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Biotechnology

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This gene bank in Ethiopia stores seeds of hundreds of wild varieties of crops at sub-

Crops need new protection every 15 years because pests and diseases develop around their existing

Careful maintenance of the earth's genetic resources is vital. Genes provide the raw materials for

Modern biotechnology is based on genetic engineering, by

zero temperatures for up to 50 years. Every five years the collection is tested for germination ability.

defences. The only effective way to confer it is to interbreed them with other strains, often wild ones.

development of new pharmaceutical, agricultural and industrial products through biotechnology.

which the DNA in the nucleus of cells can be modified to produce new varieties.

Biotechnology can be defined as the use of living organisms to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses. It has been used since people first added yeast to bread or saved the seed from the pick of their crops for next year's sowing.

Advances in molecular biology have transformed biotechnology in recent years. Whereas in the past, crop improvement depended on selective breeding within species, developments in genetic engineering now make it possible to introduce genes from one species to another, producing "transgenic" varieties. Tissue culture, through which plants can be cloned from a single cell, has speeded up the process of making new varieties available.

The first successful experiment in gene manipulation took place in 1986. By 1990, some US$ 11000 million a year was being spent on research and development- two-thirds of it by companies in the private sector. That year, the biotechnology industry in the United States produced some US$ 2 000 million worth of products.

So far research has concentrated on medicine and pharmacy, but the potential for agriculture is immense. By the mid-1990s, some 50 plant species had been biotechnically altered including rice, wheat, potato, soybean and alfalfa. Resistance to pests can he bred in this way, cutting the farmer's dependence on chemicals. Scientists are also using gene manipulation to produce quicker-growing fish

and cheaper, more effective vaccines against livestock diseases. Tissue culture has been used to boost the productivity of oil palm and eucalyptus plantations.

Biotechnology has tended to favour the industrialized world, where most of the research is concentrated. Facilities are being set up in most developing countries, but progress is hindered by a lack of money and trained people. Even though these countries provide much of the genetic raw material used, their access to biotechnology is blocked by patents and other measures taken by companies in the developed world to protect their investment in research and development.

Developing countries are concerned that substances synthesized in the laboratory or produced by transgenic crops may undercut such traditional exports as vanilla, pyrethrum, rubber and coconut oil. Biotechnology may also present environmental risks. Cloned varieties could erode genetic diversity. Genes from transgenic crops could spread to wild relatives. As yet no satisfactory international standards exist for biosafety or the patenting of living organisms and genetic materials. There are plans, however, to add a biotechnology protocol to the United Nations Convention on Biological Diversity, which was agreed following the 1992 UN Conference on Environment and Development (UNCED) generally referred to as the Earth Summit - in Rio de Janeiro.

Biotechnology protects biodiversity by assisting conservation of plant and animal genetic resources through:

- **new methods for collecting and sorting genetic material**
- **detection and elimination of disease in gene bank collections**

- **identification of useful genes**
- **improved techniques for long-term storage**
- **safer and more efficient distribution of germplasm to users.**

New crop varieties can be developed more quickly through genetic engineering than through the traditional method of cross-pollination.

Biotechnology in the developing world is hampered by:

- **inadequate funding/ lack of human resources**
- **restricted information**
- **poor higher education**
- **weak links between universities and research institutions**
- **lack of appropriate legal regimes**
- **little private sector involvement.**

However, many countries in the developing world have considerable potential for biotechnology because of their wealth of biodiversity.

The world's major national plant gene banks

Gene banks ranked by size of collection

Click here to see the map 

What you'll see next is related to the previous map

1. Institute of Crop Germplasm Resources, Beijing, China

2. N.I. Vavilov Research Institute of Plant Industry, St Petersburg, Russian Federation

3. National Seed Storage Laboratory, Colorado, United States

4. National Bureau

6. Plant Gene Resources of Canada, Ottawa, Canada

7. Institute of Plant Genetics and Crop Research, Gatersleben, Germany

8. Department of Horticulture and Fruit Breeding, University of Agricultural Science, Kristianstad, Sweden

9. National Research Centre of Genetic

11. Plant Breeding and Acclimatization Institute, Radzikow, Poland

12. Plant Genetic Resources Centre, Addis Ababa, Ethiopia

13. Institute of Germplasm, Bari, Italy

14. Institute for Agrobotany, Tapioszele, Hungary

15. Department of Genetic Resources,

16. National Institute for Forestry and Agricultural Research, San Rafael, Mexico

17. John Innes Centre, Norwich. United Kingdom

18. National Plant Genetic Resources Laboratory, Laguna, Philippines

19. Institute of

of Plant Genetic Resources, New Delhi, India

Resources and Biotechnology, Brasilia, Brazil

National Institute of Agrobiological Resources, Tsukuba, Japan

Agroecology and Biotechnology, Kiev, Ukraine

5. National Small Grain Collection, Idaho, United States

10. Institute of Crop Sciences, Braunschweig, Germany

20. Australian Winter Cereals Collection, Tamworth, Australia

Achievements

Biotechnology has already developed:

Potato plants
resistant to disease: to promote growth and decrease risk of epidemics.

Barley
with accelerated growth rates: to increase agricultural production.

Onions
that are slower to rot or sprout after cropping: to increase the shelf-life and reduce losses in quantity and quality.

Perennial maize
In Mexico in the late 1970s two wild ancestors of maize were found that have been called the botanical find of the century. They can confer resistance to seven of the domestic crop's major diseases

and can turn it into a perennial crop, allowing it to be harvested every year without resowing.

Self-cloning seeds

Some 300 species of plants reproduce asexually. Scientists are working on transferring this "apomixis" to crops. Seed resulting from normal reproduction combines genes from both parents and so grows into a plant with its own unique genetic make-up; but seed from an apomictic plant produces an exact genetic replica of its parent. So new varieties, designed for specific environments, could be produced much more quickly than before, and farmers would be able to gather their own seed. Apomictic maize is expected in 1997, but it could be ten years before the first crops reach the fields. Some seed companies view apomictic crops as a threat to their sales, while some environmentalists fear their possible effect on genetic diversity.

A weapon against cattle plague

Most of the agricultural applications of biotechnology to date have related to animal production and health. Genetic ally-engineered vaccines offer a weapon against such scourges as rinderpest, which killed 2 million cattle in Africa in the early 1980s and caused indirect losses to national economies of some US$ 1 000 million. Such diseases force herders to run resistant, but low-yielding, breeds. If they could be eradicated, it would be possible to crossbreed with high-yielding European breeds and so improve production. An Ethiopian scientist, working in the United States, has now developed a genetically-engineered vaccine against rinderpest, which uses a virus to confer immunity. Unlike the previous vaccine, the new vaccine is unaffected by heat, inexpensive, virtually indestructible and produces antibodies that can easily be distinguished from those produced by the disease - a characteristic useful for monitoring protection against infection. Tailored genetically engineered vaccines also exist for other livestock diseases, including pig scours and chicken bursar disease.

Vine-fresh tomatoes

The Flavr Savr tomato, the first big-engineered food to reach the world's markets, went on sale in the United States in 1994. Biotechnologists have given the tomato an extra gene, which prevents it softening soon after it is ripe. The main benefit, according to them, is in the improved taste. Traditional tomatoes have to be picked while they are still green to prevent them rotting before they reach the customer. The new variety, however, can be left to ripen on the vine and because of this it retains its "homegrown" taste. The Flavr Savr tomato is the first food to benefit from the United States Government's ruling, in 1992, which stated that food derived from gene-altered plants is not required to undergo any special tests.

Nitrogen-fixing rice

Rice needs 1 kilogram of nitrogen to produce 15-20 kilograms of grain, but only takes up one-third to one-half of any chemical fertilizer applied. Leguminous plants such as peas and beans produce their own fertilizer, through the rhizobia bacteria in their root nodules, which fix nitrogen from the atmosphere. Biotechnologists are working on transferring this characteristic to rice plants, either by turning them into legumes or encouraging nitrogen-fixing bacteria in the soil to move into their root cells. This could save poor farmers large sums of money, and transform yields in such regions as Southeast Asia, where an area larger than Sweden and Norway has soils too poor to sustain high-yielding rice varieties.

A tool for conservation

Biotechnology offers scientists new methods for conserving genetic diversity, particularly useful for

plants which are sterile or have poor germination rates and whose seeds do not store well. Tissue culture makes it possible to store cells, as opposed to seeds or plants. Cryopreservation - storage at very low temperatures freezes cell development and has been used successfully for cassava, coffee, banana and sugar cane germplasm. These methods require less space than preserving cuttings *in vitro* or in field collections, which are vulnerable to pests, disease and disasters. Biotechnology also makes it possible to detect and eliminate diseases in gene bank collections and offers more efficient ways of distributing germplasm to users.

Eradicating the screwworm

The New World screwworm fly's scientific name, *Cochliomyia hominivorax,* describes its ability to "devour humans", but its main menace is to livestock. It lays up to 400 eggs in the open wounds of warm-blooded creatures, including people: the maggots then eat into the living flesh. It used to cause losses in the United States alone of over US$ 100 million a year.

The New World screwworm has now been eradicated from the United States and Mexico using biotechnology. The larvae of the flies are sterilized. When mature, ten sterile males are released for

every unsterilized one thought to be in the area: they mate with females which produce no offspring. As a result the population is gradually reduced. The last screwworm case in the United States was reported in 1982, the last in Mexico in 1990.

In 1989 the pest spread, probably carried by imported animals, to Africa when there was an outbreak in the Libyan Arab Jamahiriya. FAO organized a campaign flying sterile insects from a "fly factory" in Mexico. Within two years the fly had been successfully eradicated using this sterile insect technique (SIT) and a potential disaster had been avoided.

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The view from space: Building models of the world

- How a remote sensing system works
- Satellites used for remote sensing
- How a geographic information system works
- GIS in practice: the example of tsetse fly in Africa

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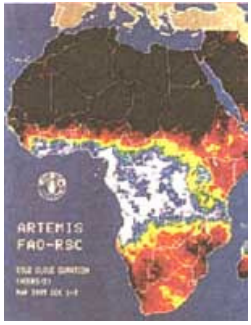


ARTEMIS draws upon satellite data to forecast crop production as well as conditions that might favour the buildup of locusts.

The new technologies of remote sensing and Geographic Information Systems (GIS) make it possible to gather, integrate and analyse vast bodies of data that can then be used to tackle complex environmental problems.

Remote sensing involves the collection and interpretation of information about something with which the sensor has no physical contact. Once simply a matter of climbing a hill and observing the lay of the land, it has evolved through black-and-white aerial photography into a complex process, using imaging radar, thermal scanning and satellites.

Modern remote sensing is based on picking up the electromagnetic energy emitted or reflected into space by different features on the earth's surface. This can provide information on geological structures, surface water, land use, soil conditions, vegetation, the oceans and a wide range of other factors relevant to agricultural and natural resource planning.

FAO's comprehensive assessment of the world's forest resources, published in 1995, drew upon remote sensing data and other national statistics. The Organization is now working on a land cover database for Africa. Such activities form part of the Global Environment Monitoring System (GEMS), a worldwide collective effort coordinated by the United Nations Environment Programme.

Two kinds of satellites are used for studying natural resources. Earth resources satellites, such as the United States' Landsat, France's SPOT and Japan's MOS, provide the detailed resolution (between 10 and 80 metres) required for thematic mapping of such things as land cover or erosion. FAO has drawn on data from earth resources satellites for thematic mapping projects in over 70 countries.

Environmental satellites, such as Europe's Meteosat or the United States' NOAA and AVHRR, offer more frequent but less detailed pictures of areas as large as countries or continents. FAO has used them to monitor rainfall and vegetation in Africa and the Near East. This information is processed by the computer system ARTEMIS (the Africa Real Time Environmental Monitoring Information System) and used to predict harvests, drought, locust swarms and food aid requirements.

Information from ARTEMIS is used by FAO's Global Information and Early

Warning System (GIEWS) and its Desert Locust Plague Prevention Group.

Remote sensing satellites, 900 kilometres up in space, enable scientists to monitor the conditions for crop production or which might encourage desert locusts to breed in large numbers. Since 1992 early warning of food crises and natural disasters has been transmitted to regional processing centres in Kenya, Ghana and Zimbabwe via the satellite telecommunications system DIANA (the Direct Information Access Network for Africa).

OLIVIA, a satellite environmental monitoring programme for Asia and the Pacific, is currently being developed.

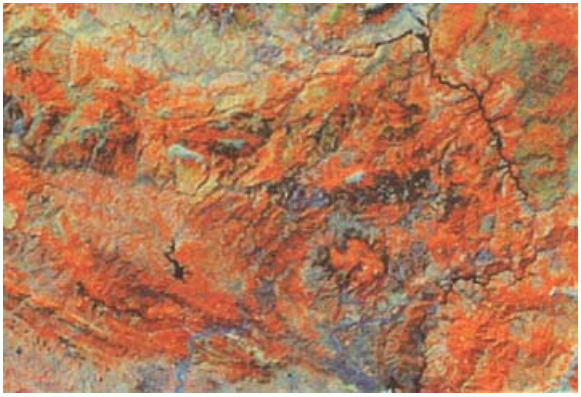
How a remote sensing system works

Click here to see the figure 

Remote sensors record and monitor the earth's surface by measuring the various emissions or reflections of electromagnetic energy from different types of vegetation, soils and other features.

Satellites used for remote sensing

This data is then colour coded to produce an image. Here red represents forest, blue/green, agricultural land, and purple, rocky outcrops



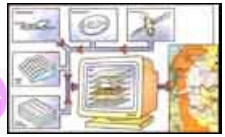
The image is then verified by ground sampling:

Olive groves

High land

Pasture

How a geographic information system works



Click here to see the figure

A GIS integrates various types and styles of data which have been collected using a number of different systems. For example, a user could climate, crops and population to establish optimum use of agricultural land for food production.

Resource use planning depends on correlating a vast quantity of data. For instance, a planner trying to locate suitable sites for growing a particular crop must combine information about soils, topography, rainfall, land tenure, transport, infrastructure, labour availability and distance from markets. This involves reconciling maps of different scales and types with tables of statistics and written information.

Until the early 1980s, this was a laborious process, achieved by overlaying transparent maps on light tables. Such manual integration of different soil maps used to prepare FAO's Soil Map of the World, for instance, took an estimated 150 person-years of work.

Introduction of the Geographic Information System (GIS) has transformed the situation. Once the data, often derived from remote sensing, have been entered into the computer system, they can be combined with other data to provide a wide range of outputs, including three-dimensional views, maps and tables. It is even possible to animate events. GIS can also be used to model the effect of a specific process over a period of time for a particular scenario.

FAO is harnessing GIS to help planners in the developing world make a wide range of decisions. It has been used, for example, to identify areas in Africa with potential for different kinds of irrigation, to

assess the suitability of land for forestry and to map Kenya's agro-ecological zones. GIS helped Costa Rica to pinpoint the best sites for aquaculture in the Gulf of Nicoya.

GIS can also be a tool for the conservation of genetic resources. When the characteristics of places where samples have been found in the past are merged with maps of unexplored areas, GIS can give collectors an idea of new locations to search for germplasm. It can also provide an inventory of the species, characteristics and environmental conditions of a given area as an aid to *in situ* conservation.

In 1987, the former International Laboratory for Research on Animal Diseases used GRID, a GIS developed by UNEP, to investigate the environmental factors which limit the range of East Coast Fever, a tick-borne disease which kills many cattle in Africa. Data on climate, vegetation and cattle range were combined to identify high-risk areas where the disease might spread if infected cattle were introduced.

GIS in practice: the example of tsetse fly in Africa

GIS data on the current incidence and distribution of tsetse fly in Africa are used to assess, among other things, where cattle can be safely kept or where they might require protection.

The top map shows the present distribution of the palpalis group. This is a riverine species of tsetse fly which congregates in humid and sub-humid zones.

The bottom map shows cattle distribution superimposed on tsetse infested areas, thus giving an approximate picture of the current encroachment of the tsetse fly on grazing areas. It suggests that around 10 percent of the subcontinent's cattle are being kept within the tsetse-infested area. The dots

on the periphery of the red area represent cattle distribution in the tsetse-free drylands.

Two of many electronic maps produced by FAO using GIS for environmental management and planning.

Click here to see the figure 

GIS is used to identify high-risk areas that are then targeted in cattle vaccination programmes.

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Transfer of technology

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Lo-Trau stove fuelled by rice husks.

Meal cooked using biogas made in the family's own yard using fermented organic waste.

The UN Conference on Environment and Development the Earth Summit - in 1992 placed technology transfer on the international agenda as an essential factor in development programmes.

New technology using waste materials is spreading throughout the developing world.

Exchange of ideas, skills and techniques is vital if the majority of the world's people are to benefit from technological advances. There is nothing new about this: the Babylonians taught the ancient world how to make bricks. Since the colonial era, technology transfer has tended to be a matter of patronage

between developed and developing countries, rather than an equal exchange. While this type of cooperation continues to be necessary, technical cooperation among developing countries (TCDC)

is becoming increasingly important. Technologies passed from one developing country to another may work better than those evolved in the developed world.

Channels for technology transfer include regional centres for integrated development in the Near East (CARDNE), Asia and the Pacific (CIRDAP) and Africa (CIRDAFRICA); technical cooperation networks (in 1994 there were some 25 of them linked to institutions in Latin America and the Caribbean); and global

information networks, such as AGRIS/CARIS, set up by FAO to provide information on agricultural research and technology. By mid-1995, 73 countries and 2 700 experts were participating in AGRIS/CARIS.

Examples of TCDC include:

- **The adoption of Asian equipment by rice growers in the Sahel. This includes push rotary hoes and weeders, for swift weeding, and a stove developed in Viet Nam which burns rice husks. By burning hitherto unused residues from rice mills, the stoves reduce pressure on forests for fuelwood and charcoal. They produce no smoke, and the ash can be used as fertilizer.**
- **The transfer of a model biogas digester from India to Cambodia. The digester was developed for use in India by a local NGO, Action for Food Production (AFPRO), which has now adapted it for Cambodia, where deforestation has been exacerbated by two decades of social upheaval.**
- **An agreement between India and the Philippines which provides for study visits, consultancies and the exchange of information and germplasm. The two countries are engaged in training each**

others' technicians in a wide range of fields. These include fish farming and vaccinology (from the Philippines to India), and animal health, farm machinery and the postharvest treatment of cashew nuts (from India to the Philippines).

- **A regional workshop in Buenos Aires in 1992, attended by 19 Latin American and Caribbean countries and China, Nigeria and the Philippines. Over 270 joint projects were agreed. They included Guatemalan training of Argentinians in control of the cattle worm; Argentinian help to Nigeria on potato and sunflower production and marketing; Chilean advice to China on wine production; and the transfer of an ancient Inca method of preserving potatoes from Peru to Guatemala, Cuba and Colombia.**

Some technology transfer opportunities

LAND/WATER

- **assessment of agroecological potential**
- **sustainable resource management**
- **improved water management technologies**

CROPS/LIVESTOCK

- **seed/fertilizer production and distribution**
- **integrated pest management (IPM)**
- **re-evaluation of traditional crops**

- **use of animal power**
- **dairy cooperatives**
- **animal breed improvement**
- **pest/disease control**
- **food processing**
- **post-harvest loss prevention**

FISHERIES

- **resource surveys**
- **aquaculture**
- **fish processing and marketing**

FORESTRY

- **community forestry and agroforestry**
- **policy development**
- **nurseries and plantations**
- **forest industries**

RURAL DEVELOPMENT

- **people's participation**
- **access to markets and credit**
- **agricultural training**
- **appropriate technology to assist rural women**

- **rural energy**

FOOD SECURITY AND NUTRITION

- **quality control**
- **early warning systems**
- **remote sensing**
- **food stock management and distribution**

Major FAO information systems

- **AGRIS (International Information System for the Agricultural Sciences and Technology)**
- **ARTEMIS (Remote Sensing Database)**
- **ASFIS (Aquatic Sciences and Fisheries Information System)**
- **CARIS (Current Agricultural Research Information System)**
- **FAOSTAT (Statistical Database for WAICENT)**
- **FISHDAB (Fisheries Statistical Database)**
- **FIPIS (Fishery Project Information System)**
- **FORIS (Forest Resources Information System)**
- **GDAGR (Global Databank for Animal Genetic Resources)**
- **GIEWS (Global Information and Early Warning System)**
- **GIS (Geographic Information System)**
- **GIS-DAD (Global Information System for Domestic Animal Diversity)**

- **GLOBEFISH (International Fish Market Indicators)**
- **Land Resource Data Bank**
- **Plant Nutrition Data Bank**
- **Seed information System**
- **WAICENT (World Agricultural Information Centre)**
- **WIEWS (World Information and Early Warning System on Plant Genetic Resources)**
- **World Forest Resources Inventory**

Regional centres and organizations

Regional centres and organizations provide technical inputs, research, training, and disseminate information to promote regional cooperation. They include:

- **CARDNE (Centre for Agrarian Reform and Rural Development in the Near East)**
- **CIRDAFRICA (Centre for Integrated Rural Development in Africa)**
- **CIRDAP (Centre on Integrated and Rural Development for Asia and the Pacific)**
- **SADC (Southern African Development Community)**

Regional networks and programmes

Regional networks/programmes coordinate research, information and technical cooperation. They

include:

- **Coordination of Rinderpest Eradication in West Africa project (including cattle vaccination) 11 countries**
- **Latin American Technical Cooperation Network on Watershed Management- 20 countries**
- **Near East Regional Research and Development Network on Small Ruminants -10 countries**
- **Pacific Island countries cooperation in root crop production and development- 12 countries**
- **Regional Cooperative Programme for Improvement of Food Legumes and Coarse Grains - 14 Asian countries**
- **Regional Cooperative Research Programme (Network) on Fish Technology in Africa - 16 countries**

Selected examples of technical cooperation among developing countries

The map shows some selected examples of technical cooperation among developing countries.

Click here to see the map

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- Overseas aid flows

A question of commitment

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Development patterns that perpetuate today's inequities are neither sustainable nor worth sustaining.

World food security depends on increased, and above all, better directed investment in agricultural development in the developing world. This requires greater commitment from both developed and developing countries.

Official aid to agriculture in the developing countries rose from some US$ 11 000 million a year in the early 1980s to US$ 14 000 million in 1988 but has now plummeted to less than US$ 10 000 million a year in today's values. The private sector, including farm households, provides 80 percent of all investment. Public spending on agriculture within developing countries has also fallen. It is difficult to calculate

exactly how much is spent every year, but FAO data suggest that between 1977 and 1992 some US$ 26 000 million a year was invested in on-farm improvements and some US$ 16 000 million a year in post-harvest facilities and in agro-industry.

Estimates suggest that the level of net investment will not have to increase much, in most of the world, to meet the needs of the next two decades: the exception is sub-Saharan Africa, where investment must double. However, gross investment, including capital stock maintenance, needs to grow by about US$ 39 000 million a year in primary and post-production operations. Of this, US$ 5 000 million must be spent on rural infrastructure and social services, which have been neglected by both national governments and donors. Less than 10 percent of the US$ 200 000 million spent on infrastructure in the developing world in 1993 went to the countryside.

Priorities for investment have shifted in recent years as a result of diminishing per caput availability of land, environmental concerns and a greater focus on people and poverty. Future needs include the development of new technology; intensification (via irrigation, land improvement, mechanization and the use of purchased inputs); the improvement or construction of facilities to handle, store, process, transport and market produce; and the improvement of rural roads, power supplies and telecommunications. These priorities vary from region to region. In Asia and Latin America, for example, rapid urban growth calls for relatively large investment in marketing and processing. In Africa, rural infrastructure is a top priority.

Issues such as locust and desertification control, early warning systems for drought and famines, outbreaks of plant and animal disease, and shared fishery and water resources involve more than one country at a time. Investment is particularly weak and difficult to organize unless the countries concerned are committed to finding solutions.

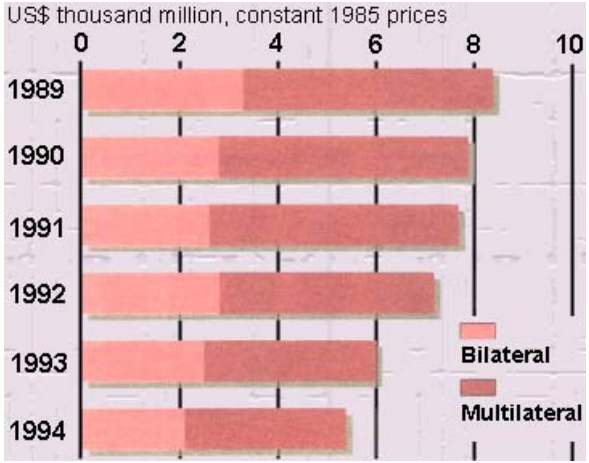
Overseas aid flows

Overseas aid per caput, 1992

Click here to see the map 

Assistance to agriculture

Commitments of external assistance to agriculture*



***Broad definition**

Sources: FAO; OECD

Farmers participation in agricultural extension

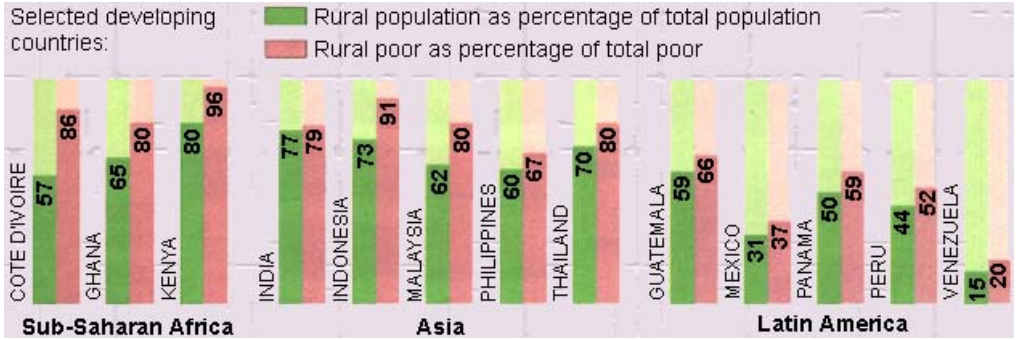
Members of the village committee of Ankofafa, Madagascar, inspect the results of community anti-erosion measures.

Small farmers are the major agents of agricultural improvement in the developing world. They invest their savings and labour; they have the most to lose or gain from the projects designed by governments or aid agencies. Their commitment is vital to any success.

In the past, city-based experts and planners have tended to overlook grassroots opinion and expertise. FAO's Investment Centre (IC) helps potential borrowers to design projects for investment by donors and has placed great importance in recent years on involving farmers in the process. This makes it possible to tailor projects to farmers' needs and to establish what innovations they are prepared to adopt.

In Zaire, for example, collaboration between farmers and peasant organizations has helped strengthen agricultural extension in six pilot areas of the country. A wide variety of farmer-driven and government-supported initiatives in agricultural training have enabled an estimated 320 000 farmers to be reached over a five-year period. The farmers were trained in areas such as agroforestry, market gardening and animal husbandry. Similar work in China has led to nearly US$ 1 000 million worth of projects. Further projects are starting in Armenia, Jordan, Mali and Zambia.

Indicators of rural poverty



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The right to food

Agriculture in the twenty-first century

Sharing the world's resources

Global warming

Food and agriculture: the

future

Dimensions of Need

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The right to food

The most basic of human rights is the right to adequate food and nutrition.

FAO seeks to mobilize international and national support for the establishment of world food security.

No human right is more fundamental than the right to food. Other human rights mean relatively little to those who are starving. Yet, although the world has enough food for all - and its average availability per caput has increased over the past three decades - some 800 million people are still chronically malnourished. Although the diets needed to provide the nutrients essential for a healthy and productive life are known, an estimated 2 000 million people still suffer from micronutrient deficiency diseases.

The United Nations, since its inception, has insisted that access to adequate food is a universal human right and a collective responsibility of the world community. In 1948 the Universal Declaration of Human Rights recognized that "everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including food...". In 1966, the International Covenant on Economic, Social and Cultural Rights developed this more explicitly, stressing the "right of everyone to... adequate food" and specifying that everyone's fundamental right is to be free of hunger. The same rights were reaffirmed at the 1974 World Food Conference.

FAO's Constitution clearly sets out its intention of ensuring humanity's freedom from hunger and calls on governments to take action, individually and collectively, to help to bring this about. The Organization looks beyond promoting food production to examining conditions for a stable food supply and to aiming to ensure that everyone always has both physical and economic access to basic food needs. In 1983 the FAO Conference adopted three key guidelines for world food security: ensuring adequate food availability; providing access to food, particularly for the poor; and enhancing the stability of food supplies. FAO continues to press for wider recognition of the right to food and, in 1992, it initiated the Declaration of Barcelona which emphasizes food rights and seeks to mobilize support from international organizations, governments, non-governmental organizations and individuals. This right to food found a practical expression in the Plan of Action adopted by the joint FAO/WHO International Conference on Nutrition in 1992.

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Agriculture in the twenty-first century

- Food supplies and crop production

- Share planted to modern wheat varieties in developing countries
- Increasing yields
- Water resources
- Fertilizer use in developing countries
- Rural poverty
- Rural illiteracy

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The future, just like the past, is likely to be characterized by a mix of successes and failures along the path towards a better fed world and more sustainable livelihoods and agriculture.

Forecasts suggest that by 2010, agriculture will tend to be more intensive and more productive.

In the future, the current problems of water distribution and resource and environmental degradation are likely to increase.

As we progress into the next century, the world as a whole will continue to produce enough to feed an increasing population. Nutrition will continue to improve in most developing regions. But the disparities between regions will become even greater, with sub-Saharan Africa particularly badly affected.

The rate of growth in world food production, which has been slowing down for the past three decades, will continue to decelerate. It dropped from 3 percent a year in the 1960s to 2 percent in the 1980s, and is expected to continue to fall to 1.8 percent in 2010. World population, meanwhile, is forecast to increase to around 7 000 million, 94 percent of the increase being in developing countries.

Food supplies for direct human consumption will increase in developing countries from about 2 500 calories per caput per day in the early 1990s to just over 2 700 calories in 2010. By then three regions - East Asia (including China), North Africa and the Near East, and Latin America and the Caribbean - are likely to reach or exceed the 3 000 calorie mark. South Asia may make significant progress, coming close to the present developing country average. But in sub-Saharan Africa where nutrition has already declined over the past three decades -food supplies per caput are likely to grow little, if at all, remaining at less than 2 200 calories a day.

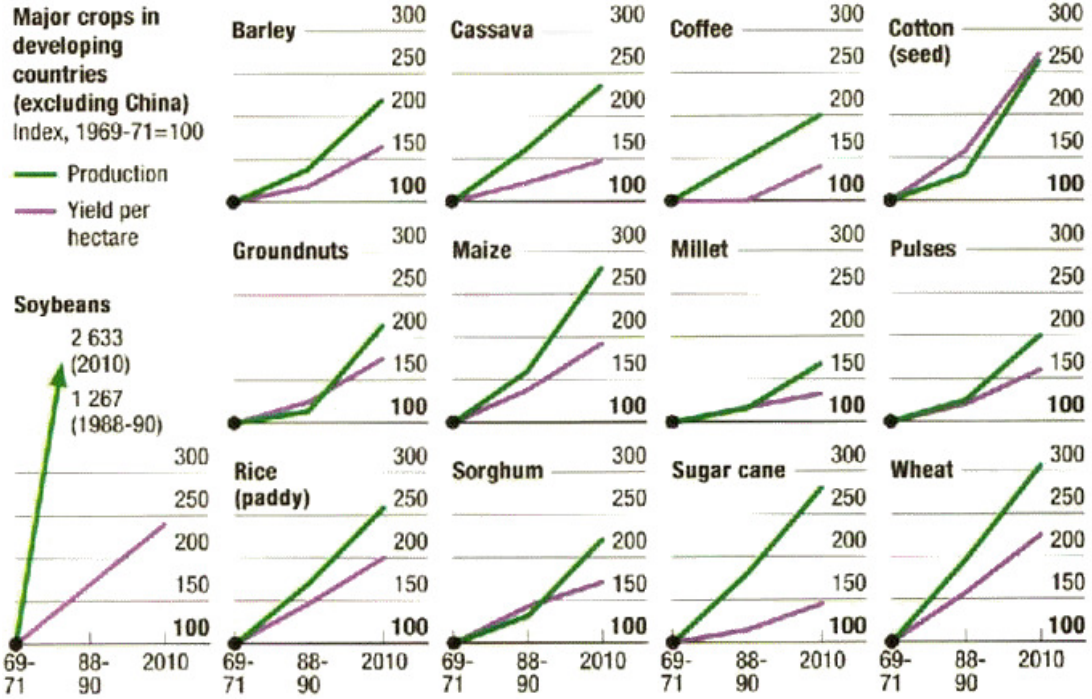
As a result, sub-Saharan Africa is likely to take over from South Asia as the region with the greatest number of chronically undernourished people; the number is expected to grow there from 200 million at the start of the 1990s to around 300 million 20 years later, while the number in South Asia is expected to fall only marginally from the present 250 million. These broad estimates indicate there may be fewer chronically malnourished in the developing world, despite population growth: down from the present 800 million to 650 million. But this estimate shows that past hopes that the world would be on a firm path to eliminating hunger and malnutrition by the end of the century remain optimistic in the

absence of any new, major global initiative that might significantly change present perspectives.

Total imports of agricultural products by developing countries are growing faster than exports. For some, this will reflect the development process as they turn away from economies dominated by agriculture. But for those low-income countries that remain heavily dependent on agricultural exports to finance food and other imports it will reduce their chances for sustainable economic growth.

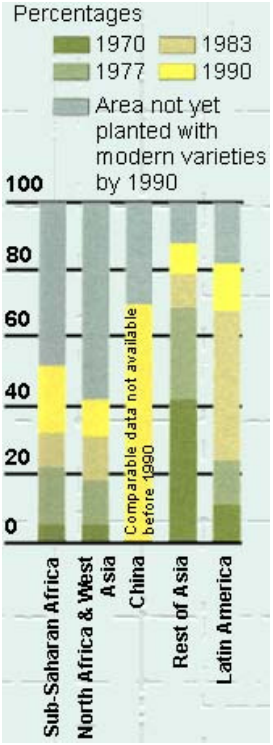
Food supplies and crop production


Per caput food supplies
Calories per day
1969-71
1990-92
2010
Sub-Saharan Africa
2 140
2 040
2 170
North Africa and Near East
2 380
2 960
3 120
South Asia
2 060
2 300
2 450
East Asia
2 050
2 670
3 040
Latin America and Caribbean
2 510
2 740
2 950
Developed countries
3 180
3 300
3 470



Share planted to modern wheat varieties in developing countries

Share of wheat crop area planted to modern wheat varieties* in developing countries



***Excludes tall varieties released since 1965**

Increasing yields

Increases in food production by the year 2010 will depend on further intensification of agriculture in developing countries. Together with growth in yields, more land will be brought into production and the existing land used more intensively.

Growth in yields has been the main cause of increases in production in the past, and will be even more important in the future, particularly in Asia and North Africa and the Near East, where land is scarce. Yields of both wheat and rice are expected to grow substantially, if less rapidly than in the past, but this will depend on an unabated research effort.

Fertilizer use in developing countries (excluding China) has grown four-fold over the past 20 years, although the rate of growth declined sharply from the 1970s to the 1980s. Application is expected to go on increasing, while the rate of growth will continue to fall: it is forecast that some 80 million tonnes of nutrients in the form of fertilizer will be used in developing countries, outside China, in 2010, compared to 37 million tonnes in the early 1990s.

The amount of land under cultivation is expected to increase. In 1995 about 760 million hectares were used to produce crops in the least developed countries (excluding China): this could grow to some 850 million hectares by 2010. Only about 600 million of the 760 million hectares in use are actually cropped and harvested in an average year - a cropping intensity of 79 percent. This rate of use could increase to 85 percent, bringing the total harvested area to some 720 million hectares by 2010.

The area occupied by human settlements could increase by some 35 million hectares, some of which will be land with agricultural potential. The expansion would take place mainly in sub-Saharan Africa and Latin America and the Caribbean, although there might also be some in East Asia (excluding China).

Achieving higher yields and greater intensification will depend crucially on maintaining and expanding irrigation systems; they will have to increase by 23 million hectares, or 19 percent, over and above the area lost to waterlogging and salinization. The bulk of this increase would be in South Asia.

Sustainable production

Working towards eliminating undernutrition and food insecurity in developing countries is only one of the two main tasks that have to be undertaken in order to feed present and future generations. The other is the need to safeguard the productive potential and broader environmental functions of agricultural resources.

The FAO Forest Resources Assessment of tropical countries in 1990 estimated their annual deforestation to be about 15.4 million hectares or 0.8 percent of the total tropical forest area. Agricultural expansion is a major contributor to deforestation and is expected to continue to be so. The impact of the expansion of crop production need not be great. More deforestation is likely to continue, however, as a result of the extension of grazing and of informal, unrecorded -often slash-and-burn -agriculture. Both deforestation and the draining of wetlands for agriculture will reduce biological diversity.

Water

Demand for water is expected to grow in years to come, but Africa and Asia are already experiencing an increasing shortage in the availability of water per caput. In many countries throughout the world water resources are scarcer than land availability. The need to increase agricultural production will accentuate pressures on water; the resulting scarcity may drive up prices beyond economic levels for crops in some areas. Meanwhile over-extraction of groundwater, particularly in the Near East and large areas of South

Asia, is causing water levels to fall beneath the reach of the shallow tubewells used for irrigation, or leading to intrusions of salt water which make it unsuitable for crop production. Water contamination from a number of sources including fertilizers, pesticides and the effluents of intensive livestock units and fish farms, is likely to increase.

The problem of land degradation is also likely to grow. Degradation from "nutrient mining" - denuding soils of major nutrients such as nitrogen and phosphorus and micronutrients such as boron and manganese - is serious in many countries, but most acute in sub-Saharan Africa.

Poverty is a major driving force behind rural environmental damage, as more and more people try to extract a living out of dwindling resources, producing a risk of a vicious circle of human deprivation and resource degradation. But it is not exclusively to blame.

Wealthier areas of the world, such as Western Europe and North America, have also suffered resource degradation, including soil erosion, water pollution and deforestation. They have responded, in part, by changing policies and incentives and by increasing investment. Most important of all, they have devised technological options and innovation and have educated land users in how to protect the resource base while increasing productivity. This is the same challenge facing many developing countries today.

Water resources

Internal renewable water resources per caput, 1992

Click here to see the map 

Fertilizer use in developing countries

Rural poverty

Reducing and eliminating rural poverty is the most effective way both to tackle hunger and to promote development, concludes the FAO study *World Agriculture: Towards 2010.* It says, "Only a combination of faster, poverty reducing development and public policy, both national and international, will ultimately improve access to food by the poor and eliminate chronic undernutrition. "

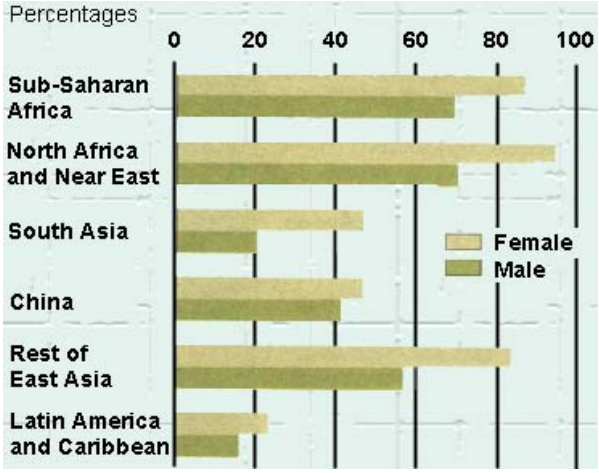
Increasing agricultural production as such will not end hunger since poor people may not be able to afford to buy the food that is produced; increasing the output in countries highly dependent on agriculture will, however, boost rural incomes and thus reduce poverty and assist development, since most of the world's poorest people depend on agriculture as the main source of their income.

Policies that neglected agriculture and promoted inappropriate technologies and management practices are now discredited. The FAO study calls for the shifting of technology from such "hardware" solutions as large doses of pesticides or building terraces with machines, to "solutions based on more sophisticated, knowledge and information-intensive resource management practices which can lower both off-farm costs and environmental pressures". New policies and measures will be needed to help farmers, forest users and fisherfolk pursue sustainable agricultural and rural development.

Access to land, through land reform, is a major factor in poverty alleviation and agricultural growth. Progress so far has been limited, but the case for reform remains strong on both efficiency and equity grounds. The poor in agriculture need better access to rural finance and better marketing services. And they need education, training and technical assistance to help them to be open to the new and profitable innovations that will be especially necessary in the transition to sustainable development. In this there is a role both for direct government intervention and for private sector initiatives.

Rural illiteracy

Rural illiteracy rates



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Sharing the world's resources

- National energy consumption levels
- Rates of change in food production

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The richest quarter of the world's population accounts for more than three-quarters of consumption of many natural resources. At the other end of the spectrum, the poor satisfy their immediate needs by destroying their local resources slash-and-burn agriculture, Mexico.

Terraced farmland, Nepal. FAO supports many programmes designed to meet the particular needs of mountain areas such as this, and their inhabitants.

Less than one-quarter of the world's people, those who live in the developed countries of both West and East, consume 80 percent of the energy and metals and 85 percent of the paper used each year. Three countries, the United States, Germany and Japan, together produce more than half of the planet's economic output, while the 450 million people of sub-Saharan Africa share about the same amount as the 10 million who live in Belgium.

The high consumption and high productivity of the industrialized countries need to be balanced by a shift in investment, research and development, productive capacity, and management and other skills to the developing world. At the same time, the developed countries need to become more efficient by reducing waste and paying the full price of goods and raw materials imported from developing countries.

The intensive use of energy by the industrialized countries causes pollution and contributes to global warming, while the overnutrition of many of their people causes disease and death. Poverty in many developing countries leads people to cut down forests, damage watersheds and degrade the land, while undernutrition also kills and gravely damages health. A more equitable sharing of resources would assist development and help reduce critical pressures on the environment in developed and developing countries alike.

The 1992 UN Conference on Environment and Development, the Earth Summit, focused world attention on sustainability and natural resources, and set out in Agenda 21 a plan of action for future global partnerships. FAO played a major role in drafting Agenda 21 and has been designated the "task

manager" for following up many of its resolutions.

The Organization's primary responsibilities cover land resources, forests, mountain ecosystems, and sustainable agriculture and rural development. But it is also involved in water resources, control of desertification, conservation of biological diversity, oceans and coastal issues, and the provision of information for decision making. FAO promotes joint activities and programmes to encourage the exchange of information, to help develop common strategies and to consolidate and analyse information for presentation to the Commission for Sustainable Development established as a result of the Earth Summit. It also chairs UN sub-committees on oceans and water resources that coordinate the implementation of the corresponding Agenda 21 chapters.

Diagnosing information for sound decision making is a major objective of Agenda 21. FAO is developing indicators of sustainable agriculture and rural development (SARD) for a number of areas including forest management (with the International Tropical Timber Organization) and land quality (with the World Bank). It is promoting the design and application of measures to assist countries in analysing the effects of economic development on environmental and social systems.

FAO is supporting efforts to strengthen international cooperation and the exchange of information on such issues as watershed management and development of appropriate farming systems. It is helping to formulate national action plans and investment programmes; encouraging the participation of representatives from mountain communities in national development planning; and is promoting the conservation and development of the technologies and cultures of mountain areas.

FAO is assisting many countries in sustainable agricultural development. It promotes the conservation and sustainable use of plant and animal genetic resources for food and agriculture, fosters sustainable

rural energy production and extends the application of integrated pest management, integrated systems for plant nutrition and other cost-effective, environment-friendly technologies. It encourages the wise use of natural resources through land and water management programmes. FAO helps to obtain investment intended to meet these objectives and direct it to resource users. It has also developed agro-ecological zone mapping, evaluating land potential and matching soils, climate and environment to crop requirements.

National energy consumption levels

Per caput energy consumption, 1991

Click here to see the map

Figures are for commercially traded energy only. Boundaries of nations formed since 1991 (in former Yugoslavia, in former Czechoslovakia, Eritrea) are shown in grey.

Source: UNDP

Rates of change in food production

Per caput food production, 1988-93

Click here to see the map

Boundaries of newly-formed nations (in former USSR, in former Yugoslavia, in former Czechoslovakia, Eritrea) are shown in grey.

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Global warming

- How the greenhouse effect works
- Worldwide forecasts
- Concentration of greenhouse gases in the atmosphere and their contribution to global warming

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Naturally occurring greenhouse gases keep the earth warm enough to be habitable. Increasing their concentrations and adding new ones will gradually make the earth quite a different place.

According to the best estimate by the Intergovernmental Panel on Climate Change, if present trends continue, sea levels may rise by about 40 centimetres by the end of the next century. Small island states, such as the Bahamas, Maldives and Tonga, will be most affected.

Deforestation reduces a vital store of carbon dioxide.

Agriculture depends on the climate more than any other human activity, and so is particularly vulnerable to climatic change. The Intergovernmental Panel on Climate Change (IPCC) estimates that as a result of increasing human-induced emissions of carbon dioxide, methane, nitrous oxide and other "greenhouse gases", average temperatures may climb by about 0.3 degrees centigrade per decade over the next century, while sea levels could rise by at least 2-4 centimetres per decade. This will have an impact, still to be quantified, on agriculture, forestry, fisheries, food security, biodiversity and rural environmental conditions.

Not all of the effects of global warming would be harmful to agriculture. Higher concentrations of carbon dioxide can have a fertilizing effect under optimal growing conditions: 10-20 percent of improved crop productivity over the past century could be the result of the gradual increase in the level of the gas; and crop productivity could increase further, by up to 30 percent, if the concentration of carbon dioxide doubles as foreseen over the next 50 years. It could also offset the damage done to plant growth by

other pollutants, and increase the efficiency with which crops use water. Rising temperatures could increase the yield of some plants, while diminishing others. Rainfall could also increase, by about 10 percent, but its distribution and intensity would change; some areas would benefit, others would be harmed, but it is not yet certain which ones.

Overall, global warming is expected to add to the difficulties of increasing food production. The weather and climate would become more unpredictable, making farming and planning more difficult. Present agricultural zones would shift, sometimes by hundreds of kilometres in latitude and by hundreds of metres in altitude on hills and mountains. Some plant and animal species, particularly those such as trees with long life cycles, might not be able to adjust to this and poorer farmers, in particular, would find it hard to adapt. Fishing areas may also shift, leading to disruption, although the overall productivity of the oceans might stay about the same. Diseases and pests would possibly increase. Biological diversity could be at risk in natural environments such as tropical forests and mangroves. And the rise in sea levels would increase flooding, submerging or waterlogging coastal plains which are among the most productive, and highly populated, lands.

Global warming is likely to accentuate the existing imbalance in world food production between the developed and developing countries. Cooler, temperate regions - home to the industrialized countries - are expected to receive most of the benefits from global warming, while tropical and subtropical ones are likely to suffer most. Farmers in wealthier countries are also most likely to be able to adapt to climate change. Sub-Saharan Africa, where food production already lags behind the rest of the world, is expected to be hardest hit.

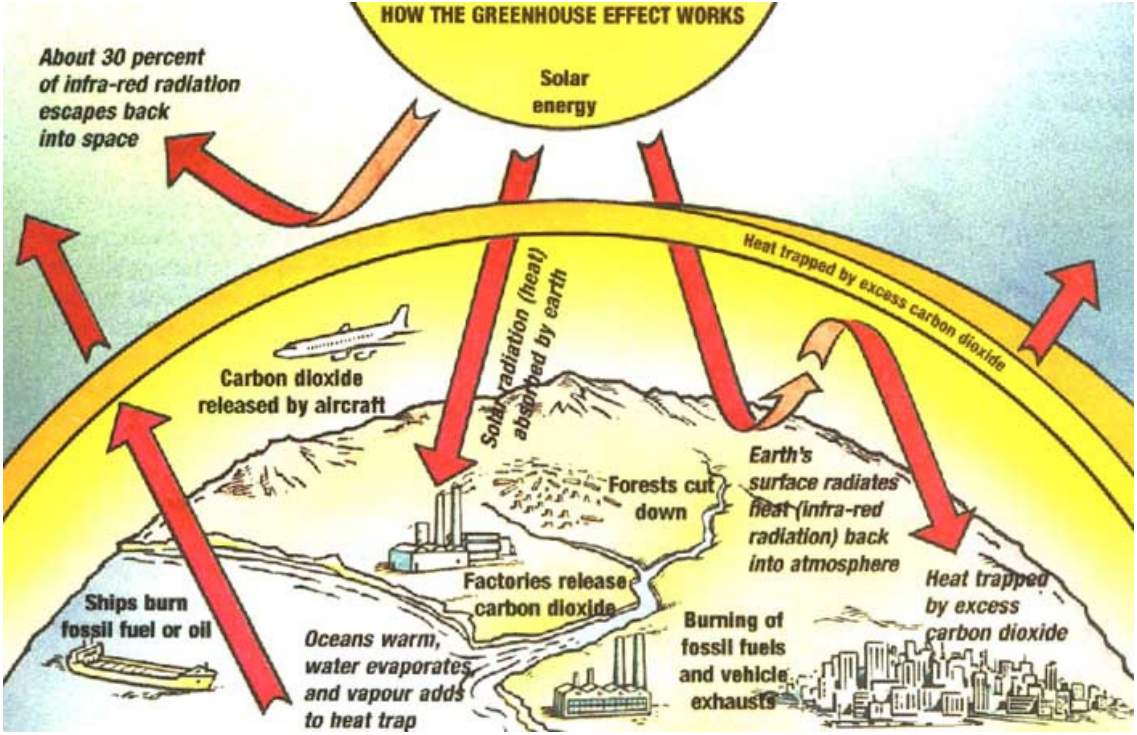
Carbon dioxide (CO_2) is the most important greenhouse gas after water vapour. Much atmospheric CO_2 originates from use of fossil fuels for the production of energy in industrialized countries but about 30

percent has been estimated to result from deforestation and other land use practices such as rangeland burning. Some 35 percent of worldwide methane emissions are now estimated to arise from fermentation in rice paddies and in the digestive systems of cattle and other ruminants. And agriculture, including the application of nitrogenous fertilizers, may account for as much as 90 percent of nitrous oxide emissions.

The growth of carbon dioxide in the atmosphere can be slowed by reducing the rate of deforestation. Using biofuels derived from plants, instead of fossil fuels, will also reduce these emissions. Changes in land management techniques such as reforestation would stimulate the annual terrestrial uptake of atmospheric CO_2 and its storage in the organic matter of arable or grassland soils. FAO is helping governments and people to reduce emissions of methane and nitrous oxide, which have no positive effects on plant growth, by improving the use of nitrogenous fertilizer, modifying irrigated rice cultivation and feeding cattle a well-balanced diet-including, for example, straw treated with urea - that produces less methane than diets of untreated roughage.

The Organization also monitors the condition of tropical forests, helps to combat deforestation and promotes the planting of trees. It is developing plans for preparing for disasters and early warning systems for droughts, outbreaks of pests and diseases, and other "extreme events" affecting food and agriculture. It is promoting the development of more resilience in agriculture: for example, by encouraging diversification and developing improved crop varieties and animal breeds. And it is stimulating further research to assess the impact of global warming on food production.

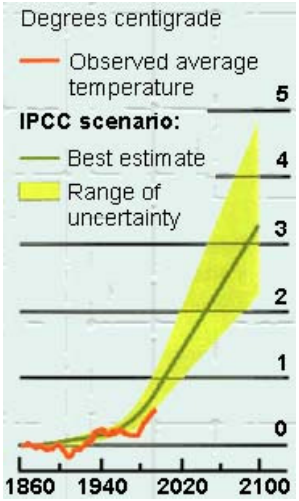
How the greenhouse effect works



Worldwide forecasts

Potential changes in surface temperature according to the Intergovernmental Panel on Climate Change

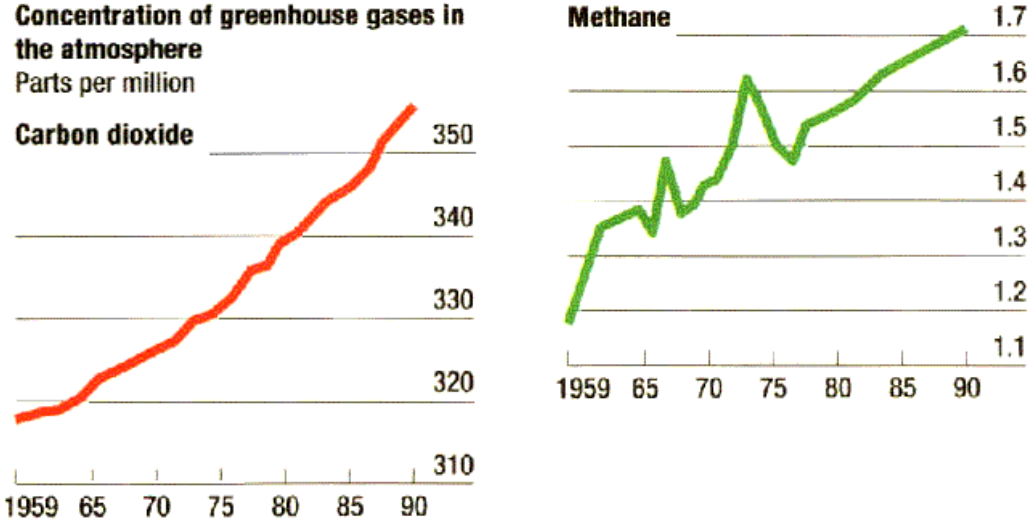
(IPCC)



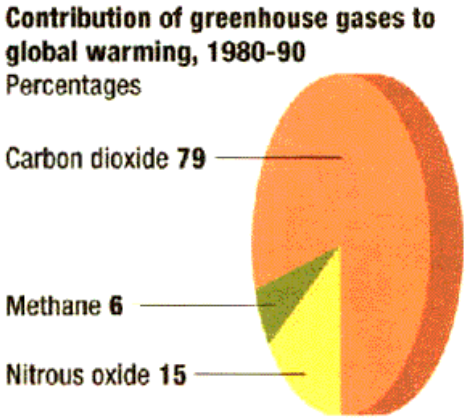
Source: IPCC

Concentration of greenhouse gases in the atmosphere and their contribution to global warming

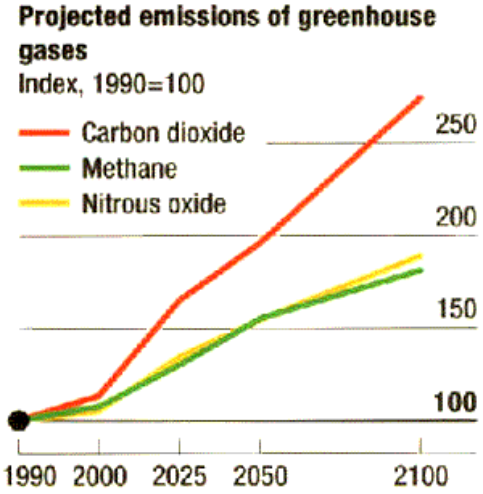
Concentration of greenhouse gases in the atmosphere


Concentration of greenhouse gases in the atmosphere
Parts per million
Carbon dioxide
350
340
330
320
310
1959 65 70 75 80 85 90
Methane
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1959 65 70 75 80 85 90

Contribution of greenhouse gases to global warming, 1980-90



Projected emissions of greenhouse gases



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The challenge of sustainability

- The Den Bosch declaration

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"Sustainable development is pro-people, pro-jobs and pro-nature" *Human Development Report 1994.*

In the long term, increasing food production depends on using natural resources sustainably, not destroying them.

Five root causes of unsustainable practices

There are five root causes of unsustainable agricultural practices and degradation of the rural environment:

Policy failure

Leading among the causes of unsustainable agriculture are inadequate or inappropriate policies which

include pricing, subsidy and tax policies which have encouraged the excessive, and often uneconomic, use of inputs such as fertilizers and pesticides, and the overexploitation of land. They may also include policies that favour farming systems which are inappropriate both to the circumstances of the farming community and available resources.

Rural inequalities

Rural people often know best how to conserve their environment, but they may need to overexploit resources in order to survive. Meanwhile commercial exploitation by large landowners and companies often causes environmental degradation in pursuit of higher profits.

Resource imbalances

Almost all of the future growth in the world's population will be in developing countries and the biggest increases will be in the poorest countries of all, those least equipped to meet their own needs or invest in the future.

Unsustainable technologies

New technologies have boosted agricultural production worldwide, but some have had harmful side effects which must be contained and reversed, such as resistance of insects to pesticides, land degradation through wind or water erosion, nutrient depletion or poor irrigation management and the loss of biological diversity.

Trade relations

As the value of raw materials exported by developing countries has fallen, their governments have sought to boost income by expansion of crop production and timber sales that have damaged the environment.

Drylands

Most of the 20 million square kilometres of the world's drylands - which support 500 million people are subject to degradation; some 60 000 square kilometres of land are lost each year. The main strategies for sustainable agriculture and rural development must be to create employment locally and to find alternatives to practices which overexploit the land. Low-cost soil and water conservation measures are needed, while the pressure on fuelwood can be reduced by tapping other local sources of energy, such as wind and biogas. Planting legume-based crops and trees, which fix their own nitrogen,

can reverse the depletion of soil nutrients and reduce the need for mineral fertilizers.

Overgrazing can be reduced by encouraging greater control over the use of resources and increasing the offtake of livestock by improving market networks. The reduction or removal of subsidies and other actions that reduce the cost of maintaining livestock can also encourage greater offtake. Growing hay, development of leguminous forage and the promotion of species of trees and shrubs that are productive during the dry season can provide alternative sources of feed and alleviate shortages.

Irrigated land

About 35 percent of all irrigated land - the major source of cereals and export crops - is at risk of salinization because of poor management. Efficient use of water can be promoted by local farmers participating in drainage and irrigation design, improved training and water pricing policies that curb excessive use. Small-scale schemes planned and implemented by local institutions can reduce many irrigation problems if backed by national policies that effectively support appropriate technologies, credit, marketing, energy supplies and maintenance of equipment.

Tropical forests

Humid and semi-humid forests support 1 000 million people and are the world's largest biomass reservoir, but their sustainability is threatened by the removal of trees and the degradation of watersheds. Most of this is caused by clearing for agriculture, which is unsustainable either because the fertility of the soil is low or because the methods of cultivation are unsuitable.

To meet the needs of their increasing populations, most developing countries will need to convert some of their forest areas for agricultural use, but this needs to be done on the basis of land use planning that ensures that it is sustainable.

The pace of deforestation will be slowed only by ensuring that the conservation and management of forest resources are more attractive to local people than their destruction, and that commercial interests use forest land in a sound, sustainable way.

Options to help achieve this include agroforestry involving food crops and trees; the sustainable harvesting of non-wood forest products; and sustainable forest management and timber harvesting.

Hill and mountain areas

The world's highlands cover 10 million square kilometres, and serve as watersheds for far more. In Asia, for example, some 9 million square kilometres of downstream land is at risk of flooding as a result of highland degradation. The central objectives must be to raise farm productivity using low-cost technologies, and to reduce population pressure. Policies that promote employment in agriculture and opportunities for income outside it are recommended. Perennial tree and shrub crops, and mixing crops and livestock, provide sustainable alternatives to shifting agriculture and produce higher incomes from far less land.

Sustainable forest management and agroforestry provide fodder, fuelwood and timber, and reduce erosion. Moderate slopes should be reserved for horticultural and fodder crops, steep ones for tree crops - possibly through incentives and regulations. Overgrazing can be countered by selling more livestock, sterilization and culling, and controlling livestock by stall feeding. Improved breeds and animal health will raise productivity, even with fewer animals.

As these areas often have poor access, their management relies on local initiatives, but these must be complemented by development of roads, hydropower schemes, and better credit and marketing.

Proposals for progress

FAO proposes a choice of four key strategies to attain sustainable agriculture and rural development. The first two promote intensification; the third and fourth are applicable when limits on natural resources or environmental or socio-economic constraints make this unsustainable.

Intensification through specialization
This is mainly suited to land with high crop potential. It depends on the judicious use of external inputs such as pesticides and fertilizers combined with improved agricultural and related practices. The introduction of improved soil management, integrated pest management and efficient waste management all promote sustainability.

Intensification through diversification
This is suited to a wider range of conditions. Mixed cropping systems, plus improved management techniques, help promote maximum efficienty in natural resource use. Diversification can minimize environmental and socio-economic risks, assist waste recycling and reduce the need for external inputs.

Combining on-farm and off-farm activities
Promoting additional sources of income can limit pressure on natural resources.

Extensive systems

Suited to marginal areas, or ones with low agricultural potential, they can either be specialized (as in ranching) or diversified (as in shifting cultivation). Few external inputs are used, so integrated pest management, water management, and the conservation and maintenance of soil fertility are particularly important. The sustainability of these systems depends on having low population densities and only light pressure on natural resources.

Three objectives should guide the choice between these options:

- **improving efficiency in the use of resources and inputs;**
- **increasing the resilience of agriculture and producers to adverse socio-economic and environmental conditions;**
- **promoting diversity, through varied farming systems that help spread the farmer's risks or the use of areas for other purposes. such as forestry.**

The Den Bosch declaration

In April 1991, FAO held a conference on agriculture and the environment, with the cooperation of the Netherlands Government, attended by senior government officials and experts from some 120 countries. It adopted the Den Bosch Declaration calling for "fundamental changes" in development policies and strategies so as to meet the world's increasing need for food without degrading the environment. These changes included:

- **the participation of rural people in the research and development of systems for more efficient**

management of the natural resources available to the farmer;

- devolving the responsibility and authority for decision making to the local level, rather than relying on top down" administration;
- allocating clear and fair legal rights and obligations on the use of land and other natural resources, including land reforms as necessary;
- investing in improving, rehabilitating and conserving natural resources;
- adjusting economic and agricultural policies and instruments to promote production systems and technologies that can help attain sustainability;
- encouraging demand and providing incentives that favour crops and animals that can be produced and processed sustainably;
- promoting practices, production and processing systems that pay particular attention to safeguarding health and the quality of the environment;
- promoting opportunities in rural areas to earn livelihoods off the farm.

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Fair and free trade

- The Uruguay Round of trade negotiations
- Probable evolution of net agricultural trade balance

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It is often assumed that agricultural trade liberalization will benefit developing countries, but the regions that will benefit most, in the short term, from the GATT Agreement on Agriculture are among the richest in the world.

The present net surplus in the agricultural trade balance of developing countries is likely to decrease in the future.

Under the GATT Agreement on Agriculture, food prices will rise on the world markets. This will favour exporting countries but also offers importing countries an opportunity to reward their farmers and reduce imports.

The Uruguay Round of trade negotiations

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT), concluded in December 1993, is the first to include the liberalization of agricultural trade. Its Agreement on Agriculture could cut tariffs by an average of 36 percent in developed countries and 24 percent in developing ones and reduce domestic support for producers by 20 percent and 13.3 percent respectively. Expenditure on export subsidies is to be cut by 36 percent. Developing countries have ten years in which to make the cuts, compared with six for developed countries; the least developed are not required to make any reductions at all.

Food prices will rise and this will, naturally, benefit exporters and hurt importing countries. But farmers in developing countries may also gain because subsidized exports from developed countries have undercut them, reducing production. For the same reason, the food security of developing countries

should also improve. There should be some reduction in agricultural production in the developed countries and a slight rise in the developing ones, but the total world harvest will hardly be affected.

In all, the value of world agricultural trade is expected to rise by about 1 percent. Half of this will result from higher prices, half from increases in volume. The Agreement is likely to slow down the general decline in the growth rate of world trade seen since the 1980s - caused mainly by decreased imports by the main developed countries -but it seems unlikely to halt it.

In fact, the impact of the Agreement is expected to be comparatively small since it represents only partial liberalization. The cuts in support to agriculture, although impressive in absolute numbers of dollars, are relatively small and are spread over a number of years. Even after the changes have been completed, a large degree of distortion will remain in the market. The Agreement calls for the process of liberalization to continue with the long-term objective of "substantial progressive reductions in support and protection, resulting in fundamental reform " .

The regions that will benefit most from the Agreement on Agriculture are among the richest in the world, while many developing countries, particularly in Africa, are likely to lose from it.

The implications for individual countries of FAO's projections for agricultural commodity markets following the implementation of the Uruguay Round stem from changes in market prices, new opportunities for exports and the extent to which external markets may influence producers and consumers.

Exports of developed countries in the year 2000 would be some US$ 17 000 million higher as a result of the Agreement on Agriculture and those of developing countries would increase by some US$ 9 300

million. At the same time, imports of developed countries are projected to increase by about US$ 19 000 million compared with an increase of US$ 6 400 million for developing countries. The major beneficiaries are the great food exporting regions of North America, the Southwest Pacific and Latin America.

Developing countries will face considerable changes in world market conditions, and they will be hurt by a side-effect of liberalization: the erosion in the value of the preferences that industrialized countries give to produce from some developing countries. The agricultural preferences given by the European Union, Japan and the United States in 1992 were potentially worth US$ 1 900 million; this is expected to fall by nearly half (US$ 800 million) as a result of the Uruguay Round. Many of the recipients of such preferential schemes are among the poorest developing countries.

Most African countries tend to be importers of food, particularly wheat, rice and dairy products, and exporters of tropical products such as cocoa, coffee and fruit and some agricultural raw materials. Twenty-eight of them are among the least developed and 44 are among the low-income food-deficit countries. The increases in the price of food from temperate areas as a result of the Agreement are likely to cause a substantial rise in their import bills; the value of their exports would also rise but not by so much. Estimates suggest that their US$ 1 000 million export surplus in all agricultural commodities in 1987-89 will become a deficit of US$ 500 million in the year 2000, partly as a result of the Uruguay Round.

Most African countries could well have to give greater weight to a strategy that increases food production and promotes diversification in their export crops. The rise in world prices and decrease in export subsidies offers them an opportunity to reward their farmers better in order to encourage greater production.

Much of Asia is largely self-sufficient in food and its agricultural exports are expected to increase as a result of the Agreement. In Latin America and the Caribbean a rise in agricultural export earnings is expected to outweigh greatly the increase in the cost of food imports, so that the region's favourable balance of trade should rise from US$ 20 000 million in l 987-89 to US$ 32 000 million in the year 2000: US$ 2 400 million of this estimated increase is ascribed to the Uruguay Round.

Probable evolution of net agricultural trade balance

	Net balance (US$ million) 1988/90	Likely changes 1988/90-2010 (percent)		Net balance (US$ million) 1988/90	Likely changes 1988/90-2010 (percent)
Coffee	+7 544	+24	Pulses	-194	+100 or more
Oilseeds, vegetable oils, oil-meals	+3 640	+50	Cotton, excl. cotton textiles	-265	increase, probably large
Sugar	+3 244	decline	Animal fats	-689	increase
Rubber	+2 924	+35	Wool, excl. wool textiles	-917	increase, probably large
Cocoa	+2 211	+24			
Citrus	+1 659	+10-20			

Bananas	+1 927	+33	Beverages (mostly alcoholic)	-952	increase
Other fruit	+1 989	+100-150	Meat, eggs	-1 137	+100 or more
Vegetables	+1 756	+50-70	Hides and skins, excl. leather products	-1 547	increase, probably large
Tea	+1 055	+20			
Spices	+570	modest increase	Dairy products	-5 348	+55
Cassava/other roots	+899	-40	Cereals	-15 962	+80
Vegetable fibres, excl. cotton	+91	0 or decline			
Tobacco	+8	0			
Other products (unspecified)	+2 498				
Sub-total	**+32 015**		**Sub-total**	**-27 011**	
NET BALANCE = +5 004					

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- World military spending

Tapping the peace dividend

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There were hopes when the Cold War came to an end that reductions in arms expenditure, in both developed and developing countries, would release large sums for investment in development. This has still to happen.

Global military spending has fallen sharply - from a peak of US$ 995 000 million in 1987 to US$ 767 000 million in 1994 (at constant 1991 prices). This cut, an average of 4 percent a year over the period, yielded a saving of US$ 935 000 million. But little of it has been spent on human or sustainable development. The United States and the countries of the former Soviet Union have led the way in reducing spending, but in the former most of the savings have gone to reduce the overall budget deficit and national debt, while in the latter they have been largely swallowed up in economic crisis.

The potential for tapping the peace dividend, however, remains. Military spending still places a large burden on the world's resources and is equal to the total income of almost half the world's people. The 1994 *Human Development Report* estimated that a further 12 percent reduction would release enough money to provide safe drinking water and primary health care (including the immunization of children) for the entire world population, eliminate severe undernutrition and cut moderate undernutrition by half. An earlier report estimated that continuing to reduce military spending by a further 3-4 percent a

year while earmarking one-quarter of the savings for aid, would raise official development assistance to meet the UN target of 0.7 percent of GNP and still leave a substantial amount to spare for use at home.

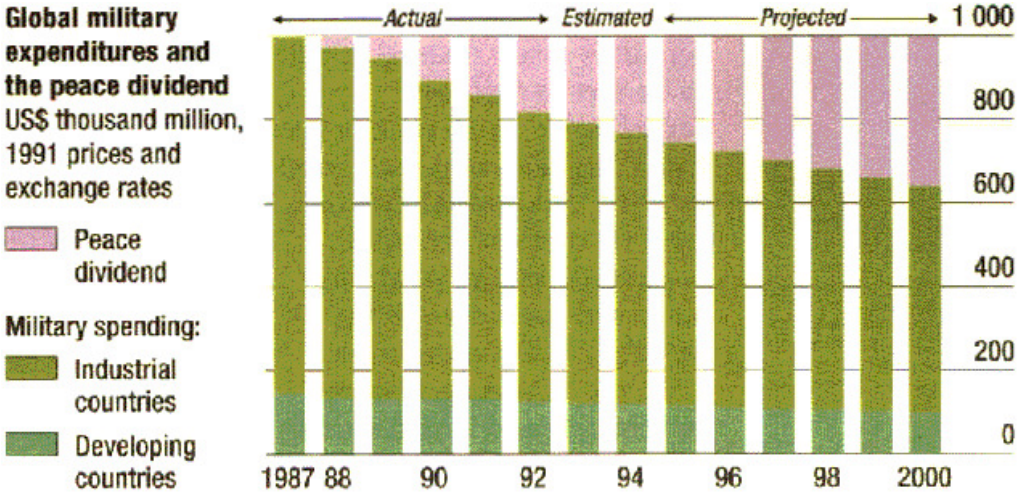
Considerable scope also exists for tapping the peace dividend by cutting military expenditure in developing countries. Their spending rose by 7.5 percent a year between 1960 and 1987, almost three times as fast as in developed countries, while their share in global expenditure more than doubled from 7 percent to 15 percent. So far they have undertaken little disarmament.

The establishment of a Global Demilitarization Fund under international jurisdiction has been proposed by Oscar Arias, the former President of Costa Rica and winner of the 1987 Nobel Peace Prize. He suggests using a proportion of the peace dividend to achieve further cuts in expenditures. All countries would commit themselves to reducing military spending by at least 3 percent a year: developed ones would give perhaps one-fifth, and developing countries perhaps one-tenth, of their savings to the Fund. This would then be used to reward the efforts primarily, but not exclusively, of developing countries to disarm and demobilize.

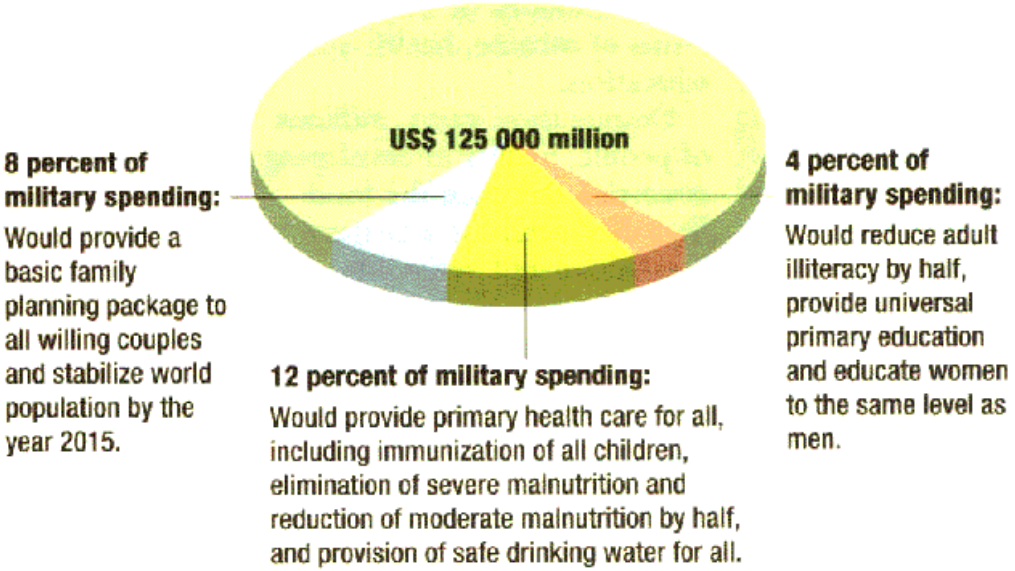
World military spending

World military spending in 1992 (US$ 815 000 million) equalled the income of 49 percent of the world's people

Global military expenditure and the peace divided



Total military spending in developing countries, 1992



Source: Human Development Report, 1994

A global tax for development

As official aid shrinks, development experts are proposing new ways of raising the money to fund development. These could be less dependent on the changing priorities of donor countries and their governments. Many envisage new forms of international taxation.

A global income tax has been proposed, as has a world tax on the use of such shared resources as the oceans (for fishing, transport or mining seabed minerals), the Antarctic (for mining) or space (for communications satellites). There are also various proposals for pollution taxes, particularly on emissions of carbon dioxide, the main contributor to global warming: some countries already have domestic carbon taxes in place.

Professor James Tobin

Professor James Tobin , winner of the 1981 Nobel Prize for Economic Sciences, has proposed a worldwide tax on international currency transactions, which now amount to US$ 1 000 000 million a day. A levy of just 0.5 percent on each transaction would raise over US$ 1 500 000 million a year. He says that such a tax would slow down speculative movements of capital, while not being heavy enough to deter commodity trade or serious international capital commitments. The proceeds would be devoted to international purposes and placed at the disposal of international institutions.

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Promises to keep

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FAO has seen 50 years of progress yet its pursuit of a better and more equitable world is unchanged.

The Constitution of FAO is as relevant now as when it was adopted 50 years ago. The promises made then have still to be met in full, but considerable progress has been made in alleviating hunger and poverty. The availability of food set against the total population of the world has increased even though the population has more than doubled. World agricultural production and international trade in agricultural products have grown dramatically. There have been broad gains in the standard of living in terms of income, health and education.

Despite these gains, millions of people, mainly in developing countries, still lack the food that they need for a healthy, productive and active life. At the same time, because the benefits of past progress have not been shared equitably, the gap between rich and poor, individuals and nations alike, has grown wider. Global food security, which will ensure that everyone has an adequate diet, has yet to be put in place.

The population of the world at the time of FAO's founding stood at about 2 500 million persons. By FAO's 50th Anniversary in 1995, it had reached an estimated 5 700 million. In 2045, the Population Division of the United Nations has projected that it could be between 7 960 million and 11316 million, according to whether one assumes a low or high growth rate for the years to come. No matter which scenario may prove the more accurate, one thing is certain: in the foreseeable future our planet must sustain an increasing number of people, bringing an even greater demand for food, clothing, shelter, health care and education.

The existence of poverty and hunger is the principal challenge facing the world community. As the specialized agency responsible within the United Nations system for food, agriculture and rural development, FAO clearly has a central role in helping meet these challenges. In fact, the elimination of hunger and the establishment of food security by means of sustainable development are the driving forces underlying the mission of the Organization as it moves towards a new century.

In celebrating the 50th Anniversary of FAO, its Members have chosen to reaffirm their dedication to its principles and to renew their commitment to its mission. Setting objectives for food, agriculture and rural development, and the conservation of natural resources, this partnership, which embraces almost every nation in the world, has agreed to give due emphasis to:

- **promoting agriculture, forestry and fisheries as key sectors in the quest for sustainable economic development;**
- **empowering food producers and consumers, recognizing the importance of those who harvest the earth's natural resources and the rights of all people to safe, nutritious food;**
- **making sustainable use of natural resources for development thereby meeting the responsibility as custodians of this heritage to present and future generations;**
- **building a global development partnership in which all nations and peoples can participate in order to achieve growth with equity.**

Management and sustainable use of natural resources is vital.

Using natural resources can provide jobs and incomes to combat poverty.

Food losses can be minimized by improving storage and preservation.

All people, particularly women, should be able to participate fully in rural development.

A favourable environment for trade needs to be created.

Sustainable use and care of natural resources should be rewarded.

Food security and improved nutritional status for

Consumers should be

Research capacity

everyone should be a priority in national policies and plans.

protected with safe, good quality foods.

must be strengthened in developing countries.

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Further information

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PUBLISHED IN ROME BY FAO

1984
Land, Food and People

1984
Sharing Experience for Progress.

1985
Fifth World Food Survey

1986

Introduction to Irrigation.

1989

Fertilizers and Food Production.

1989

Forestry and Nutrition - a Reference Manual.

1989

Nuclear Strategies in Food and Agriculture, 1964-1989.

1989

Sustainable Agricultural Production: Implications for International Agricultural Research.

1990

The Conservation and Rehabilitation of African Lands.

1991

FAO/Netherlands Conference on Agriculture and the Environment, Report of the Conference.

1991

Fish for Food and Development

1991

How Good the Earth?

1991

The Global Information and Early Warning System on Food and Agriculture.

1992

FAO Handbook on TCDC.

1992

FAO/WHO International Conference on Nutrition, Final Report of the Conference.

1992

Food and Nutrition: Creating a Well-fed World.

1992

Forests, Trees and Food.

1992

Nutrition, the Global Challenge.

1992

Protect and Produce, Putting the Pieces Together

1992

Sustainable Development and the Environment, FAO Policies and Actions, Stockholm 1972-Rio 1992.

1993

Biotechnology in Agriculture, Forestry and Fisheries.

1993

Current World Fertilizer Situation and Outlook, 1990/91-1996/97.

1993

Food Aid in Figures, Vol. II.

1993

Food and Nutrition in the Management of Group Feeding Programmes.

1993

Harvesting Nature's Diversity.

1993

Rural Poverty Alleviation: Policies and Trends.

1993

Science and Technology in the Work of FAO

1993

World Soil Resources.

1994

Cherish the Earth.

1994

Communication: A Key to Human Development

1994
Global Climatic Change and Agricultural Production.

1994
Water for Life.

1994
What has AIDS to do with Agriculture?

1995
Commodity Review and Outlook 1994-95.

1995
Fighting Hunger

1995
Food Control and Consumer Protection.

1995
Food for All.

1995
Impact of the Uruguay Round on Agriculture.

1995
State of the World's Forests.

1995

The Keita Integrated Development Project

1995

The State of World Fisheries and A qua culture.

FAO PERIODICALS

Ceres.
DEEP (Development Education Exchange Papers).
FAO Annual Review.
Food, Nutrition and Agriculture.
Food Outlook, Global Information and Early Warning System on Food and Agriculture.
Foodcrops and Shortages.
Rural Development (RD).
TCDC (Technical and Economic Cooperation among Developing Countries) Newsletter.
The State of Food and Agriculture.
Unasylva.
Yearbook of Fishery Statistics Catches and Landings.
Yearbook of Fishery Statistics Commodities.
Yearbook of Forest Products.
Yearbook of Production.
Yearbook of Trade.

OTHERS

Alexandratos, N. (ed) (1995), *World Agriculture: Towards 2010, An FAO Study,* Chichester: Food and Agriculture Organization of the United Nations/ J. Wiley.

BP (1995*), BP Statistical Review of World Energy,* London: The British Petroleum Company.

Brown, L.R., Kane, H. & Roodman, D.M. (1994), *Vital Signs,* Worldwatch Institute, London & New York: W.W. Norton & Company.

CGIAR (1994), *CGIAR Annual Report 1993-1994,* Washington, D.C.: Consultative Group on International Agricultural Research.

Georghiou, G.P. & Saito, T. (1983), *Pest Resistance to Pesticides,* New York: Plenum Press.

Grigg, D. (1992), *The Transformation of Agriculture in the West,* Oxford: Blackwell.

Hoyt, E. (1992), *Conserving the Wild Relatives of Crops,* Rome: IBPGR/IUCN/WWF.

IPCC (1990), Houghton, J.T. et al. (eds), *Climate Change: The IPCC Assessment,* Cambridge: Cambridge University Press for the Intergovernmental Panel on Climate Change (IPCC).

IPCC (1992), Houghton, J.T., et al. (eds), *Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment,* Cambridge: Cambridge University Press for the Intergovernmental Panel on

Climate Change (IPPC).

Lean, G. & Hinrichsen, D. (1992), *Atlas of the Environment,* Oxford: Helicon.

Seger, J. (1995), *The State of the Environment Atlas,* London: Penguin.

UN (1994 rev.) *Long-range World Population Projections, Two Centuries of Population Growth, 1950-2150,* New York: United Nations.

UNDP (1994 and other years), *Human Development Report,* New York & Oxford: Oxford University Press.

UNEP (1992), *One World, Environment and Development, 1972 to 1992,* Nairobi: United Nations Environment Programme.

UNESCO (1992), *Environment and Development Briefs: No.1 Debt for Nature; No.2 Ground Water; No.3 New Technologies; No.5 Disaster Reduction; No.6 Coasts; No.7 Biodiversity,* Paris: United Nations Educational, Scientific and Cultural Organization.

Wilson, E.O. (1988), *Biodiversity,* Washington, D.C.: Greenpeace International.

World Bank (1994), *World Debt Tables 1994-95,* two vols, Washington, D.C.: World Bank.

World Bank (1995), *Global Economic Prospects and the Developing Countries,* Washington, D.C.: World Bank.

World Bank (1995), *Social Indicators of Development,* Washington, D.C.: World Bank.

World Bank (1995), *The World Bank Atlas,* Washington, D.C.: World Bank.

World Bank (1995), *World Tables 1995,* Baltimore: The Johns Hopkins University Press.

WRI/UNEP/UNDP (1994), *World Resources 1994-95, A Report by the World Resources Institute in Collaboration with the United Nations Environment Programme and the United Nations Development Programme,* New York & Oxford: Oxford University Press.

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World map - A country by country reference

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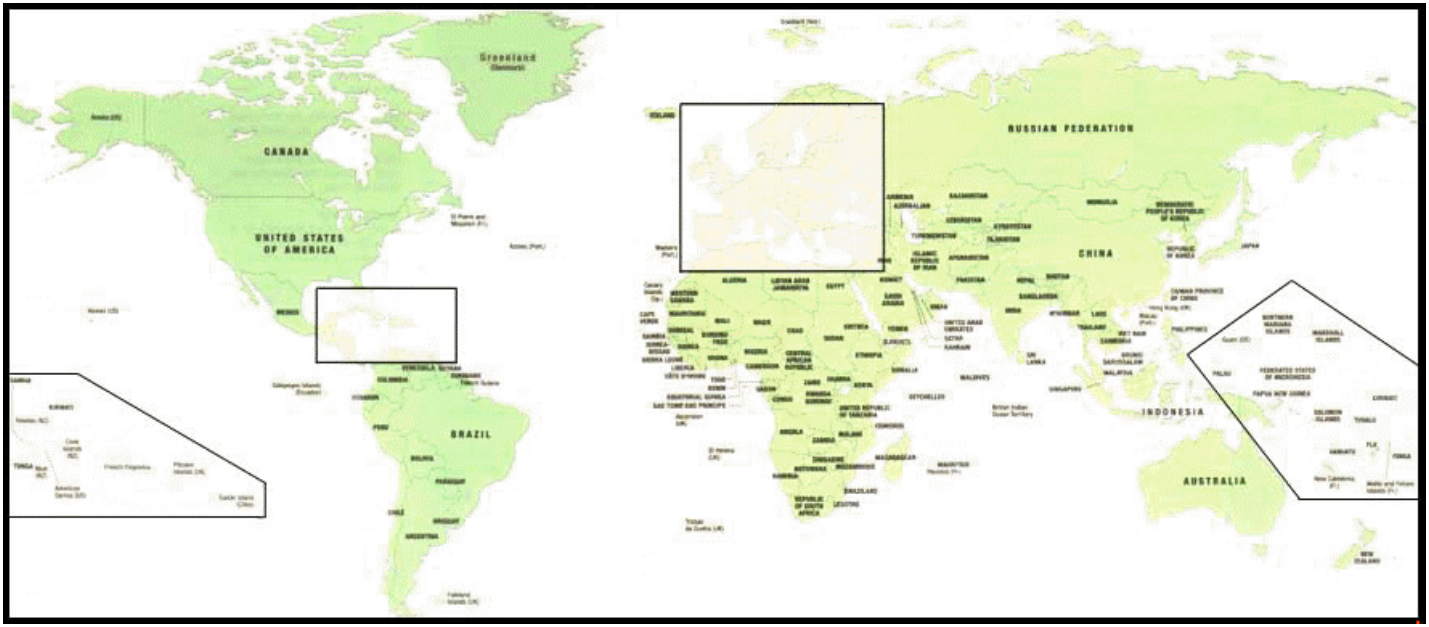
This map is for identifying countries only. The designations employed do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This image contains hotspots, so you can see any part of this map (in full details) just by

clicking on the respective zone of the map.



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The United Nations system

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UN Headquarters, New York. The UN is involved in every aspect of international life from peacekeeping to the environment, from children's rights to air safety, but it cannot legislate.

The United Nations (UN) is an organization of sovereign nations. It provides the machinery for its Member States to help solve disputes or problems, and deal with matters of concern to all humanity. It does not legislate.

The International Court of Justice (ICJ) is the principal judicial organ of the UN.

The General Assembly is the UN's main deliberative body. All Member States are represented in it and each has one vote.

The Economic and Social Council (ECOSOC) coordinates the economic and social work of the UN.

The Security Council has primary responsibility for maintenance of international peace and security. It

has five permanent members each with the right to veto, and ten others elected for two-year terms. Member States are obligated to carry out its decisions.

The Secretariat services all organs of the UN except the ICJ, doing the day-to-day work of the UN, ranging from administering peace-keeping operations to organizing conferences.

The Secretary-General controls and directs the Secretariat, and is chief administrative officer at all meetings of the General Assembly, Security Council ECOSOC and the Trusteeship Council.

The Trusteeship Council was established to ensure that governments responsible for administering Trust Territories took adequate steps to prepare them for self-government or independence. This task having been completed in 1994, the Council will now meet as and when required.

The specialized agencies and programmes have wide international responsibilities for development, health and economic, social, cultural, educational, scientific and technical, and other fields.

Principal organs of the United Nations:

KEY:

- **United Nations programmes and organs (representative list only)**
- **Specialized agencies and other autonomous organizations within the system**
- **Other commissions, committees and ad hoc and related bodies**
- **Cooperative arrangements between the UN and the newly established WTO are currently under discussion**

Security Council

- Military Staff Committee
- Standing committees and ad hoc bodies

Peace-keeping operations

- Various programmes

General Assembly

- Main and other sessional committees

- Standing committees and ad hoc bodies
- Other subsidiary organs and related bodies
- UNRWA United Nations Relief and Works Agency for Palestine Refugees in the Near East
- IAEA International Atomic Energy Agency

Economic and Social Council

International Court of Justice

Secretariat

Trusteeship Council

- INSTRAW International Research and Training Institute for the Advancement of Women
- UNCHS United Nations Centre for Human Settlements (Habitat)
- UNCTAD United Nations Conference on Trade and Development
- UNDCP United Nations International Drug Control Programme
- UNDP United Nations Development Programme
- UNEP United Nations Environment Programme
- UNFPA United Nations Population Fund
- UNHCR Office of the United Nations High Commissioner for Refugees
- UNICEF United Nations Children's Fund
- UNIFEM United Nations Development Fund for Women
- UNITAR United Nations Institute for Training and Research
- UNU United Nations University
- WFC World Food Council
- WFP World Food Programme
- ITC International Trade Centre UNCTAD/GATT

- FUNCTIONAL COMMISSIONS

Commission for Social Development
Commission on Crime Prevention and Criminal Justice
Commission on Human Rights
Commission on Narcotic Drugs
Commission on Science and Technology for Development
Commission on Sustainable Development
Commission on the Status of Women
Commission on Population and Development
Statistical Commission

REGIONAL COMMISSIONS

Economic Commission for Africa (ECA)
Economic Commission for Europe (ECE)
Economic Commission for Latin America and the Caribbean (ECLAC)
Economic and Social Commission for Asia and the Pacific (ESCAP)
Economic and Social Commission for Western Asia (ESCWA)

SESSIONAL AND STANDING COMMISSIONS

EXPERT, AD HOC AND RELATED BODIES

- ILO International Labour Organization
- FAO Food and Agriculture Organization of the United Nations
- UNESCO United Nations Educational, Scientific and Cultural Organization
- WHO World Health Organization

World Bank Group

- IBRD International Bank for Reconstruction and Development
- IDA International Development Association
- IFC International Finance Corporation
- MIGA Multilateral Investment Guarantee Agency

- IMF International Monetary Fund
- ICAO International Civil Aviation Organization
- UPU Universal Postal Union
- ITU International Telecommunication Union
- WMO World Meteorological Organization
- IMO International Maritime Organization
- WIPO World Intellectual Property Organization
- IFAD International Fund for Agricultural Development
- UNIDO United Nations Industrial Development Organization
- WTO World Trade Organization

FAO Food and Agriculture Organization of the United Nations

Agriculture Department

- Animal Production and Animal Health
- Nuclear Techniques in Food and Agriculture (joint FAO/IAEA)
- Land and Water Development
- Plant Production and Protection
- Agricultural Support Systems

Economic and Social Department

- Agriculture and Economic Development
- Commodities and Trade
- Food and Nutrition
- Statistics

Fisheries Department

- Fishery Policy and Planning
- Fishery Resources
- Fishery Industries

Forestry Department

Forestry Policy and Planning
Forest Resources
Forest Products

Sustainable Development Department

Research, Extension and Training
Women and People's Participation
Rural Development and Agrarian Reform

Technical Cooperation Department

Investment Centre
Field Operations
Policy Assistance

Regional (sub-regional) offices

Africa (Southern and East Africa)
Asia and the Pacific (the Pacific Islands)
Latin America and the Caribbean (the Caribbean)
The Near East (North Africa)
Europe (Central and Eastern Europe)

Liaison offices

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Oceanic Zone