



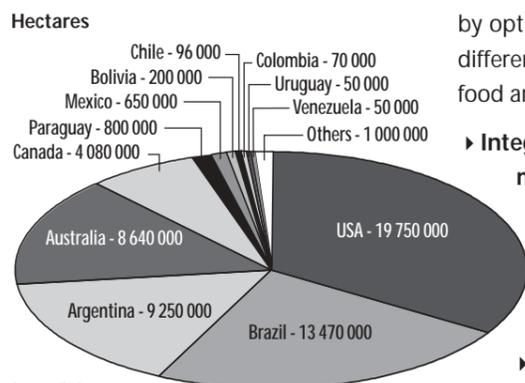
# Food security and the environment



## KEY FACTS

- ▶ Arable land per person is shrinking, from 0.38 hectares in 1970 to 0.23 in 2000, with a projected decline to 0.15 hectares per person by 2050.
- ▶ Soil erosion is responsible for about 40 percent of land degradation worldwide, much of it caused by tillage.
- ▶ About 20 percent of irrigated land in the developing world has been damaged to some extent by waterlogging or salinity.
- ▶ About 30 percent of livestock breeds are close to extinction. About 75 percent of the genetic diversity of agricultural crops has been lost since 1900.
- ▶ An estimated 250 million people have been directly affected by desertification, and nearly 1 billion are at risk.
- ▶ Land under organic production methods is increasing, currently totalling about 15.8 million hectares. Two-thirds of this land is in Argentina and Australia, the rest mostly in Europe. Just 0.5 percent of agricultural land is farmed organically in developing countries.

## WHO IS USING NO-TILLAGE?



In 1999, an estimated 58 million hectares worldwide were farmed using no-tillage techniques.

*With world population expected to reach 8 billion by 2030, pressure on the environment will continue to mount. The challenge of the coming years is to produce enough food to meet the needs of an additional 2 billion people while preserving and enhancing the natural resource base upon which the well-being of present and future generations depends.*

## FEEDING 8 BILLION PEOPLE SUSTAINABLY

FAO projections show increasing pressure on the environment from a variety of food production trends.

By 2030, crop production in the developing countries is projected to be 70 percent higher than in 1995/97. About 80 percent of this increase will continue to come from intensified crop production, for example, higher yielding varieties and higher cropping intensities. The rest will come from further expansion of arable land.

Arable land in the developing countries is projected to increase by 12 percent (an additional 120 million hectares), most of it in South America and sub-Saharan Africa, with an unknown but probably considerable part coming from deforestation (see

Trees and people, *overleaf*). Irrigation will play an increasingly important role in developing countries, but if it is not well managed it will lead to waterlogging and salinity (see Key facts, *left*) and water scarcity.

Increased use of mineral fertilizers will lead to more widespread nitrate contamination of water resources. Intensive livestock production will cause ammonia damage to ecosystems.

As large-scale commercial farming operations increase, they could displace small-scale livestock farmers, thus exacerbating rural poverty and food insecurity.

In light of these trends, an ecosystem approach to agriculture is imperative (see Managing agriculture for the future, *below*).

## MANAGING AGRICULTURE FOR THE FUTURE

An ecosystem approach to agriculture manages soil, water, plants and animals as parts of a functional whole. It relies on restoring the natural ecological balance by optimizing the competition between different plant and animal species for food and space. Strategies include:

▶ **Integrated pest and production management:** prevents pest outbreaks through naturally occurring predators, parasites, pest-resistant varieties and traditional cultural methods.

▶ **Organic agriculture:** optimizes the health and productivity of soil, plants, animals and people. Almost all synthetic inputs are prohibited and soil-building crop rotations are required.

▶ **Conservation agriculture:** ensures soil fertility through better nutrient cycling by micro-organisms in the soil. Low- or no-tillage and mulching help soil structure, making soil more resistant to wind erosion and giving crops better access to often-scarce moisture.

But economic pressures often induce farmers to grow a particular crop in the most profitable way possible, leading them to ignore sustainable practices. Therefore, public policy needs to encourage sustainable agriculture. An ecosystem approach, which considers economic, social and ecological factors together, is the only way to prevent degradation of the environment.

## MOUNTAINS: THE WORLD'S WATER-TOWERS

About one person in ten lives in the mountains, but one in two depends on mountains as a source of water. Water flows are threatened by deforestation, overgrazing and poorly managed land use on steep hillsides, which leads to soil erosion. Recent disastrous floods in Asia and the Americas demonstrate the critical contribution of mountain forests in regulating water flow over large areas.

The topography, soil, vegetation and land use in upper watersheds have direct impacts on water, natural resources and communities dependent upon them. Poor farming practices on steep slopes increase water runoff, resulting in loss of topsoil, reduction in land productivity, sedimentation of reservoirs and increased risk of flash floods. In 1995 in Pakistan's Swat Valley, such floods washed away over 1 200 hectares of agricultural land, along with 26 water mills. Three years earlier, also in

Pakistan, mountain floods caused US\$14 million of damage, including destruction of 4 600 hectares of crops. In China, landslides are estimated to cause US\$15 billion in damage and kill 150 people each year.

Environmental protection and economic needs must be addressed together. This includes sustainable forestry practices. Erosion-control methods (for example, correct terracing of agricultural fields) must be

designed in cooperation with local farmers to ensure they are practical and accepted. The interaction between different plant and animal species (including humans) must be understood to protect the balance between them.

**The United Nations has designated 2002 as the International Year of Mountains and FAO as lead agency for the Year. For information see [www.mountains2002.org](http://www.mountains2002.org)**

## FISH: A FINITE SOURCE OF FOOD

World fish catches have increased fourfold since 1950, threatening many fish stocks. As a result, species may be lost or replaced by their prey, upsetting the fisheries balance. So control measures such as closures of fisheries must be systematic, not designed around single species.

In 1999, 28 percent of fish stocks were recovering, depleted or overexploited. A further 47 percent of stocks were fully exploited, while 21 percent were moderately exploited and only 4 percent underexploited.

The 1992 "Earth Summit" specifically called for an ecosystem approach to fisheries. But local economies must be taken into account, or people will be forced to ignore environmental concerns. Fishing

industries support control measures if they are fair.

Aquaculture now produces a third of the fish we eat, a figure that will rise to half by 2030. But hazards include release of veterinary drugs into the food chain and excess nutrients into the environment. And if farmed fish escape, they can compete or breed with wild fish. In New Brunswick, Canada, 33 percent of river salmon are thought to have escaped from farms.

Farmed fish can also spread disease; sea-lice infestation on wild salmon in Norway is ten times greater in areas where fish are farmed. Aquaculture is important for food security and poverty alleviation, but it can and must be practised safely.

## GENETIC EROSION

Farmers have always selected plants with valuable characteristics, resulting in what are called farmers' varieties or landraces. They have also interbred their best animals. Landraces and their wild relatives contain genetic traits, such as pest resistance or heat tolerance, needed by farmers and breeders. However, many factors, including human pressures, are causing the disappearance of genetic resources.

About 1 000 domestic animal breeds were lost in the last century; 32 percent of the 1 335 breeds for which population data are available are threatened. Genetic uniformity makes food crops vulnerable to external stress such as pests and disease. For example, it made the United States vulnerable to a blight that destroyed almost US\$1 billion worth of maize in 1970.

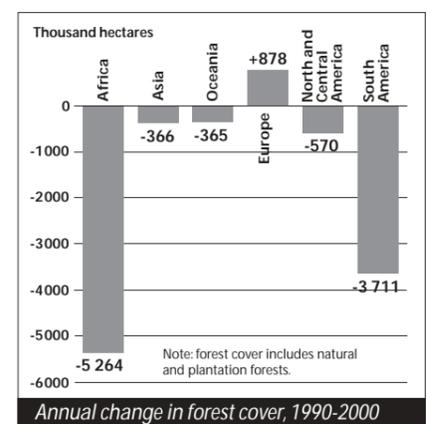
Local communities need to become active partners in developing and implementing strategies to maintain and widen the genetic diversity of the ecosystem, including preservation of habitats for wild relatives.

## TREES AND PEOPLE

Global forest cover declined by a net 9.4 million hectares per year between 1990 and 2000. This reflects a loss of 14.6 million hectares per year of natural forests, offset by gains of 5.2 million hectares per year from natural forest expansion and afforestation. Tropical countries accounted for 97 percent of deforestation but only 36 percent of gains in forest cover. Natural fires, unsustainable management and fuelwood harvest contributed to forest loss, but removal of forest for food production and subsistence needs remained the prime causes.

Forest conservation and development policies must balance people's needs for both a healthy environment and economic benefits. If managed properly, forests have a value not only as sustainable sources of wood for commercial uses, but also for

renewable supplies of food, medicines, building materials and other traditional products. With the commitment of key stakeholders and the adoption of proven forest management tools, it is possible to balance conservation, protection and commercial demands with the needs of local people to earn their livelihoods.



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