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# Limits to Growth: Facing Food Scarcity

**A**S INCREASING GLOBAL DEMANDS put pressure on declining grain stocks, countries the world around are in for a wake-up call.

It may be the ultimate irony that in our efforts to make the earth yield more for ourselves, we are diminishing its ability to sustain life of all kinds, humans included. A sobering report published last November by the Worldwatch Institute announced that despite technological advances, the world's stocks of rice, wheat, corn and other grains have fallen to their lowest level in two decades. "Measured in days of global consumption, the world's estimated carryover stocks of grain for 1996 had fallen to 49 days" - the lowest level ever.

Unseasonably cold, wet weather in some countries, and crop-withering heat waves in others, have lowered grain harvests in such major grain-producing countries as Canada, the U.S., parts of Europe and Russia. In many farming regions, the summer of 1995 was the hottest ever recorded. Thus, many of the world's farmers found themselves contending with temperatures higher than they have ever known much as global climate models had projected would result from the planet's rising levels of atmospheric carbon dioxide. As that trend continues, shrunken harvests could become the price of our addiction to fossil fuels.

For decades, grain stocks have remained more or less adequate; as population has surged, so has food production. Boosted by new crop varieties, fertilizers, and irrigation, yields improved dramatically. But in recent years production has faltered, and much of the optimism engendered by those ever-rising yields is evaporating. Since the bumper crop of 1990, there has been no growth in global grain production at all while population has grown by some 440 million people, the equivalent of 40 New York Cities. And what is of greatest concern is not only the growing number of mouths to feed, but what type of diet they will demand.

## The High Price of a Meat-Based Diet

Even as population grows at a record pace, those with low incomes, who account for most of humanity and who typically depend on a starchy staple such as rice for 70% or more of their calories, see prestige in consuming more livestock products. This desire to match the first world's fat-laden diet appears to be global-wide. As disposable incomes rise sharply across the developing world, a fast-growing middle class from Seoul to Sao Paulo is buying more beef, poultry, and pork. Since 1950, world meat consumption has leaped four-fold, from 44 million tons to 184 million tons. Consumption per person has nearly doubled from 17 kilograms in 1950 to 33 kilograms in 1994. Ironically, as developing countries adopt the fat-laden North American diet, they are experiencing a sharp rise in the diseases that accompany it, including heart disease, cancers, and osteoporosis.

In China alone, the demand for pork is creating a soaring population of hogs, 510 million by the year 2000, from 307 million a decade ago. And the new taste for meat is placing heavy pressure on the grain supply, since hogs yield only one pound of pork for each four to six pounds of grain they consume. Consequently, China has been transformed from a net grain exporter of 800 million tons to a net importer of 16 million tons. Its overnight emergence as a leading importer of grain, second only to Japan, is exacerbating

the rise in world grain prices.

It is only a matter of time until China's grain import needs overwhelm the export capacity of Canada, the U.S. and other exporting countries. But before that happens, the shortage will spread, because even as China is bidding for a growing share of the world's exportable supplies, so are scores of other countries. The grain import needs of countries such as Indonesia, Iran, Pakistan, Egypt, Ethiopia, Nigeria, Mexico, Bangladesh, and India could easily triple by 2030. In the competition for high-priced exportable supplies, the weaker economies will lose out. In more human terms, so will many of the world's poor.

## The Politics of Scarcity

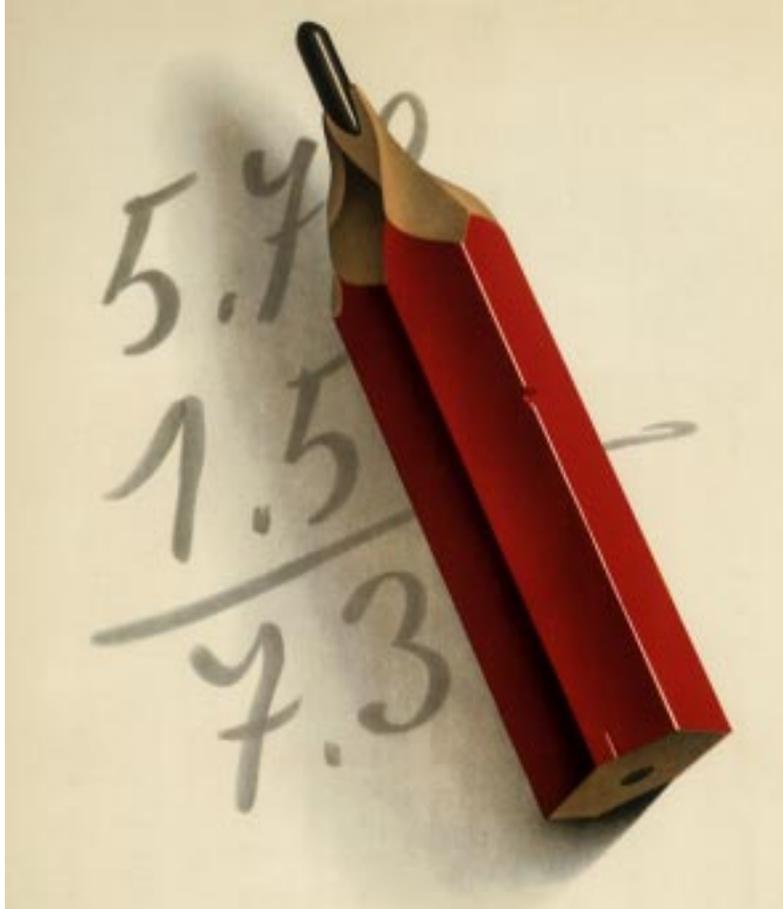
The fall in world grain carryover stocks in each of the last three years may mark the early stage of a transition from a buyer's market to a seller's market, one in which long-term grain prices are more likely to be rising than falling, and in which the politics of surplus, which have dominated the period since World War II, will be replaced by a politics of scarcity.

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ty. Instead of a few exporting countries competing for markets that were never quite large enough, more than a hundred importing countries will compete for supplies that never seem adequate. Already, 1995 witnessed the steepest rise in prices of wheat, rice and corn seen in many years.

Experience with world food scarcity in the last half century has been limited to a few years in the mid-1970s, after the Soviet Union secretly cornered the wheat market in 1972 and drove grain prices abruptly upward. The U.S. government, in an effort to keep domestic food prices from rising in response to the scarcity, imposed an export embargo on soybeans, a crop that supplies much of the world's cooking oil and a large share of the protein meal fed to livestock. Since the U.S. was supplying over half the world's soybean exports, the economic shock waves from this decision reverberated throughout the world.

It was during this time of relative grain scarcity that the use of food for political purposes became an international issue. The U.S. State Department was accused of maintaining a blacklist of countries that voted against U.S. interests in



the United Nations, and of putting blacklisted countries at the end of the line awaiting scarce food aid.

In the world of the late 1990s, many more countries will be seeking food supplies – some of them desperately – than will be in the market to sell. Even now, only a handful of countries consistently export grain on a meaningful scale: Argentina, Australia, Canada, France, Thailand, and the United States. Current world grain exports add up to roughly 200 million tons per year, of which the United States accounts for close to one-half. That puts great power in the hands of one government; and the possibility that food could be used for political purposes may be of a growing concern to a majority of countries.

## The Shrinking Land

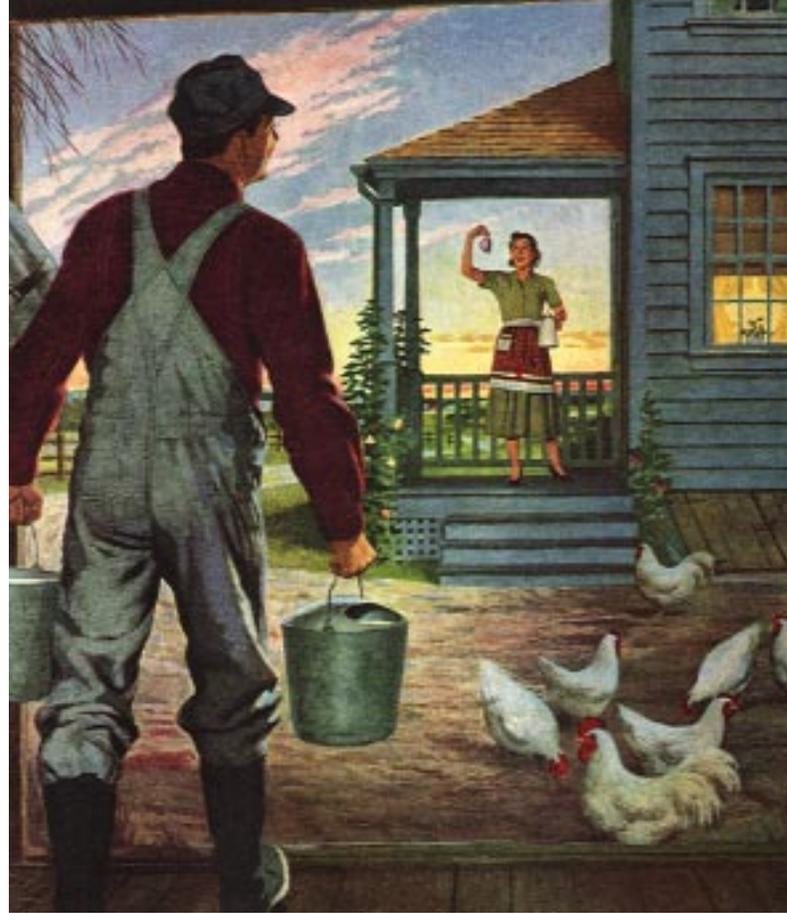
Food cannot be grown just anywhere: it can't be grown in places where the land is too cold, too dry, too steep, or too barren. It also can't be grown where there is no water or where the soil has been degraded by erosion. Of the land that is still free of all these constraints, nearly all is already in

cultivation. Moreover, some of the most arable land is slowly losing its productivity.

In the former Soviet Union, the harvested grain area has shrunk from its peak of 123 million hectares in 1977 to 94 million in 1994. In the United States, the Conservation Reserve Program established in 1985 retired much of the highly arable land that was plowed in the late 1970s, paying farmers to return it to grass before it became wasteland.

Other more densely populated countries are losing prime cropland to non-farm uses. As Asia industrializes, the construction of thousands of factories, roads, parking lots, and new cities is wiping once-productive crop land off the map. Japan, South Korea and Taiwan, the Asian countries that industrialized first and can serve as models of what may happen elsewhere, have collectively lost about 40 percent of the grain harvested area they had in 1960. Each year, Indonesia is losing an estimated 20,000 hectares of cropland on Java alone, which is enough to supply rice for 360,000 people, even as it adds 3 million people per year.

This global trend is epitomized perhaps by how quickly



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Vietnam, now a rice exporter, managed to break its own vow not to let industrialization undermine essential food production. In the spring of 1995, Vietnamese Prime Minister Vo Van Kiet established a ban on building factories in rice paddies. Just four months later, he changed his mind in order to allow Ford Motor Company and other firms to build on 6,310 hectares of farmland near Hanoi.

### **The Dehydration of the Planet**

This year a group of scientists at Stanford University in California looked at the global balance sheet and discovered something alarming: Humanity which has increased from one billion to almost 6 billion in 200 years may soon be running out of water. The Stanford team found that humans and their crops, farm animals and forestry plantations were already using one fourth of all the water taken up by plants. The other 10 million or more species on the planet had to share what was left.

As agriculture pushes crop yields to the limit, water tables in major food-producing countries are dangerously low. In India, water tables are falling in several states includ-

ing the Punjab, the country's breadbasket. Here, groundwater pumping exceeds recharge by one third and water tables are dropping nearly 1 meter per year. In China, the water table around Beijing has dropped from 15 feet below ground level in 1950 to more than 150 feet below today. Non-renewable aquifers such as the great Ogallala Aquifer in the U.S. are taxed to the limit; the Ogallala is already largely depleted in its more shallow southern reaches.

If groundwater levels are falling consistently around the world, it becomes a question of some urgency whether the difference can be made up with surface water. The planet's great rivers, after all, are perpetually renewing. Yet here, too, there are signs of trouble. In more populated regions, rivers have been tapped, diverted and dammed until often there is little water left to continue on its way. In fact, many rivers now run dry before they reach the ocean. In 1995, China's great Yellow River completely disappeared some 620 kilometers from its mouth on the Yellow Sea. On the opposite side of the globe, the Colorado River was disappearing into the Arizona desert; since 1993 it has rarely reached the Gulf of California. In central Asia, the Amu Darya is drained dry

by Turkmen and Uzbek cotton farmers well before it reaches the Aral Sea.

The pollution of our remaining water supplies through urban, industrial and livestock runoff adds a further threat. Humans can no longer regard water as available on tap: as scientists are repeatedly pointing out, it is one natural resource for which there is no substitute.

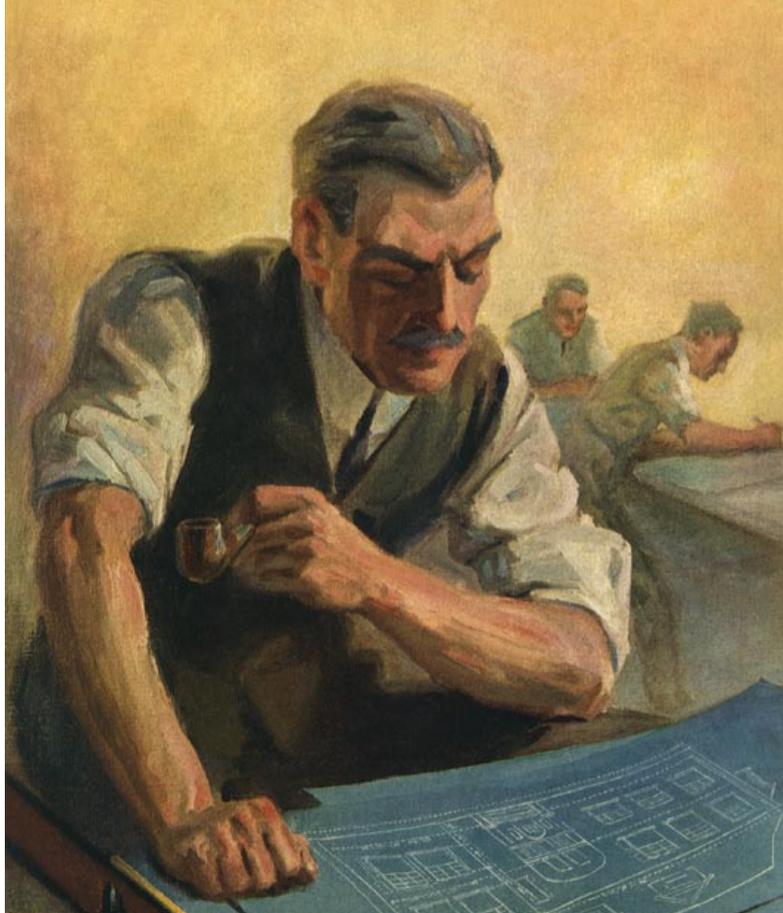
## Will Science Save the Day?

Technological advances have steadily enhanced our capacity to raise living standards. They not only helped boost food production, they also increased our access to sources of water, energy, timber, and minerals. In many ways, however, technology has proved to be a double edged sword. Take, for example, the chlorofluorocarbons that at first appeared to be ideal chemicals for so many different uses. It turned out that once they reached the upper atmosphere they began destroying the ozone layer, thus threatening life on the planet.

Likewise, the irrigation, agricultural chemicals and high-yielding crop varieties that made the Green Revolution possible also depleted and contaminated water supplies, poisoned wildlife and people, and encouraged monoculture cropping that reduced agricultural diversity. New genetically-engineered seed strains carry the high price of being susceptible to pests and diseases more than ever before.

Millions of acres of cropland are planted every summer with endless snaking rows of corn plants that are nearly alike as identical twins. If one of those plants is vulnerable to a new strain of disease, they all are. This threat nearly became a reality in 1993 with a wildly successful corn variety known as Pioneer 3394, produced by Pioneer Hi-Bred International Inc. in Des Moines. It was the largest-selling variety of corn in the world, by far. As it happened, Pioneer 3394 and many of its relatives were highly sensitive to a disease called gray leaf spot, and conditions were right for gray leaf spot to become an epidemic. That's precisely what happened. The disease marched across cornfields in Missouri, Iowa, Illinois, and Indiana. In some areas, every cornfield was affected, although the extent of crop losses isn't yet known.

As a society, we have failed to discriminate between technologies that meet our needs in a sustainable way and those that harm the earth. We have let the market largely dictate what technologies move forward, without adjusting for its failure to take proper account of environmental damage.



## Carrying Capacity

As world population threatens to grow far beyond the planet's crop yields to sustain it, the central issue to be addressed is: How many people can the earth support and, even more crucially: *At what level of consumption?*

Grain use per person measures both the amount of grain consumed directly, which accounts for half of human caloric intake, and the amount consumed indirectly in the form of livestock products, which accounts for a large share of the remainder. Canada has the dubious distinction of topping the list of affluent countries in per capita grain consumption at a whopping 974 kilograms per person. The U.S. follows at 860 kilograms per person. Low-income, largely vegetarian societies such as India consume only 186 kilograms per person. If the current world grain harvest, averaging 1.75 billion tons thus far during the 1990s, were boosted by roughly 15 percent to 2 billion tons, that harvest if equitably distributed could support 2.5 billion people at the American level of consumption, 5 billion at the Italian level, or 10 billion at the Indian level.

These numbers point to a looming gap between the projected growth of world population to 10 - 14 billion, and the strains on both oceanic and land-based food production imposed by the current population of 5.7 billion — most of whom would like to eat higher up the food chain. This gap



underscores the need for governments to assess their national carrying capacities so that they and the people they serve can understand the difficult choices that lie ahead.

Now that the global fish catch has leveled off, we have a good sense of just how much food the oceans can sustainably provide. We are also beginning to develop a clearer sense of what can reasonably be expected from the land. Barring any new technologies that could lead to quantum jumps in food production, the way the discovery of fertilizer did, there is no possibility that the entire world can adopt the American diet. Indeed, for the first time in history, humanity is facing the prospect of a steady decline in both seafood and grain consumption per person for as far as we can see into the future.

## Global Solutions

While the future looks bleak at worst, and challenging at best, there are many ways individuals and their country's governments can help to turn the tide. Firstly, awareness of the issues and honesty about the underlying causes is essential. As long as the first world desire for affluence and consumption is held as a global model for growth, there is little hope. Already many individuals in the west are seeking to limit their consumption through simpler lifestyles and making the transition to a plant-based diet. The Worldwatch Institute outlines several key solutions to our global crisis:

**Allow market prices to lower per capita grain consumption.** When grain prices doubled in the 1970s, Americans lowered their consumption of meat, milk and eggs enough to reduce grain feeding by 46 million tons, which would cover 20 months of world population growth. The disadvantage of this approach is that prices that are high enough to move the affluent down the food chain can inflict severe suffering on the poor.

**Educate people about the health risks associated with excessive consumption of fat-rich livestock products.** The healthiest people are not those living

at the top of the food chain.

Perhaps the most effective and efficient technique is a tax on livestock products, one not unlike that applied by most governments to alcoholic beverages, another grain-based product. If the world's affluent could reduce their consumption of grain-fed livestock products by 10%, they could free up 64 million tons of grain for direct human consumption. This would cover world population growth for another 26 months. A 20% reduction would buy more than four years. And the health benefits would greatly lower health care costs.

Convert the land used to produce tobacco into the production of food. If the 5 million hectares of cropland now used to grow tobacco were turned over to growing grain, it would not only provide enough grain to support world population for six months, but it would also reduce mortality rates and sharply lower health care costs.

Design a world action plan to stabilize soils, recognizing that every ton of topsoil lost to erosion today diminishes the food supply for the next generation.

Individuals in wealthier countries can help lighten humanity's load by voluntarily reducing their personal levels of consumption. ■

