AND THE PACIFIC				
Bangladesh	2.2	0.3	0.5	0.6
Cambodia	3.1	0.8	2.1	2.0
Dem. People's Rep. of Korea	1.1	- 2.5	- 4.4	- 4.1
India	1.8	0.4	1.1	1.0
Lao People's Dem. Rep.	2.5	0.2	1.5	1.0
Mongolia	1.3	- 0.4	- 2.8	- 2.9
Nepal	2.4	- 0.5	0.2	0.2
Papua New Guinea	2.5	- 0.2	- 0.8	- 0.5
Philippines	2.2	0.4	- 0.2	- 0.4
LATIN AMERICA AND CARIBBEAN				
Bolivia	2.4	0.4	1.8	1.8
Costa Rica	2.9	0.3	1.2	0.7
Cuba	0.5	- 2.3	- 6.5	- 6.3
El Salvador	2.1	0.1	- 0.3	- 1.3
Guatemala	2.6	- 1.0	0.0	- 0.4
Honduras	2.8	0.3	- 1.8	- 1.0
Mexico	1.7	0.1	0.9	0.8
Nicaragua	2.9	0.2	1.3	0.8
Trinidad and Tobago	0.7	0.1	0.0	- 0.1
Venezuela	2.2	- 1.1	- 0.1	- 0.3
NEAR EAST AND NORTH AFRICA				
Afghanistan	5.0	0.7	1.9	1.8
Algeria	2.0	0.0	- 0.2	- 0.3
Iran, Islamic Rep.	1.8	0.1	1.8	1.9
Iraq	2.9	- 1.3	- 3.1	- 3.3
Jordan	4.3	- 0.3	- 1.0	- 1.1
Morocco	1.9	- 0.2	- 0.5	- 0.5
Yemen	4.7	0.2	- 1.1	- 0.9
SUB-SAHARAN AFRICA				
Angola	3.2	1.1	0.8	0.7
Botswana	2.3	- 0.6	- 4.0	- 4.0
Burundi	1.1	- 1.8	- 3.7	- 4.0
Cameroon	2.5	0.5	0.4	0.3
Central African Republic	2.4	0.4	1.3	1.2
Congo	3.0	0.3	- 0.8	- 0.9
Dem. Rep. of the Congo	3.3	- 3.0	- 4.7	- 4.8
Guinea	3.0	0.8	1.2	1.0
Kenya	2.7	0.4	- 1.5	- 1.3
Liberia	2.6	- 0.4	1.1	2.6
Madagascar	2.9	- 0.6	- 1.7	- 1.9
Mali	2.5	- 0.4	0.1	1.0
Namibia	2.5	- 0.2	- 3.9	- 3.8
Niger	3.4	0.1	- 0.6	- 0.6
Rwanda	0.0	- 0.6	- 2.8	- 2.9
Senegal	2.5	0.0	- 0.9	- 1.1

(continued)

Table 2. (continued)

Region/subregion/country	Average annual growth rate, 1990-92 to 1997-99 (percentage)			
	Total population	Per capita dietary energy supply	Per capita food production	Per capita agricultural production in total population
Somalia	1.7	- 1.0	- 0.2	- 0.2
Swaziland	1.8	- 0.3	- 4.4	- 4.6
Uganda	3.0	- 0.6	- 1.6	- 0.9
United Rep. of Tanzania	3.1	- 1.2	- 2.1	- 2.2
Zambia	2.6	- 0.4	- 1.1	- 0.9
Zimbabwe	2.1	0.6	0.3	1.2
NO SIGNIFICANT CHANGE				
LATIN AMERICA AND CARIBBEAN				
Dominican Republic	1.7	0.4	- 1.0	- 1.0
Haiti	1.6	1.0	- 2.0	- 2.1
Suriname	0.4	0.2	- 3.1	- 3.1
SUB-SAHARAN AFRICA				
Côte d'Ivoire	2.4	0.7	0.8	1.2
Gambia	3.5	0.7	- 0.7	- 0.9
Lesotho	2.0	0.4	- 0.9	- 1.4
Mauritania	2.9	0.5	- 2.0	- 2.0
Mauritius	1.0	0.3	- 0.7	- 1.4
Mozambique	3.2	1.7	1.8	1.9
DECREASE				
ASIA AND PACIFIC				
China*	1.0	1.7	5.3	4.9
Indonesia	1.5	1.1	0.4	0.3
Malaysia	2.2	0.7	1.1	0.1
Myanmar	1.7	0.8	3.5	3.5
Pakistan	2.5	0.9	1.8	1.1
Sri Lanka	1.1	0.9	0.5	0.9
Thailand	1.4	1.3	0.7	0.9
Viet Nam	1.7	1.5	3.1	3.5
LATIN AMERICA AND CARIBBEAN				
Brazil	1.4	0.9	2.6	2.3
Chile	1.5	1.3	2.0	1.9
Colombia	1.9	0.8	0.1	- 1.0
Ecuador	2.1	1.1	2.3	1.8
Guyana	0.4	1.0	7.2	7.1
Jamaica	0.9	0.9	0.7	0.7
Panama	1.8	0.6	- 1.4	- 1.4
Paraguay	2.6	1.0	0.7	- 0.9
Peru	1.7	3.6	4.6	4.3
Uruguay	0.7	0.9	4.1	3.1
NEAR EAST AND NORTH AFRICA				
Egypt	1.9	0.5	2.9	2.6
Kuwait	- 2.2	4.1	—	—
United Arab Emirates	2.6	0.6	—	—

Table 2. (continued)

Region/subregion/country	Average annual growth rate, 1990-92 to 1997-99 (percentage)			
	Total population	Per capita dietary energy supply	Per capita food production	Per capita agricultural production in total population
SUB-SAHARAN AFRICA				
Benin	3.0	0.8	2.5	3.6
Burkina Faso	2.5	0.8	0.3	1.1
Chad	3.0	2.6	1.6	1.8
Gabon	2.8	0.4	- 1.4	- 0.9
Ghana	2.5	2.7	2.6	2.6
Malawi	1.6	1.7	4.4	3.4
Nigeria	2.8	1.5	2.1	2.0
Sierra Leone	0.4	0.6	- 2.3	- 2.4
Sudan	2.3	1.3	3.1	3.0
Togo	2.6	1.5	1.1	1.2

Notes:
Changes in the number of undernourished from 1990-92 to 1997-99:
Increase: >0.5% per year
No significant change: -0.5-+0.5% per year
Decrease: <-0.5% per year
This analysis of change excludes Ethiopia and Eritrea, which were not separate entities in 1990-92, and the nine countries where the percentage of undernourished in the total population was less than 2.5 percent in 1990-92.
Agricultural and food production:
Growth rates of agricultural and food production refer to the change of the aggregate volume of crop and livestock products weighted by 1989-91 average international commodity prices. The food production aggregates include edible commodities, except those with low nutritive value such as coffee and tea.
* Including Taiwan Province of China.
— Agricultural and food production is not relevant.
Sources:
Total population: *UN World Population Prospects*, 2000 revision.
Dietary energy supply, agricultural and food production: FAO estimates.

Acronyms

AIDS
acquired immunodeficiency syndrome

CARE
Cooperative for Assistance and Relief Everywhere

CIAL
Comité de Investigación Agrícola Local (Colombia)

CIAT
International Centre for Tropical Agriculture

DES
dietary energy supply

FIQA
fish inspection and quality assurance

FIVIMS
Food Insecurity and Vulnerability Information and Mapping Systems

GTL
Genetic Technologies Ltd (Kenya)

GTZ
German Agency for Technical Cooperation

HACCP
Hazard Analysis Critical Control Point (system)

HIV
human immunodeficiency virus

ICRISAT
International Crops Research Institute for the Semi-Arid Tropics

IFPRI
International Food Policy Research Institute

IDB
Islamic Development Bank

kcal
kilocalorie

ORT
oral rehydration therapy

PSNFP
Primary School Nutritious Food Programme (Nepal)

SNAPE
Service national d'aménagement des points d'eau (Guinea)

VAM
vulnerability analysis and mapping

VMC
Village Management Committee (Zambia)

UNICEF
United Nations Children's Fund

WIID
World Income Inequality Database

WFP
World Food Programme

WHO
World Health Organization