

# Perspective



## Food for the Future — Subsistence or Surplus?

PAUL B. SEARS, Chairman, Yale University Conservation Program

**I**T IS UNFORTUNATE to have to admit that scientists themselves are divided on the question as to whether we can maintain an economy of plenty for the indefinite future. The division, however, is not a random one. Most geologists, biologists, and students of population are gravely concerned about the prospects. On the other hand we find a considerable group representing chiefly the exact and applied sciences, which assures us that such concern is needless and that our greatest resource is human resourcefulness itself, which will meet, by invention and development, any emergency that may arise. In view of the spectacular accomplishments of modern technology, this latter group commands considerable respect and has a following among economists and publicists.

Such differences of opinion are all to the good, providing they neither lead to hopelessness on the one hand or a fool's paradise on the other.

Briefly, the case of the geologists, biologists, and demographers is as follows:

(1) The space available, even on the largest continents, is limited, for human occupation and economic development has its limits, or is finite.

(2) World population, including our own, has increased and is increasing at a rate without precedent in the history of mankind.

(3) There is no warrant in biology for supposing that a finite physical base can support an indefinitely expanding population and economy, but there is an overwhelming lot of evidence that it cannot.

(4) The capacity of land to support life has always in the past rested upon a well-organized system of living cover which has regulated the movement of water, and use and re-use of soil minerals, and the storage of solar energy in the form of organic compounds.

(5) The net effect of most of our operations to date has been to disrupt this system and make it less efficient. Examples are many. Witness the flash floods and mudflows of the western foothills, following destruction of the vegetation.

(6) At the same time our landscape is becoming less efficient, our demands for its products are steadily increasing—surpluses of food to the contrary notwithstanding.

(7) While great increase in food and fiber production can result from putting our land under forced draft, it is a dangerous expedient. Robert Salter, while an agronomist with the Ohio Experiment Station, pointed out that in spite of all of our advances in knowledge, the per acre yield of Ohio farms was with difficulty being maintained. Later, when he was with the U. S. Department of Agriculture, he stated that the greatly increased yields due to hybrid corn were being obtained at the expense of soil fertility.

(8) That great increases in organic material can come from better land use and management on existing farms, more efficient use of marine and fresh waters, artificially controlled growth of algae, and even from the tropics, I do not question. All of these sources have a high theoretical efficiency. Yet every industrial designer knows the difference between the energy present in fuel and that available in work from the engine. Each and every one of these sources has its limits, while the capacity of population to increase apparently does not.

If satisfactory and economical methods can be worked out, it will mean an increasing dependence upon highly specialized technology. Every time that happens, our system becomes more vulnerable when pressures arise. Each complication is an added, not a diminished risk.

Biology has its laws no less than physics and chemistry, and land-use its limitations no less than engineering.

If we continue to exploit the land and disrupt the great cycles of water energy and nutrient minerals under conditions of increasing consumption and population, some genius with a slide rule may see how to maintain the American way of life. I do not.

*(Excerpts from an address before the Agricultural Luncheon, 42nd Annual Meeting, Chamber of Commerce of the U. S., April 27, 1954)*