FOOD is a primary necessity for man, yet like air and water most Americans have taken food for granted. For our generation of Americans, the food surpluses of the past two and one-half decades have been accepted as the norm. American housewives reacted to the recent high beef prices with outrage. Beef shortages were met with disbelief. “Boycott beef,” was the popular motto. Yet, beef prices are not high in comparison to the rest of the world; for instance, in September a boneless sirloin steak sold for $15.00 per pound in Tokyo supermarkets. We Americans forget that historically food shortages, high food prices, and even famines have been the rule rather than the exception. America’s abundant, low-cost food will probably never again be experienced. Since man left the Garden of Eden, food surpluses have been rare and malnutrition has afflicted mankind from the beginning. Possibly it existed in the Garden of Eden — because the inhabitants were not eating enough apples.

For over a million years, during most of man’s existence on this earth, food was procured by hunting and gathering. Plant and animal culture was unknown. Remnants of these Paleolithic societies exist today in a few remote areas of the world. Before the dawn of agriculture, the land’s carrying capacity was quite low; a maximum world population of about 7 million could be supported by hunting and gathering.

Some 10,000 years ago, as man entered the Neolithic Age, a system of slash and burn agriculture was developed, and gradually spread over most of the arable lands of the world. In sizeable areas of tropical forests, this system is still used today. Slash and burn agriculture requires about 40 ha of land/person with cereal crop yields averaging about 1,000 kg/ha. On the arable lands of the world, a population of not more than 35 million could be sustained with slash and burn agriculture.

The next agricultural advance was a crop-fallow rotation system which was developed with selected crops on the better soils of the world. It was the Medieval agriculture system. While crop yields remained at about 1.5 ha were required to support one person, although additional land was required to provide for livestock grazing. This system could support a maximum world population of nearly 1 billion.

In the late 1700’s, the new husbandry was brought into production. It was hailed as an agricultural revolution — a system of livestock agriculture. Cereal yields doubled to 2,000 kg/ha. About .75 ha of arable land supported one person, although additional land was required to provide for livestock agriculture. A world population of nearly 1 billion could be supported with the livestock agriculture system. This was the world population in 1930.

The next agricultural advance was based on scientific and industrial developments of the century; it was the system of agriculture with fertilizers. Average cereal yields doubled again to 4,000 kg/ha and 0.3 ha of arable land supported one person. Uniform distribution and western European diets, a world population of 4.2 billion could be sustained on today’s arable croplands with the agriculture system. Today’s world population, approaching 4 billion.

Since the disturbing prediction in 1824 by Malthus, for man and his food, agricultural technology has brought about geometric rather than arithmetical increase in crop yields from 100 kg/ha for the three agricultural systems. Should we use a useful yardstick, or should I say measure the level of agricultural development?

In addition, vast new agricultural lands have brought into production. The result has been an exponential increase in world food supply and a similar exponential increase in population. The increase in population is well known. World population has doubled four times in the last 2,000 years, three of these doublings have come in the last 100 years. The rapidity with which man can increase the carrying capacity of the earth is illustrated by a parable of the lily pad as told in the recent book, The Limits to Growth. It contained a single lily pad, the next day there were 2, and so on until the pond was completely filled by the 30th day.

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