

Research Department Federal Reserve Bank of San Francisco

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Food: The Future

Despite the problems it has created for harried housewives, the farm boom has brought untold prosperity to the farm community and its associated industries. Farm cash receipts, at a \$74-billion annual rate in the first half of 1973, were one-fourth higher than a year ago; net income per farm, at close to \$8,700, for the second straight year was running about 16 percent above the year-before level, even after adjustment for rising prices.

Farmers may rightly be skeptical about the continuation of such prosperity, since they have suffered too many boom-and-bust cycles over the past generation, with the inevitable overhang of surpluses creating heavy downward pressures on prices. This time may be different, however, as problems of a different sort emerge. The immensely productive American agricultural economy, despite its four-fold increase in output per man-hour since World War II, may be hard-pressed to keep up with the heavy demands generated by a rapidly growing and increasingly integrated international economy.

The nation's—and the world's—farmers must operate with necessarily limited resources to meet a demand for food that could actually accelerate as the world's people become more prosperous over time. In the past, farm economists questioned whether agricultural production could increase as rapidly as population, at between one percent and three percent annually, depending on country. (With a two-

percent population growth overall, merely maintaining current per capita consumption levels would require a doubling of world production within a single generation.) Today, pundits wonder whether food production, in addition, can keep up with rates of increase in per capita income of up to five percent a year.

Demand: affluent people

Economists have long argued that food spending declines relatively as income increases (Engel's Law). In view of changing diet patterns, however, this need not necessarily be true. Three square meals a day may be the physical limit for any person, but the quality of meals can be improved substantially. Thus, meat consumption tends to rise steadily as affluence increases. In South Asia, 7 pounds per capita annual consumption may be the rule, but in this country the total is about 200 pounds per capita, which suggests that total demand could rise stratospherically as other countries strive to reach the American standard.

Americans consume indirectly about 80 percent of their domestic grain supply, first using it for feed and then consuming the meat it produces. We eat slightly less grain directly for food than others do, but we absorb far more than others when both food and feed grains are considered together. Thus, each American consumes almost one ton of grain per year, while inhabitants of poorer countries consume approximately one-fifth as much.

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Growing affluence and growing population together affect world food demand, so that it tends to grow proportionately with GNP. More exactly, a combination of 3-percent population growth and 3-percent per capita income growth would typically produce a 5-percent increase in demand for food, according to a World Bank study. Many countries have increased their annual demand by that margin but have been unable to meet it from domestic supplies, and hence have relied increasingly on the American granary. Even before the recent export boom, farm economists had noted an 11-percent increase in import demand for each 10-percent rise in per capita income of importing countries.

Much of the recent increase in demand has come from the northern tier of industrial countries (Europe and Japan), whose dietary habits approach those of this country a generation ago. As incomes rise in these countries, which contain two-thirds of a billion people, a larger share of the additional income is converted into demand for livestock products. However, many of these countries—for example, land-short Japan and water-short Russia—do not have the resources to satisfy that demand, so that they are forced to import increasing amounts of livestock products or, alternatively, feed and soybeans with which to expand their livestock production.

Demand: nutrition

An important demand consideration

is the worldwide struggle to stave off malnutrition as well as actual starvation. Human diets must contain six basic kinds of nutrients: carbohydrates, proteins, fats, minerals, vitamins and water. An adequate daily diet must contain 1,400 calories or more, obtained from such sources of carbohydrates as wheat, rice and potatoes; but it must also contain 40 to 50 grams of protein, to provide the eight essential amino acids.

If the protein comes from animal rather than vegetable sources, the protein molecules are more similar to those of humans. In the digestive process, animal-based protein provides the ingredients in the proportion required to rebuild human protein. Vegetable-based protein fails in this regard, with cereal grains (for example) being deficient in certain essential amino acids. Thus, even if a person receives a sufficient quantity of proteins, their quality may be deficient, with the nutritious value of these proteins being reduced by a proportional shortage of one or more amino acids.

One solution to protein deficiency is to increase the meat consumption of the world's people. Still, if the developing countries were to even approach U.S. food-consumption standards, they would need a very substantial expansion of grain supplies. Meat consumption, desirable as it is for nutritional purposes, is an inefficient way of eating grain; in this country, it takes about six pounds of grain to raise one pound of meat, with the grain/meat ratio ranging between three pounds for

poultry to ten pounds for beef.

A simpler and quicker solution, which is possible with present technology, is the enrichment or fortification of existing foods by physically adding nutrients during the food-processing stage. Children eating a few slices of enriched bread thus will obtain the vitamin-mineral equivalent of a diet filled with fruits, vegetables and milk. Alternatively, some newly-developed foods should be useful; for example, Vita-Soy, a cola drink high in nutritional value, and Wheat-Soy Blend, a food with protein quality similar to ground beef or cheese.

Yet, despite the expectation of continued technological progress, warning signals are already evident in the crucial area of protein supply—specifically, soybeans, beef and fish. Soybean yields lag because of unresponsiveness to nitrogen fertilizer, cattle herds grow only slowly because of biological constraints, and many of the world's fisheries are being seriously depleted. The world protein market (like the energy market) thus appears to be shifting from a buyer's to a seller's market.

Supply: tightening

As demand climbs due to rising population and rising affluence, the world's farmers face several important constraints in their efforts to expand global food production. The traditional solution—increasing the area under cultivation—may have only a limited scope in the future. In fact, some parts of the world face a net reduction in farmland because

of the growth of competitive uses—recreation, transportation, industrial and residential development. For example, the city of San Jose has expanded within two decades from 17 to 136 square miles, covering some of the world's prime agricultural land with a vast expanse of freeways, housing tracts and shopping centers.

Even where arable land is available, water shortages may hamper production growth, since most of the rivers that lend themselves to damming and irrigation have already been developed. Future efforts to expand fresh-water supplies for farming focus on such costly techniques as desalting sea water, diverting rivers and manipulating rainfall patterns.

For several decades, the world has been fortunate to have two major food reserves: grain reserves in the principal exporting countries, and cropland idled under U.S. farm programs. In recent years, however, the need to draw down grain reserves and to utilize idled cropland has occurred with increasing frequency, with predictable results for world prices. The devalued American dollar has cushioned the impact for foreign buyers—and stimulated the U.S. export boom in the process—but the full force of these developments has been felt by American food buyers. A prolonged period of remarkably stable world prices for the principal food commodities (based on U.S. commodity support levels) has come to an end.

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BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT
(Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding 9/26/73	Change from 9/19/73	Change from year ago	
			Dollar	Percent
Loans adjusted and investments *	74,954	- 763	+ 9,907	+ 15.23
Loans adjusted—total*	58,125	- 760	+ 10,117	+ 21.07
Securities loans	1,144	- 874	- 793	- 40.94
Commercial and industrial	20,355	- 53	+ 3,370	+ 19.84
Real estate	17,482	+ 95	+ 3,092	+ 21.49
Consumer instalment	8,671	+ 22	+ 1,326	+ 18.05
U.S. Treasury securities	5,023	- 97	- 1,005	- 16.67
Other securities	11,806	+ 94	+ 795	+ 7.22
Deposits (less cash items)—total*	73,180	+ 241	+ 9,169	+ 14.32
Demand deposits adjusted	21,066	- 143	+ 1,310	+ 6.63
U.S. Government deposits	1,080	+ 367	- 117	- 9.77
Time deposits—total*	49,934	+ 142	+ 8,066	+ 19.27
Savings	17,467	+ 91	- 872	- 4.75
Other time I.P.C.	23,468	- 49	+ 7,046	+ 42.91
State and political subdivisions	5,970	+ 85	+ 841	+ 16.40
(Large negotiable CD's)	12,373	- 159	+ 6,568	+ 113.14
Weekly Averages of Daily Figures	Week ended 9/26/73	Week ended 9/19/73	Comparable year-ago period	
Member Bank Reserve Position				
Excess reserves	- 29	+ 33		23
Borrowings	264	86		88
Net free (+) / Net borrowed (-)	- 293	- 53		- 65
Federal Funds—Seven Large Banks				
Interbank Federal funds transactions				
Net purchases (+) / Net sales (-)	- 996	- 148		- 360
Transactions: U.S. securities dealers				
Net loans (+) / Net borrowings (-)	+ 150	+ 668		+ 367

*Includes items not shown separately.

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