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Ultimately, food supply defines carrying capacity

The term "carrying capacity" describes the number of individuals that a habitat can sustain over an indefinite period and is defined by limiting factors in the environment. For example, the number of owls in a forest may be limited by the number of mice and other rodents available for food.

Determining the Earth's carrying capacity for modern humans appears to be more complicated. As consumers of massive amounts of natural resources for items other than food, we tend to look at energy, minerals and wood as potential limiting factors on population growth and consumption. But like owls, food ultimately defines the top end for human population growth.

In a new book, "Full House," researchers at Worldwatch Institute point out that though food production has kept pace with dramatic population growth in the past 50 to 100 years, growth now is beginning to outstrip food supplies.

"Between 1950 and 1994, world grain production expanded 2.6 fold, outstripping population growth by a wide margin and raising the grain harvested per person by 40 percent," they wrote. "But in recent years, these trends suddenly have been reversed. After expanding at 3 percent a year from 1950 to 1984, the growth in grain production has slowed abruptly, rising at scarcely 1 percent annually from 1984 until 1993. As a result, grain production per person fell 12 percent during this time."

The authors cite many reasons for the loss of momentum in food production. In the 1950s, for example, there were many technological improvements to agriculture that had yet to be implemented on a large scale. As agricultural technology spread, global food production rose. But as the use of new technology and improved plant varieties have become common throughout the world, food production has leveled off. New agricultural methods cause only slight increases in productivity.

The growth in productivity of world fisheries and rangelands also has decreased, mainly because they are being used at or beyond their sustainable capacity.

The "Full House" authors note that few people recognize the threat industrialization poses to future productivity. As densely populated countries industrialize, cropland is used for cities, suburbs, factories and roads.

"The experience in Japan, South Korea and Taiwan gives a sense of what to expect," they wrote. "The conversion of grassland to non-farm uses and to high-value specialty crops has cost Japan 52 percent of its grainland, South Korea 42 percent and Taiwan 35 percent."

"As the loss of land proceeded, it began to override the rise in land productivity, leading to declines in production. From its peak, Japan's grain production has dropped 33 percent, South Korea's has fallen 31 percent and Taiwan's 19 percent. These declines occurred at a time when population growth and rapidly rising incomes were driving up the demand for grain. The result is that by 1993 Japan was importing 77 percent of its grain, South Korea was bringing in 68 percent, and Taiwan, 74 percent."

As other countries industrialize, there is a potential for a dramatic decrease in world food supply. Industrialization of India and China, already with huge populations, could take enough land out of production to cause large-scale shortages and famine.

With food supply reaching its maximum and population growth continuing to occur, our options are limited. If we fail to reverse the trend, food prices eventually will rise and, in turn, boost pressure to overharvest fisheries and to overwork rangeland and farmland. This would reduce the long-term ability of both land and water to produce food.

Population growth will catch up with us. Unless we voluntarily limit our numbers and ensure a sustainable food supply, nature inevitably will lead us to zero population growth by starvation.

If you have a suggestion for a column, a gripe, a success story or whatever, write it down and send it to me, care of the Columbia Daily Tribune, PO Box 798, Columbia, Mo., 65205.