The Omens of Famine

Climate changes and energy shortages conspire to renew threats of the ancient scourge

by John H. Douglas

The first article of a two-part series on the growing threat of worldwide food shortages and famine. This week, Science and Society Editor John H. Douglas examines how changes in the terrestrial and economic climates have conspired to threaten millions of the world's poor with starvation, especially in Asia, where he has worked and traveled for several years. Next week, he explores the emergency measures being considered to forestall a crisis and the scientific progress being made toward finding long-term solutions.

Like cancer, starvation seldom kills its victims directly. Rather, it weakens the whole fabric of life until the frailest part gives, then the rest disintegrates. For an individual, the end usually comes by disease; for a society, by anarchy. Famine, like cancer, is easiest stopped before it spreads, and now danger signals from many areas of the world have become unmistakable.

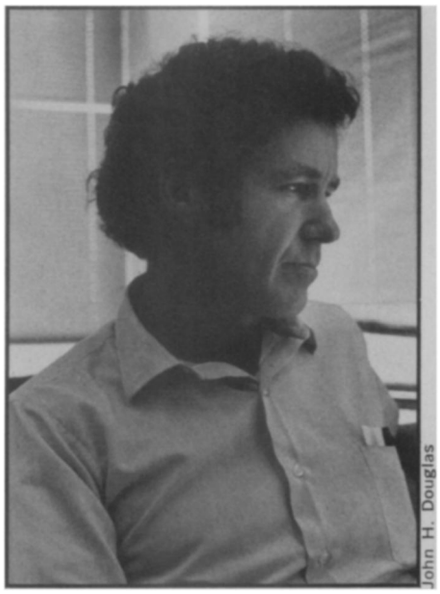
A walk down any thoroughfare in Asia—whether on a worn village path or beside one of the many new highways—is not likely to reveal an overwhelming presence of starvation. Mechanization and the brimming productivity of "Green Revolution" crop hybrids have allowed developing countries to increase their food productivity by almost a third during the last decade, enough to offset population growth and slightly raise per capita consumption. One may still see families living under overturned wrecks beside a road in India, but even that hard-pressed country had hoped for self-sufficiency in grain, until recently.

Then the rains failed. On the other side of the world, half the wheat crop of the world's largest producer went to a nation able to pay a much higher price, the Soviet Union. Finally came another Middle Eastern war, and though siding with the Arabs, India's oil supplies dropped and prices rose like everybody else's. The foundations of development had proven extremely fragile.

That inherent fragility is what a walk down any thoroughfare in Asia does reveal: A few rich living among many poor, the two-thirds of the world's population that must scrap for a quarter of its protein; a few tractors, which, without fuel, cannot harvest the Green Revolution crops that depend on them; most important, only a few domestic sources of fertilizer, a petroleum product without which the new, productive grain hybrids cannot grow.

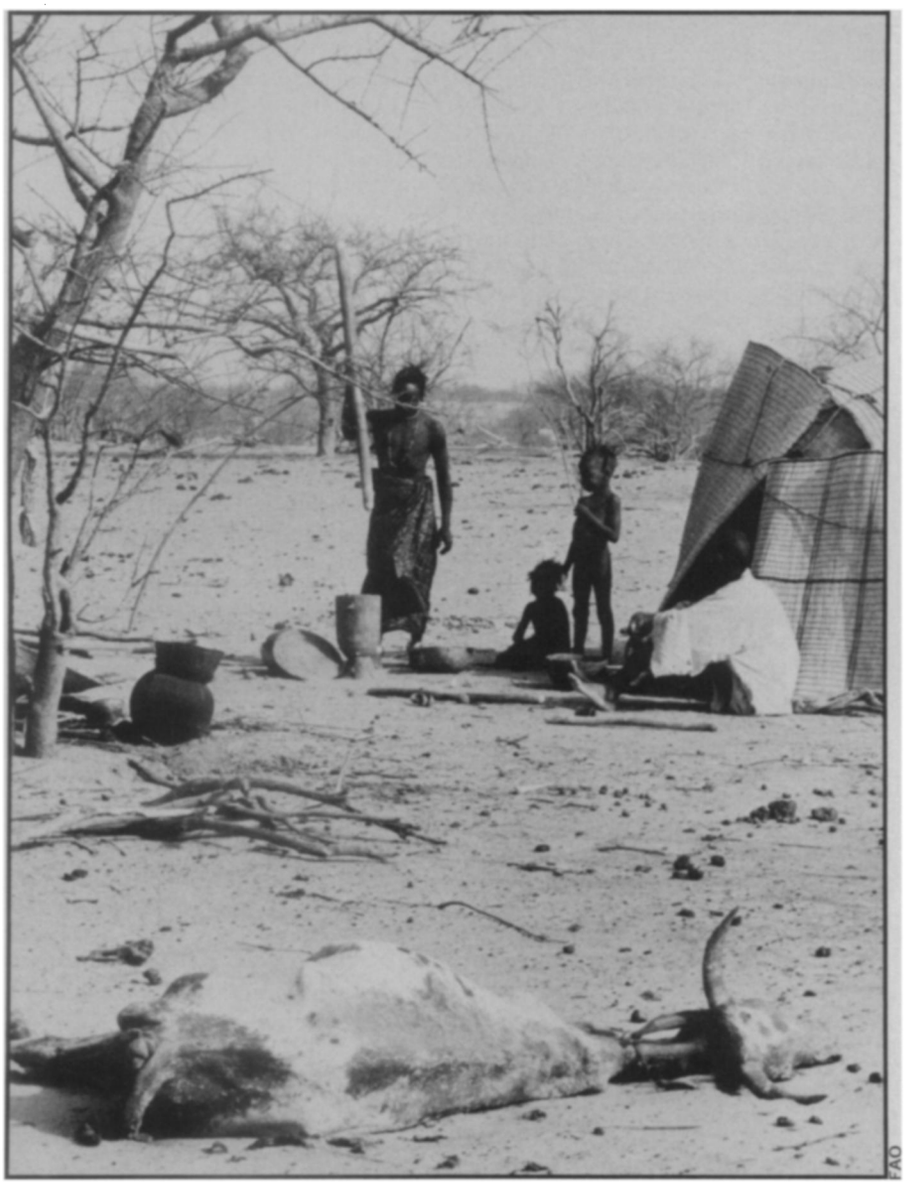
Development has brought dependence. Machinery, petroleum and fertilizer are, for most developing countries, import items. The economies of many small countries are narrowly based on some abundant local commodity, such as rubber or gold, and when population pressures outstrip the land's capacity for growing crops, limited foreign exchange capability must be used to buy food. Whereas before World War II Western Europe was the only grain deficit region on earth, now only North America and Australia remain as net grain exporters. The United States and Canada together have a greater stranglehold on the world's food exports than the Arabs have on petroleum.

That dominance developed gradually, the result of the same forces that have recently increased production in developing countries—mechanization, fertilizer and prolific hybrids. In the wave of development since the end of World War II, the United States has come to produce half the world's corn and two-thirds of its soybeans. Most of this increase was accomplished by raising productivity. Per acre corn production, for example, has grown 240 percent while the labor required has dropped 60 percent. Mechanization

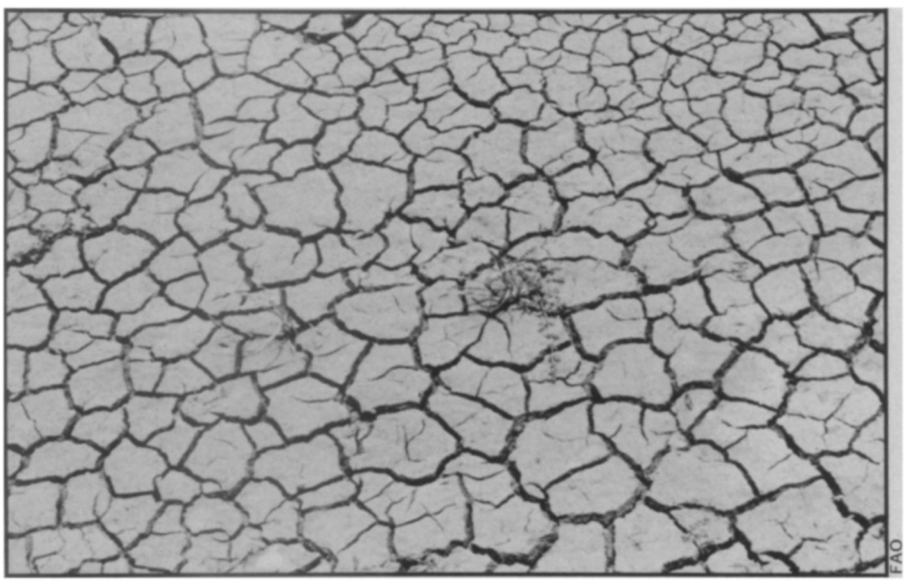


Brown: Must we "cut Asia adrift?"

The faces of famine: Women in the Sahel wait hours for handouts of grain.



The Christine Wells, Upper Volta. A nomadic family prepares to eat its last remaining grain after fruitlessly driving its cattle herd here in search of water.



As an apparent global cooling trend shrinks the equatorial belt of monsoon rains, drought threatens several of the world's most populous regions, including India.

and increased use of fertilizers, of course, made farming more energy intensive, so that now roughly 80 gallons of gasoline are required directly to raise an acre of corn, with about twice that much energy involved in making the fertilizer and transporting and processing the various products off the farm.

At first, the increased productivity led to embarrassing surpluses—butter stored in Kentucky caves, millions of tons of grain left to rot in silos around the country, farmers paid for not raising crops on as much as one-seventh of the nation's farmland. Since prospective consumers in developing countries could not afford to pay American prices for the surpluses, a "Food for Peace" program was launched to sell the extra food for whatever commodities, local currency or political advantage could be traded in return. The American agricultural glut became a buffer, providing a measure of price and nutrition stability for the developing "Third World."

The surpluses would have ended even without bad weather and the energy crisis, though these events have precipitated the demise. "Food for Peace" assumed the absence of any viable market for the surplus goods, but now one has arisen: The world's poor must compete with the rising affluence of the world's rich. Food consumption does not increase linearly with wealth. On the contrary, as income rises, people eat less grain directly and begin to eat more meat, which requires as much as seven times the grain, as feed, to put an equivalent amount of protein on the table. Just at a time when the United States faced a humiliating dollar devaluation and rising balance of payments deficit, agricultural exports suddenly doubled, becoming the most important single item in the country's international trade picture. A bad harvest in Siberia led to the largest single agricultural sale in history, depleting the remaining U.S. stored grain reserves. Suddenly surpluses became too valuable to give away.

With malevolent coincidence, the world's climate almost simultaneously began to change (SN: 9/29/73, p. 197). The desert-creating high-pressure areas that lie between the monsoon rains to the south and the cold circumpolar winds to the north began to migrate toward the equator, bringing drought to regions of Africa, China, South Asia, India and Central America. Climatology is a young and inexact science, but the few specialists willing to speak up on the subject say the recent changes are the apparent result of a global cooling trend that has lowered the earth's temperature 2.7 degrees F. since 1945. The best evi-

Off the Beat

Tangerine physics, or the textbook is a frictionless puck

It was about four o'clock Easter Sunday morning. We had all been through two strenuous hours in church and since coming to the party had imbibed rather much champagne. The conversation had skidded from liturgics to sex to analytic geometry when, apropos of an argument over free-standing altars, someone popped the question: "Where do you find a frictionless ladder?"

"'Answer is obvious,'" I replied, quoting a Chinese physics professor of my long departed youth, "in the second chapter of any elementary physics text. Nowhere else in the universe will you find a frictionless ladder."

Such is the world of the physics textbook. It is a place where friction can be turned off at will, where freely falling bodies freely fall. There is an answer to every problem written out in advance in the teacher's edition. The textbook has mathematics for every problem, and it will tell you what mathematics to apply to what problem, but it is often coy about why. It is nice to know that $S = \frac{1}{2}gt^2$, and that it applies to falling bodies provided there is no air resistance, no electrical charges or electromagnetic forces, no baryonic charges or strong-interaction forces at work on the things. But why $S = \frac{1}{2}gt^2$? Because it's in the middle of the big red box on page 45.

Obviously, as any literary student will tell you, the real world is not like this. Perhaps one reason literary types are turned off by physics is that they like to take life whole, as in a novel, and object to having it pared, julienned and coated with the ever handy frictionless lubricant.

Obviously, too, real physicists don't work that way. Those guys out there in the multimillion-dollar government labs were dealing with the real physics of the real world. They were not climbing around on frictionless ladders.

Therefore we concluded that there was an *Urprinzip*, a way to know how to solve unsolved problems, that would be communicated to us in due time. We tended to fantasize it happening on the night before we got our Ph.D.'s in a ceremony rather like the accolade of knighthood.

Meanwhile we were being drilled. It was rather like parade-ground drill in the army, which has little if any connection to what soldiers do in combat but which continues because it keeps drill sergeants in work.

We accepted the drill. We were docile students—this was before Berkeley got into the news. Solving physics problems was only faintly more absurd than conjugating irregular French verbs or composing *temps surcomposés* (ask your friendly neighborhood French grammarian what those are), and the world of the textbook fit our expectations. We had been brainwashed. I remember an elementary-school teacher who prophesied every other day that "Arithmetic is an exact science." (There ain't no such thing as an exact science, lady, but that's getting ahead of the story.) And there was another, a gentleman with a slightly Pennsylvanian cast of speech, who kept admonishing us to "folly the book." Folly the book we did. We drilled and waited for *Der Tag*.

Der Tag never came. When I grew older and was professionally licensed to ask of physicists the irreverent questions that students interested in grades never do, I discovered that there is no *Urprinzip*. A real physicist in the real world confronted by an unsolved problem tries something and sees if it fits. He uses a suggestion from previous work, a hunch, an inspired guess (attributed to angels or demons according to his religious persuasion). Or he goes by an unpredictable and totally individual catena of mental connections: from the Eightfold Way of Buddhist philosophy to the eight-member group of Sophus Lie to a theory of the structure of elementary particles. There is no big red box in the sky.

In short, real physics is done by all the arts, crafts and pyrotechnics that make the human mind such a fascinating instrument. It should be one of our most compelling subjects of study, but meanwhile . . . back in the textbooks . . . they are playing hockey with frictionless pucks.

—Dietrick E. Thomsen

Famine . . .

dence from ice and sediment records indicates that weather over the last half century has been the warmest in 1,000 years and that a cycle of colder temperatures can be expected. The effect would be a major shift of rain patterns and deserts, and a shorter growing season for northern latitudes.

The sub-Sahara row of six countries, known collectively as the Sahel region, presents a grim test case of what may happen in more populous areas if droughts spread. There, for the first time in living memory, people walk across the Niger River. The fabled desert outpost of Timbuktu has required airlifts of food. A quarter-million people are estimated to have died from the resulting famine, and 80 percent of the livestock in one country have been killed. Every year that the drought continues, the Sahara desert moves relentlessly southward some 30 miles.

The Indian sub-continent may be next, according to Lester R. Brown, a senior fellow at the Overseas Development Council in Washington and an outspoken observer in matters of world food supplies. Even before the energy crisis hit, the world appeared to be at the "bust end of a cycle" in world fertilizer industry. Brown told SCIENCE NEWS, but now with massive fertilizer shortages, Asia may next year face "the largest food deficit of any area in history." If the monsoons should fail again, widespread famine would surely follow.

India appears most vulnerable. Even India's own National Council of Applied Economic Research admits: "Sometimes the very immensity of the problem numbs one's senses and impairs the capacity to deal with it." In some stores serving the poorest classes, rations were cut in half last year. Riots have already occurred in two states. Kerosene for cooking has risen beyond the price reach of many. Inflation gallops along at 25 percent a year, and half of India's total export earnings may have to go to buy oil. A Wall Street Journal article concluded "the next 12 months will make the past 12 look good."

China would be better off, except for the fertilizer problem. That country has, in many ways, worked an economic miracle, almost abolishing malnutrition without substantially raising per capita income. But much of China's foreign exchange goes for fertilizer; it is the world's largest importer, buying mostly from Japan, which has now been severely hit by the energy crisis. China is also the current number one U.S. wheat customer, even in good weather. With an intricate irrigation system, China is better prepared to meet drought than India, but should fertilizer continue scarce, China too could face severe difficulty.

No one knows when the crunch will come, but Lester Brown says that within a year, leaders of the world's developed countries may be faced with the agonizing decision of whether to "cut Asia adrift" or ration food at home to feed starving millions abroad.

On any street in Asia one can smell the pungent aroma of the local, highly spiced cuisine. How hard to believe that too is so terribly fragile. □