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Global Warming Famine — or Feast?

by Dennis T. Avery and H. Sterling Burnett

For over 30 years, Lester Brown, a MacArthur Foundation "genius award" winner and president of the Earth Policy Institute, has warned that human activities threaten agricultural productivity and human well-being. Brown and other environmental lobbyists argue that continuing human-caused global warming poses a significant threat of world famine. They say hotter temperatures will cause crops to wither on the vine and increase the evaporation rate of moisture from the soil.

The available evidence undermines Brown's claims. Indeed, a warmer planet has beneficial effects on food production. It results in longer growing seasons — more sunshine and rainfall — while summertime high temperatures change little. And a warmer planet means milder winters and fewer crop-killing frosts.

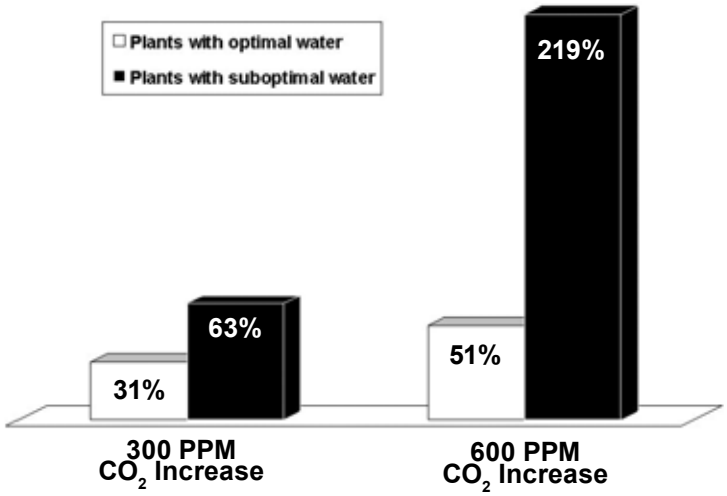
Global warming also increases carbon dioxide (CO_2), which acts like fertilizer for plants. As the planet warms, oceans naturally release huge tonnages of additional CO_2. (Cold water can hold much more of a gas than warmer water.) Since 1950, in a period of global warming, these factors have helped the world's grain production soar from 700 million to more than 2 billion tons last year.

Climate History. The Earth's climate is less stormy and more stable during warming periods. Warming heats the polar regions more than the equatorial, reducing temperature differences. This diminishes the power of storms.

Only in the past 20 years have scientists begun to understand that the Earth has a persistent 1,500-year climate cycle that creates these warming and cooling trends. The first Greenland ice cores brought up in 1984 provided 250,000 years of climate history. Evidence of the 1,500-year climate cycle has since been found in Antarctic glaciers, in the seabed sediments of four oceans, in ancient tree rings, and in cave stalagmites on all the continents and New Zealand.

At the latitudes of New York and Paris, temperatures during warming periods rise about 2 degrees Celsius above the mean for 500 to 750 years. Then they fall abruptly about 2 degrees below the mean for a similar period. Thus, the Earth's climate is always warming or cooling. Sunspot records and the isotopes of carbon, oxygen and beryllium trapped in ice cores and cave stalagmites indicate that this process is driven by a small cycle in the sun's radiance.

Relative Plant Growth Under Increased CO_2 Conditions



Source: Sherwood Idso, *CO_2 and The Biosphere: The Incredible Legacy of the Industrial Revolution* (St. Paul: University of Minnesota Department of Soil, Safety and Climate, 1995).

Climate and Agriculture. The present warming trend has not resulted in agricultural water shortages. Indeed, rainfall is currently increasing moderately over most of the world because global warming evaporates more water from the oceans, where it falls back to earth in a reinvigorated hydrological cycle.

Infrared satellite readings show that the Earth has been getting greener since 1982, thanks apparently to increased rainfall and CO_2. Worldwide, vegetative activity generally increased by 6.17 percent between 1982 and 1999 — despite extended cloudiness due to the 1991 eruption of Mount Pinatubo and other well-publicized environmental stresses.

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Continued warming should increase rainfall, rather than reduce it. And even if some areas do experience greater aridity under warmer conditions, both nature and humans have been through it many times before. Modern transportation helps avoid food shortages.

Higher CO_2 Levels. Whether as a natural reaction to warming in the early part of the 20th century, or the result of human activities — including energy use and tropical forest conversion — the amount of CO_2 in the atmosphere has increased by more than 30 percent during the past half-century. CO_2 is a critical component of photosynthesis, the process by which plants use sunlight to create carbohydrates — the material that makes up their root and body structures. Increasing CO_2 levels both speeds the growth of plants and improves the efficiency of their water use. More CO_2 also decreases water loss in plants, which is beneficial in arid climates or during droughts.

Botanists have long realized that CO_2 enhances plant growth, which is why greenhouse owners pump large volumes of CO_2 into their sheds — to grow more tomatoes or carnations. This was confirmed by 55 experiments conducted by research scientist Sherwood Idso, formerly of the U.S. Department of Agriculture. For example:

- Increasing CO_2 by 300 parts per million (ppm) above the current atmospheric level of more than 370 ppm enhanced plant growth by 31 percent under optimal water conditions, and 63 percent under water scarcity. [See the figure.]
- With a 600 ppm CO_2 increase, plant growth was enhanced 51 percent under optimal water conditions and an astonishing 219 percent under conditions of water shortage.

CO_2 enrichment also causes plants to develop more extensive root systems, with important results: 1) Larger root systems allow plants to reach additional pockets of both water and nutrients in the soil, reducing the metabolic energy required to capture vital nutrients. 2) More extensive, active roots also stimulate and enhance the activity of bacteria and other organisms in the soil that are beneficial to plants. When dinosaurs walked the Earth (about 70 to 130 million years ago), there was from five to 10 times more CO_2 in the atmosphere than today. The resulting abundant plant life allowed the huge creatures to thrive. Since many of today's plants evolved when CO_2 levels were much higher, some scientists fear today's plants are literally starving from CO_2 deprivation.

Based on nearly 800 scientific observations around the world, a doubling of CO_2 from present levels would improve plant productivity on average by 32 percent across species. Controlled experiments have shown that:

- Under elevated CO_2 levels, average yields of cereal grains — including rice, wheat, barley, oats and rye — are 25 percent to 64 percent higher.
- Tubers and root crops, including potatoes, yams and cassava, yield 18 to 75 percent more.
- And yields of legumes, including peas, beans and soybeans, increase 28 to 46 percent.

Humans can help nature along. Recently, Egypt genetically engineered a drought-tolerant wheat plant — containing a gene from the barley plant — that needs to be irrigated only once, rather than eight times per season. The new wheat is expected to dramatically increase food production in semi-arid climates.

Conclusion. The real "famine test" for humanity's farming systems will not come during the Modern Warming. It will come during the next full Ice Age, when huge sheets of ice a mile thick will once again cover Canada and Russia, and the Northern Plains will be too cold to farm. Then, humanity and most of the planet's wildlife will converge on the relatively small usable land area nearer the equator, and in denser numbers than the planet has ever known.

Fortunately, that test may not come for another 10,000 years. By then, unless regulations interfere, the world should have genetically engineered a set of even higher-yielding and still more stress-tolerant crop varieties to feed humanity from less and less land.

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