

## 1) GIGADEATH

by David Pimentel

BALTIMORE (Feb 9, 1996)—If humans can't control the explosive population growth in the coming century, disease and starvation will do it, Cornell University ecologists have concluded from an analysis of Earth's dwindling resources.

A grim future—without enough arable land, water and energy to grow food for 12 billion people—is all but inevitable and all too soon, a worried David Pimentel today (Feb. 9) told an American Association for the Advancement of Science (AAAS) session on "How Many People Can the Earth Support?" "Environmentally sound agricultural technologies will not be sufficient to ensure adequate food supplies for future generations unless the growth of human population is simultaneously curtailed," the Cornell professor of ecology said, speaking for researchers who produced the report, "Impact of Population Growth on Food Supplies and Environment."

The "optimum population" that the Earth can support with a comfortable standard of living is less than 2 billion, including fewer than 200 million people in the United States, the Cornell scientist noted. But if the world population reaches 12 billion, as it is predicted to in 50 years, as many as 3 billion people will be malnourished and vulnerable to disease, the Cornell analysis of resources determined. The planet's agricultural future—with declining productivity of cropland—can be seen in China today, Pimentel suggested.

China now has only 0.08 hectare (ha) of cropland per capita, compared to the worldwide average of 0.27 ha per capita and the 0.5 ha per capita considered minimal for the diverse diet currently available to residents of the United States and Europe. Nearly one-third of the world's cropland has been abandoned during the past 40 years because erosion makes it unproductive, he said.

Competition for dwindling supplies of clean water is intensifying, too, the Cornell ecologists concluded. Agricultural production consumes more fresh water than any other human activity—about 87 percent—and 40 percent of the world's people live in regions that directly compete for water that is being consumed faster than it is replenished. Further, water shortages exacerbate disease problems, the ecologists' analysis pointed out. About 90 percent of the diseases in developing countries result from a lack of clean water. Worldwide, about 4 billion cases of disease are contracted from water each year and approximately 6 million people die from water-borne disease, Pimentel said. "When people are sick with diarrhea, malaria or other

serious disease, anywhere from 5 to 20 percent of their food intake is lost to stress of the disease," he said.

Prices of fossil fuels will rise as the world's supplies are depleted. While the United States can afford to import more petroleum when its reserves are exhausted in the next 15 to 20 years, developing countries cannot, Pimentel said. "Already, the high price of imported fossil fuel makes it difficult, if not impossible, for poor farmers to power irrigation and provide for fertilizers and pesticides," he said. The analysis was conducted by Pimentel, professor of entomology and of ecology in the College of Agriculture and Life Sciences at Cornell; Xuewen Huang, a visiting scholar in the agriculture college; Ana Cordova, a graduate student in the agriculture college; and Marcia Pimentel, a researcher in Cornell's Division of Nutritional Sciences.

The ecologists pointed to two alarming trends: At the same time that world population is growing geometrically, the per capita availability of grains, which make up 80 percent of the world's food, has been declining for the past 15 years. Food exports from the few countries that now have resources to produce surpluses will cease when every morsel is needed to feed their growing populations, the ecologists predicted. That will cause economic discomfort for the United States, which counts on food exports to help its balance of payments. But the real pain will wrack nations that can't grow enough, Pimentel said. "When global biological and physical limits to domestic food production are reached, food importation will no longer be a viable option for any country," he said. "At that point, food importation for the rich can only be sustained by starvation of the powerless poor."

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