

## Safety Security : Food Water

### The Everlasting Revolution

**Agriculture's Green Revolution rescued millions from starvation in the 20th century but failed to eradicate hunger. With global food demand set to grow by 50 percent by 2030, the new century needs a new agricultural revolution.**



#### Picture Gallery (click on the image to start)

Find our more about the ten crops that feed the world (Photo: Reuters)

The battle against hunger is one of mankind's oldest struggles. From the first plow to the improved seeds of the Green Revolution and genetically modified crops, humans have used technology to try to eliminate famine. Yet hunger haunted the poorer parts of the world. Food production could not keep up with rapidly growing populations.

In 1968, the U.S. author Paul R. Ehrlich wrote: "The battle to feed all of humanity is over...hundreds of millions will starve to death." Fortunately, he was wrong. Instead, the Green Revolution nourished Asia, Latin America and the Middle East from the late 1960s by transforming food production.

New hybrid seed varieties, irrigation systems, and large amounts of fertilizers and pesticides were the weapons of the revolution. Scientists developed plants that grew quicker, in any season, and were resistant to pests and disease. They had shorter, stiffer stems that could support heavier heads of grain. These stems required less photosynthetic energy, allowing more of the sun's energy to grow the grain. New irrigation canals, fertilizers, and pesticides provided water, nutrients, and protection.

While the amount of cultivated land increased by only 4 percent, cereal production in Asia doubled between 1970 and 1995. The Green Revolution did not expand farms; it improved and intensified them. Forests, wetlands, and pastures were preserved.

Agriculture became increasingly mechanized, and generated food surpluses that insured against bad years. Increased production also led to lower food prices and so poor people could buy more fruit, vegetables, and meat. Farming success stimulated the wider economy. Just as the Agricultural Revolution in Britain spurred urbanization, so the Green Revolution helped modernize Asia.

## The Limits of Revolution

But the Green Revolution had its limits. It only spread to areas that either received a lot of rain or were irrigated. That left out most of Africa, where today only 7 percent of arable land is irrigated. In low-rainfall, non-irrigated areas of India and China, hunger and poverty persist.

Poor farmers in remote areas could not easily get or afford the new seeds, fertilizers and water pumps. The new seeds depended on petrochemical-based fertilizers and pesticides, creating new dependencies and making farmers vulnerable to rising oil prices. Mechanization pushed down farm wages, and so people deserted the land, leaving agribusiness to take over.



### Animation: Rising Food Prices

Click on the image to learn more about food prices and why they rise and fall

This was a good thing argue those who say that subsistence farming is too precarious. Land gets sub-divided between many children, making the plots too small to be productive. Traditional farming techniques, they argue, cannot provide food security for increasing populations in a world vulnerable to extreme climate change.

But the revolution has run out of steam as crops reach the biological limits of photosynthesis. Yields have stagnated or even fallen in the last two decades. According to the Food and Agriculture Organization of the UN (FAO), when the rice variety IR8 was introduced in 1966, it produced almost ten tons per hectare; now it yields barely seven.

The main problem is that the land is exhausted. Intensive plowing, cropping, and fertilizer use gives the soil no time to recover naturally. Weeds and pests develop resistance to pesticides and so farmers must use ever-increasing amounts. This cycle pushes up costs, degrades the environment, and poisons water and food supplies.

Intensive farming also needs a lot of water. Farmers in hot, dry areas have dangerously depleted groundwater reserves. Over-irrigation can also lead to salinization of the soil. Scientists fear that Green Revolution farmers may be trapped in the same destructive cycle as over-enthusiastic farmers in the American Dust Bowl of the 1930s. Yet, with every day the world needs more food. Agriculture needs a new revolution.

### GM to the Rescue?

Some scientists say genetically modified (GM) crops are the answer. These crops can be genetically engineered to use less water, less fertilizers, and even less land. They will be more resistant to insects, disease, salt, and drought.

Genetically modified crops have expanded rapidly in the U.S., Brazil, Argentina, and India. They now cover 114 million hectares of farmland globally, about 8 percent of the total used to grow crops. Pioneers of genetically modified crops like the company Monsanto predict that the yield from maize grown in America, which has doubled since 1970, can double again by 2030.

That case is disputed. Yields from genetically modified crops declined in some cases, says a FAO report on agricultural biotechnology. In this case, the supposed benefits of genetically modified crops do not outweigh the potential health hazards and the risk of restricting access to staple food types to patent-wielding agribusiness. Furthermore, genetically modified crops still depend on petroleum-based fertilizers and they need pesticides to survive.

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Organic agriculture offers a greener alternative, which would allow small-scale farmers to produce food without expensive chemicals. It is also increasingly popular in industrialized countries where consumers reject industrial farming. More encouragingly, it works in Africa. A UN Environment Programme survey of organic projects in East Africa recently found that yields more than doubled, beating traditional and chemical-intensive farming.

Organic yields may be better in East Africa, but agricultural fund manager Bryan Agbadian of Allianz RCM says that elsewhere they are significantly smaller than on conventional fields while genetically modified seeds give even better yields.

Organic farming or genetically modified crops, which will feed the world? History suggests technology will prevail, but the Green Revolution could also be succeeded by a greener counter-revolution.

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