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LETTERS OF TRANSMITTAL

NOVEMBER 30, 1961.

To the Members of the Joint Economic Committee:

Transmitted herewith for use of the Joint Economic Committee and other Members of the Congress are two study papers which have been prepared for the Subcommittee on Foreign Economic Policy.

One is titled "Agriculture's Role in the 1960 Decade"; the other is titled "Closing the World's Nutritional Gap." Both appear under a single title, "Food and People."

It is hoped that these papers will be especially useful to the members of the subcommittee and to other Members of Congress in their consideration and study of foreign economic policy.

WRIGHT PATMAN,
Chairman, Joint Economic Committee.

NOVEMBER 30, 1961.

Hon. WRIGHT PATMAN,
Chairman, Joint Economic Committee,
U.S. Congress, Washington, D.C.

DEAR MR. CHAIRMAN: Transmitted herewith are two study papers which have been prepared for the Subcommittee on Foreign Economic Policy in connection with its present investigation and study of this subject.

The first of these papers, in order of presentation, is titled "Agriculture's Role in the 1960 Decade" which has been prepared by Mr. Ralph McCabe of the Washington Center for Foreign Policy Research and School for Advanced International Studies, the Johns Hopkins University, with the assistance of Mr. Arthur L. Fern, previously with the Johns Hopkins Center and now with the U.S. Treasury Department.

The second paper, titled "Closing the World's Nutritional Gap" has been prepared by Dr. Louis H. Bean, an economic consultant practicing in Washington, D.C. Dr. Bean has held a number of high posts in the Government, mostly in the field of agricultural economics. He was economic adviser to the Secretary of Agriculture in the years 1933–40 and again in the years 1947–53, and has more recently been a consultant to the Director of the Food for Peace Program.

I believe that these study papers will be extremely helpful to our subcommittee in its present review of all major aspects of our foreign economic policy.

Sincerely,

HALE BOGGS,
Chairman, Subcommittee on Foreign Economic Policy.

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AGRICULTURE'S ROLE IN THE 1960 DECADE

FOREWORD

In adjusting foreign economic policy to the rapidly changing world of the 1960's, the United States faces major challenges. The intensifying cold war has turned into an engagement of indefinite duration in which the independence of the less developed countries and the survival of Western civilization are stakes. The challenge of "competitive coexistence" is directed to the entire community of Western nations—the free West European countries, Canada, Japan, Australia, New Zealand and the United States.

By no means the least of these challenges is the outlook for continued hunger and malnutrition in many of the less developed countries. Despite efforts to increase agricultural production, in many of these countries the population is growing faster than food supplies. Social conflict, already endemic in some areas, may sharply increase as the struggle over dwindling supplies of food rises. The Communists, who thrive on disorder and subversion, will undoubtedly assume the responsibility for organizing the conflict whenever it arises.

The inadequacy of food production in the Sino-Soviet bloc as a whole precludes any substantial assistance from that area in closing the steadily widening gap between demand and supply in the less developed areas. Thus, the question is whether, by helping to solve agricultural problems, the Western Community can help these fourscore countries maintain independence and achieve economic viability. The question, in short, is whether the West will assume responsibility for organizing the progress and the harmonious relations between societies which make progress possible?

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CHAPTER 1

HUNGER IN THE COLD WAR

Primarily agricultural, the less developed countries are historically related to the industrialized West by trade ties, common traditions, and attachment to free institutions, including freedom of religion.

The outcome of the cold war will determine whether these countries, many of which have not achieved stable nationhood, are to retain their historic ties with the West—and their independence—or whether they shall gradually be drawn into the Communist system. What happens in this large area, embracing about half the population of the planet and half the earth's surface, can determine the ultimate position of the West.

In any consideration of the non-Communist world, account must be taken of the contrast between the surpluses of the West and the shortages, particularly of food, that prevail almost universally in the less developed countries.

For more than two-thirds of the world's people, malnutrition is a daily, engrossing concern. The extent of this problem is described in a recent report of the U.S. Department of Agriculture, "The World Food Budget, 1962 and 1966." [1] The analysis indicates that in many of the less developed countries shortages exist in proteins, fat, and calories, and that it is not likely that the food problem will be solved soon. Diet-deficit regions are reported as Latin America, Africa, West Asia, the Far East, and Communist Asia. In these regions, the nutritional gap, projected for 1962, amounts to:

> * * * animal protein equivalent to 1.5 million metric tons of nonfat dry milk; pulse protein equivalent to 150,000 tons of dry beans and peas; fat equivalent to 3 million tons of vegetable oil; and other protein and calories equivalent to 29 million tons of wheat.

Furthermore, "About the same shortages are projected for 1966."

Until these regions can increase and diversify their agricultural production, major reliance for improving diets must be placed on cereal grains. Starch foods, particularly cereal grains, are the critical factor in the world's food supply because of two kinds of efficiency: (1) The caloric content of a pound of milled rice is over 50 percent more than that of a pound of medium beef and equal to that of a pound of medium pork; (2) on the average, the production of a pound of meat requires about 8 pounds of grain. The result is that in the poorer and more crowded sections of the world, nearly all the cereal grains produced are eaten by man, as compared to nearly 70 percent of U.S. grains, excluding sorghums, consumed by animals.[2] Starches represent about three-quarters of caloric intake; grains constitute more than four-fifths of all starches.[3]

[1] U.S. Department of Agriculture, Foreign Agricultural Economic Report No. 4 (Washington, October 1961). See, especially, tables 3, 4, 5, 23, and 25.
[2] U.S. Department of Agriculture estimates.
[3] Ibid.

As we turn to an examination of the food supplies and needs in the three areas of the world—the industrialized West and Japan, the Communist countries, and the free world underdeveloped countries—a number of reservations must be made. In summing up the situation in each area for the purpose of a three-way comparison, the usual distortions incident to averages arise. No two countries in the less developed nations are directly comparable in detail; in statistical aggregates, important differences are made to disappear. Yet it is necessary to simplify if broad judgments are to be made; it is necessary to simplify if the sheer complexity of the economic affairs of more than 100 countries is to be reduced to understandable terms and treated with reasonable brevity.

TABLE 1.—*Agriculture in the tripartite world, 1959*

Area	Percent world population (1960)	Percent world arable land	Percent starch food output	Kilograms of grain per capita
Industrialized West	18	26	32	529
Sino-Soviet bloc	35	28	37	281
Less developed countries	47	46	31	169

Source: Data in appendix tables and in Food and Agriculture Organization, Production Yearbook, 1959.

The diet composition is only one of the many contrasting factors between the West and the rest of the world. The West also has a much higher daily caloric intake than other populations—about 3,000 calories per day as compared to 2,400 in the Communist countries and 2,300 in the less developed countries. (See appendix table A–6.) These differences are more pronounced, furthermore, when differences in the output of muscular effort between the West and other areas are considered.

A third dramatic contrast is found in the share of the population engaged in agriculture. In the West, only about 110 million people are associated with agriculture; in the Soviet area, about 615 million; in the less developed area, about 1 billion.[4] In the West, there are 3 acres of cereal grain for every member of the farm population; in the Communist area, about 0.9 of an acre; and in the less developed area about 0.5 of an acre per capital of rural population.[4] (Derived from appendix table A–7).

The typical farmer in the less developed countries is rarely able to produce more than his family needs—sometimes not enough. In the late 1930's, the less developed area as a whole was a major net exporter of food products. At that time, the area's cereal grain exports amounted to an average of 12 million tons a year. At the beginning of the 1960's, it had net imports of more than 3 million tons of cereal grains annually.

The West has a preponderately urban population; the other two areas are preponderantly rural. In the less developed area, the 400 million persons in urban areas are unable to live on the declining surpluses provided by the countries' billion farmers.

In the West, acreage of cultivated land is declining while production and yields are rising. Technology in agriculture has advanced to a point where one U.S. farmworker can grow enough food and fiber

[4] Food and Agriculture Organization (FAO), Production Yearbook, 1959 (Rome, 1960), p. 16 ff.

for 26 other persons. This advance of agricultural technology has brought the train of problems that usually accompany accelerating productivity. Some farmers lag behind others, depending on the quality of their land, mechanical equipment, educational levels, type of crop, and other factors. In a similar way, some countries lag behind others. But in most cases, surpluses have led to price supports to protect domestic agricultural incomes. The United States, because of rising productivity, faces the necessity of converting land from commercial agriculture to other uses.

Western agriculture is capital intensive, with most of the work performed by machines; in most of the rest of the world, human labor is the primary factor. The productivity of agriculture, the output per worker engaged, tends to increase geometrically with artificial energy inputs, in association with the use of improved seeds, chemical fertilizers, and weed and pest killers.

The West has less than a quarter of the world's cereal grain acreage, but possesses about three-quarters of the tractors and uses about 70 percent of all nitrogenous fertilizers.[5] The results in terms of output per unit of rural population are remarkable: in the West, the per capita output amounts to 1.7 metric tons of cereal grains; in the Communist area, 0.39 metric ton; and the less developed area, 0.25 metric ton. (See appendix table A–10.)

The effect of the capital intensive agriculture of the West is more sharply in evidence if the outputs per unit of arable land are contrasted for the last 25 years. In the West, a 60 percent increase in cereal yield per acre occurred from the period 1935–39 to 1959; in the Sino-Soviet area, about 4 percent; in the less developed area, about 3 percent. (See appendix table A–9.) During the same period, the population increase in the West amounted to about 20 percent; in the Communist area, about 25 percent; in the less developed area, about 50 percent. (See appendix table A–1.)

The contrast is similarly sharp when the per capita production of cereal grains for the two periods is compared. In the West, the production per capita of the population was slightly over three times that in the less developed area.

It is unlikely that substantially increased food production can be accomplished outside the West merely by putting additional land under cultivation. During the past decade, this was partially successful, both in the Communist and less developed areas, and led to some increases in food production. There is, however, a limit to the arable land.

During the past decade the Communist and less developed areas, together possessing four-fifths of the population and three-quarters of the land surface of the earth, have pressed the trend for adding land to the cultivated area to a point that may be beyond the natural limit. In any case, production is not increasing as fast as population, and yields, except for the bad years, remain relatively constant.

Because of the chain reaction set up by the population eruption and Communist failures in the agricultural sector, food has now become one of the pivotal realities on the world scene. It is a matter upon which a unified Western policy is urgently required; it should receive close and continuing attention.

[5] Ibid., pp. 98 and 101.

The main solution to the problem of hunger and malnutrition in the underdeveloped areas lies in raising yields on land now under cultivation. This requires the introduction of modern technology, adapted to local requirements.

Increases in agricultural yields should take precedence over other considerations in Western assistance programs. Until these massive populations are able to feed themselves adequately, there will be little prospect for other improvement in their national economies. The West, in possession of the world's only significant surpluses of food and fiber, is in a position of strength and leverage.

Yet the West will not be able to provide enough food for the 300 million new members who will be added to the less developed societies in the next decade. Thus, the emphasis on Western assistance to these countries should be oriented to the development of agriculture and to an increasing interdependence of rural and urban areas. The alternative appears to be a continuing regression in the agricultural regions and arising opportunity for Communist inroads.

A critical factor in improving agriculture in the less developed area is the substantially expanded use of chemical fertilizers. To this end, large investments in chemical fertilizer plants throughout the area will be required. For example, the production of fertilizer in Africa and west Asia amounted only to 1.6 percent of the world's total in 1958; in Latin America, to 1.4 percent; and the Far East (excluding Japan), to 0.8 percent. In the same year, Communist Asia produced only 0.9 percent of the total although the U.S.S.R. and the Eastern European satellites did better with 20.2 percent of the total. This compares with fertilizer production in Western Europe amounting to 39.8 percent of the total; in the United States and Canada, 27.6 percent; and in Japan, Australia, and New Zealand, 7.7 percent.[6]

Transport and draft power also are critical factors. To meet these needs, the West would be well advised to develop an inexpensive, reliable, multipurpose, and multifuel vehicle. Such a vehicle not only would displace draft animals (releasing the land needed for their support), but also provide transport for the fertilizer and other requirements of a productive agriculture, as well as for marketing purposes. It would provide a sustaining economic relationship between the agricultural and urban areas.

[6] U.S. Department of Agriculture, "The World Food Budget, 1962 and 1966," op. cit., table 24, p. 77.

CHAPTER 2

THE WEST: SURPLUSES AND PROBLEMS

In the industrialized West, the world's only area of food surplus, a major revolution in agricultural technology began in the 1950's. In North America, the fundamental changes in the process began before World War II; in the other countries of the Western community, the process did not get started until about 1950—after recovery from the effects of the war. The revolution is still underway in both North America, and in the other countries of the Western community. The effects may be illustrated in a number of ways.

For example, in the period 1935–39 to 1959, the production of the main cereals per capita of the Western rural population increased 75 percent. Expressed in another way, the total production of cereal grains increased by over 50 percent while the total acreage declined approximately 7 percent. Table 2 provides the salient statistics on Western supplies of cereal grains.

TABLE 2.—*Cereal grains in the industrialized West*

Year	Population (millions)	Area (million hectares)	Average yield (quintals per hectare)	Total output (million metric tons)	Output per capita (kilograms)	Percent change, output per capita 1935–39
1935–39	460	140	13.7	192	417	
1950	490	137	16.9	233	475	+13
1953	509	137	18.3	251	494	+18
1956	528	127	20.7	262	497	+19
1959	548	131	22.0	289	529	+26

Source: Derived from appendix tables A–1, A–7, A–8, A–9, and A–10.

When the developments in the United States are considered separately, this acceleration in productivity has been such that in two decades, the output per worker has risen much more than in the preceding 70-year period. In 1870, the U.S. farmworker produced enough food to supply 5 persons; in 1940, enough to supply 10.7 persons; in 1950, 14.56 persons; and in 1960, 26.1 persons. On one accounting, U.S. agricultural productivity has tripled since 1940, and doubled since 1950.[1]

Behind these phenomenal advances have been rapid increases in scientific knowledge and technology, efficiently and promptly applied. Application of the new technology has, moreover, required sharp increases in capital investment per worker. Capital investment per farmworker is now considerably larger than capital investment per worker in U.S. manufacturing.

The new technological advances include mechanization, new fertilizing procedures, pesticides, herbicides, irrigation, and major advances in scientific control and development of plant and animal strains,

[1] U.S. Department of Agriculture estimate based on productivity increases of land and labor.

and as yet no end to further productivity from these advances is in sight.

Mechanization

In countries where productivity increases have come mainly from mechanization, the principal instrument of the transformation has been the tractor, which is not only the main source of traction power but also of power for many other farm operations. In 1918, there were about 27 million horses and mules in the United States; in 1960, only about 3 million. The number of tractors in operation increased during the same period from about 300,000 to 4.8 million.

The efficiencies leading to this transformation are fivefold: (1) fuel is cheaper than animal feed, (2) land formerly devoted to the production of feed for draft animals is released for other purposes, (3) machines consume fuel only when they are operating, (4) animal maintenance requires more time than machine maintenance, and (5) machines can perform a great many more operations than horses and mules—digging postholes, handling materials, etc.

As the mechanization of agriculture has progressed, manpower directly engaged in agriculture has declined at about the same rate as animal draft power. In the period 1940–60, nearly 20 million members of U.S. farm population migrated to the city; the farm population declined almost 50 percent in a period in which grain output increased by about two-thirds.[2]

The mere statistics on the increased use of tractors fail to communicate the multiple advantages of the tractor: the immense savings in human labor and other economic outlay on maintenance, and the much-increased facility and flexibility deriving from the use of mechanical power.

The Yearbook of Agriculture, 1960, observes, "the method and equipment used in planting seed can make the difference in getting or not getting a stand." [3] Mechanization has led to much more effective control of the factors involved in getting a good stand, as well as quicker and more timely performance of the operations. A single-row one-horse planter able to average 7 acres a day has given way to a six- or eight-row, tractor-drawn planter that will cover 80 to 100 acres a day. With mechanization, soil and moisture conditions can be more efficiently controlled and the critical planting operation can be carried out at the most favorable time.

Mechanization also improves the efficiency of applying fertilizer. If not properly applied fertilizer may damage the plant or fail to contribute effectively to growth. The protection of crops against weeds and pests is also dependent to a large degree on mechanized operations. As the already staggering number of chemical agents used in weed and pest control increases, with concurrent efficiency and timeliness of application, the time may soon arise when these ancient threats are brought under relatively full control.

Mechanization still has a long way to go before the productivity of Western agriculture reaches an optimum level. This may be illustrated by the labor requirements for an acre of cotton: the first stage of mechanization reduced the labor required to grow and harvest an

[2] See Philip M. Hauser, "Population Perspectives" (New Brunswick, 1961), and "Scientific American," July 1961, for detailed appreciation of U.S. Changes.
[3] U.S. Department of Agriculture (Washington, 1961). The yearbook is also the source (p. 36) of chart 1.

acre of cotton from 150 to 30 hours; the next stage, already in effect in some areas, will reduce the labor to 6.5 hours.[4]

Increasing productivity and worker displacement

In a hungry world, the developing food surpluses generated by Western agriculture have become a continuing embarrassment. Western Europe, increasingly dependent for almost a century on imports of bread grains and the historic market for North American and Australian exports, is now a declining importer of bread grains. Japan is self-sufficient in rice after a long and heavy dependence on imports.[5] At the same time that European imports of bread grains have been declining, the share of North America in world grain exports has been increasing. U.S. exports are increasingly being diverted from historic markets to the hungry areas—markets which are unable to import food at world prices. In fact, so much of U.S. food exports move under special Government export programs that the United States is no longer a net dollar exporter of food—outlays on food imports in 1960 were larger than the amount realized on exports.

In the late 1930's, North America provided only 45 percent of the total world exports of bread grains; Latin America, over 20 percent; Australia about 25 percent; and the U.S.S.R. about 10 percent. Africa and Asia were almost self-sufficient. Europe accounted for about 90 percent of all imports. Today, with more than twice as many exports, only North America and Australia are significant exporters—with the United States and Canada now accounting for nearly 90 percent of the total. Africa has a significant deficit; the Asian deficit has risen rapidly; Latin America is a deficit area.

If the population of the less developed area continues to increase at current rates, just to maintain present nutrition, the year 1970 may see the development of an additional annual import requirement of 25 to 30 million tons or more of cereal grains. India alone may require an additional 8 to 10 million tons of grain.[6]

In the industrialized West problems associated with the agricultural surplus are sources of acute difficulty within countries and no small source of economic disunity among countries. The governments of almost all of these nations protect or support their farmers' incomes in one way or another. In Western Europe deep-rooted adherence to policies of maintaining protected markets for domestic agriculture appears to be a main obstacle to continuing progress of the Common Market concept. In the United States, where agriculture is, relatively speaking, a high-efficiency "industry," surpluses are greatest, and in large part because most U.S. agricultural products are met by high tariff walls in most countries of Europe. And, of course, in the United States, too, most agricultural products enjoy price supports and quotas or other barriers which have been imposed to provide a protected market for domestic producers.

The various price-support and other Government programs for agriculture in the industrialized nations have led to some anomalies. In Japan, for example, paddy rice prices are supported at about $200 per ton, as compared with $100 in the United States, and $30 in Burma. United States textile producers are paying 8.5 cents a pound more for their cotton than Japanese and Hong Kong importers

[4] Ibid., for general increases in efficiency of farm labor, see p. 317 ff.
[5] New York Times, July 25, 1961, p. 33.
[6] U.S. Department of Agriculture estimate.

of United States cotton. At the same time, Japanese and Hong Kong exports of cotton textiles to the United States have been increasing.

Underlying these protectionist policies—and perhaps in part because of these policies—forces are at work which have been creating severe problems of readjustment for populations within several of the Western nations. This is particularly true in the United States where a new technological revolution in farming has been in progress for at least two decades. That the price-support and other agricultural programs in the United States tend to support the marginal farmer and retard increases in productivity is no doubt true. Even so, the productivity increases in agriculture have been more than double those of the nonagricultural sector of the economy over the past two decades. Between 1947 and 1960, for example, the average annual increase in output per man-hour worked in agriculture was 5.8 percent while the average increase in the nonagricultural sector of the economy was 2.8 percent.[7] This rapid increase in output has resulted in a prolonged and sharp decline in agricultural employment, with the result that over the past 20 years approximately a million people a year have migrated from the rural areas to the cities, or to the suburbs of the cities. In the United States, and to a lesser extent in a few other Western countries, the rural populations have shown an absolute decline during the past decade or two.

In the United States, this unprecedented movement of rural populations into the cities continues to cause severe strains. In the early postwar years, when industry was making a rapid expansion and in need of an expanding labor force, the rural migrants to the cities were readily absorbed in productive operations. In more recent years, however, there has been substantial adoption of automation techniques in industry. Many workers moving to the cities are unable to find jobs. Indeed, total employment in manufacturing operations has been declining. Conversely, in any migration movement many people are reluctant and slow to leave long-established homes even after employment opportunities in the area have dried up.

If the industralized countries are to achieve the benefits of a more efficient division of labor and better unity in pursuit of their common causes, it would appear that they face some difficult task in evolving policies to: (1) reduce their respected barriers to trade in agricultural products, (2) encourage the shift and absorption of workers, capital and land from agricultural of nonagricultural pursuits, and (3) make a larger contribution, and a more equitably shared contribution, to the food needs of the underdeveloped countries while these countries are achieving their own agricultural and industrial revolutions.

[7] U.S. Department of Labor, Bureau of Labor Statistics, USDL 4698.

CHAPTER 3

SINO-SOVIET BLOC: PERSISTENT FOOD PROBLEMS

The Sino-Soviet bloc, as a whole, has suffered from a persistent shortage of food, with occasional lapses into massive deficits and famine. The disasters of Chinese agricultural policy have become the most conspicuous in the Communist area, but failures in the U.S.S.R. over a period of more than 40 years, persistent as well as post-World War II failures in the Eastern European satellites, would be regarded as catastrophic if compared with any but the Chinese experience.

Food is a major preoccupation of all the governments of the Communist area, from East Germany to North Korea. In every country massive efforts have been made to increase the production of food and fiber. Table 3 sets forth the relevant data.

TABLE 3.—*Cereal grains in the Sino-Soviet bloc*

Year	Population (millions)	Area (million hectares)	Average yield (quintals per hectare)	Total output (million metric tons)	Output per capita (kilograms)	Percent change output per capita 1935–39
1935–39	800	199	12.4	246	308	----------
1950	859	195	10.7	210	244	−20
1953	906	206	11.8	244	269	−13
1956	962	235	12.6	296	307	----------
1959	1,025	223	12.9	288	281	−9

Source: Derived from appendix tables A-1, A-7, A-8, A-9, and A-10.

While analysis of agricultural developments in the Sino-Soviet bloc is difficult, because of the unreliable data made available by the Communist countries, it appears that the trend in production of cereals during the 1950's as a whole was upward. Production seems to have increased, however, more or less as additional acreage has been put into cultivation. Yields in 1959 were only slightly higher than the average for 1935–39. The 1959 output of cereals per capita was still less than in 1935–39.

The situation in the different countries in the bloc varied considerably. Eastern Europe as a whole appeared to have produced enough food to meet basic nutritional standards, although the adequacy of diets varied from section to section. In Communist Asia, where reliable information is even more scanty than elsewhere, it is at least clear that starvation is a major problem.

Output of selected cereals and all grains, pulses, roots, and tubers in the three sections of the bloc for 1935, 1956 (an especially good year in the U.S.S.R. and mainland China), and 1959, is shown in table 4.

TABLE 4.—*The Sino-Soviet bloc: Selected grains and all grains, pulses, roots, and tubers, 1935–39, 1956, and 1959*

Area and year	Selected cereals			Total output, all grains, pulses, roots, and tubers, (thousand metric tons)
	Average yield (quintal per hectare)	Area (thousand hectares)	Total output (thousand metric tons)	
U.S.S.R.:				
1935–39	8.5	101,740	86,900	113,605
1956	9.1	116,783	106,567	137,430
1959	8.6	112,830	96,943	122,170
1960	8.4	106,653	89,617	----------
European satellites:				
1935–39	14.0	37,297	52,364	71,563
1956	13.3	35,435	47,011	61,296
1959	16.4	35,979	59,177	75,877
1960	(1)	(1)	(1)	(1)
Communist Asia:				
1935–39	17.9	59,803	107,190	148,983
1956	17.2	82,510	141,974	202,959
1959	17.7	74,440	131,723	201,446
1960	(1)	(1)	(1)	(1)

[1] Not available.

Source: Appendix tables A–7, A–8, A–9, and A–11.

About 75 percent of the Communist's total trade is within the bloc itself, and the remainder is with the West and less developed countries. Agricultural products play an important part in bloc trade, both internal and external. For example, some 13 percent of all NATO exports to the bloc in 1959 were foods, beverages, tobacco, fats, and oils; and 25 percent of NATO imports from the Communist countries were in the same category. That same year, the bloc exported to the less developed countries wheat valued at $36.4 million and rice amounting to $64.3 million; from them, it imported food, beverages, tobacco, fats, and oils valued at $144.2 million.

The U.S.S.R. and Eastern Europe

The record of Soviet agriculture over the period since 1917 may provide the most reliable guide to the effectiveness of Communist agricultural policy. During the period called military communism, in the years following the revolution, there was widespread famine, with mortalities estimated at from 10 to 20 million. In the succeeding period of the new economic policy, when the peasants were free of state control, agricultural output recovered and there was an approach to prewar production levels.

The collectivization program, which culminated in the extensive famine of 1930–33, was, in many respects a recapitulation of the earlier experience under military communism. The estimated mortalities again ranged from 10 to 20 million. In the late 1930's, output of food gradually increased, only to be followed by World War II, during which a large part of the agricultural system collapsed. War and famine in the years 1941–45, apparently accounted for the death of some 40 million Soviet citizens.

In 1958, there were nearly a million tractors in the U.S.S.R.; an average of almost 20 for each of 55,000 collective farms. This number does not compare with the 4.8 million tractors in use in United States agriculture, or, on a cultivated-area basis, with the 700,000 in use in

West Germany. Nevertheless, the U.S.S.R. is second only to the United States in the total number of tractors in use.[1] Lenin's directive to mechanize agriculture would seem to have been fulfilled if Khrushchev's somewhat questionable claim that all major field operations are now mechanized is correct.

The Soviets have been industriously expanding their planted area. In 1950, about 92 million hectares were sown to cereal grains; in 1959, the area had expanded to 113 million hectares—an increase of almost 25 percent. (See appendix table A–7.) Furthermore, fertilizer output has been significantly increased over the past decade, although it still lags far behind the West. The weed and pest killers so widely used in the Western area are not generally used.

Despite continuing efforts, however, Soviet agriculture does not appear to progress at a rate which could be expected. Indeed, the agricultural population of about 10 million seems to have been marking time since the late 1930's, when the average annual output of the main cereals averaged about 87 million metric tons a year. In 1950, cereal output fell 16 percent below the prewar average, and much the same state of affairs persisted through 1955. In 1956, a very good year, output increased about 20 percent, but then declined again in the following years. (See appendix table A–8.)

The difference between the unprecedented advance in the West's productivity in both land and labor since 1940 and developments in the U.S.S.R. are highlighted in table 5.

TABLE 5.—*Average yield per unit area of selected cereals*

[Quintals per hectare]

Years	U.S.S.R.	Industrialized West	Years	U.S.S.R.	Industrialized West
1935–39	8.5	13.7	1956	9.1	20.7
1950	8.0	16.9	1959	8.6	22.0
1953	7.7	18.3	1960	8.6	23.4

Source: Appendix table A–9.

In a speech to the plenary session of the Party Central Committee on January 17, 1961, Khrushchev estimated that wheat actually procured in 1960 was 25 percent below the level needed to meet requirements in full, and in respect of corn, procurements were 75 percent below requirements. The climate in 1960, it should be noted, was poor.

In this same speech Khrushchev discussed a number of alleged abuses in Soviet agriculture. After reading a letter from Lipetsk Province complaining of "drunkenness among the workers" and asserting that "the moonshiners live like capitalists," he said:

> Apparently stricter laws should be adopted in the republics against pilfering, homebrewing, and drunkenness.

Also:

> Punishment should be imposed not only on those who brew moonshine but also upon its consumers * * *.

[1] FAO, Yearbook, op. cit., p. 101.

Khrushchev was also concerned with other abuses, as the following paragraph suggests:

> We must mercilessly root out such evils as parasitism, a negligent attitude toward work, and private property psychology. A relentless struggle against the survivals of capitalism is needed * * *, and now I wish to speak about intensifying the struggle against wastefulness, about how we must be more thrifty in spending public funds."

The abuses in Soviet agriculture arising from "survivals of capitalism" were carefully enumerated in Khrushchev's speech. One of the most distressing was the widespread practice of "hoodwinking and report padding" of agricultural production and procurement. Accordingly, at the plenary session of the party central committee in July 1961, a new control commission was established to stamp out the practice of padding agricultural production and procurement reports.[3]

This new measure of the Communist Party raises again the old and persisting question of the reliability of Soviet statistics. Soviet agricultural output was reported for many years on a "biological basis," that is, on estimates made before the harvest. This was corrected in the 1950's to an "in the barn" basis—the yield actually realized after the harvest. In the barn data, theoretically, were about 10 percent below the biological data; practically, the difference was much larger. However, in any event, it still appears that reports are padded seriously enough to warrant the setting up of an entire enforcement apparatus with representatives in every state and at each collective farm. These farms are huge. The average state farm is said to be 22,485 sown acres; the average collective farm about 6,785 sown acres.

The Soviet record over the past 20 years can hardly be described as effective. In 1959, the cereal output per capita of the Soviet population was below the average prevailing in the years 1935–39. There may, accordingly, be some doubt whether the grandiose plans outlined in Khrushchev's 20-year plan can be carried out. On the record, Soviet agriculture has been less successful than that of the less developed area, in which total output of cereals increased almost 29 percent in the 25-year period as compared to about 11 percent for the U.S.S.R. (See appendix table A–8.)

In the East European satellites as a group, agricultural developments have not been as unfavorable as in the other sectors of the Communist bloc. Over the entire area of Eastern Europe, food availabilities have increased substantially since 1950. According to official reports, they have now about reached the level prevailing in the prewar period. Total output of the main cereals has increased above the prewar level. (See appendix table A–9.)

Food, however, is still a major problem. In Poland and East Germany, it has been a constantly disturbing factor. In East Germany, the population has declined about 1 million during the 1950's and agricultural output has not been sustained. In Poland, a population increase of nearly 5 million has more than canceled out production increases.

Substantial amounts of food are imported by the satellites from outside the bloc. Such imports, in 1959, included cereal grains, fruits, vegetables, lard, sausage casings, and fish. In the same year, the satellites exported to non-Communist countries food and beverages,

[3] New York Times, July 24, 1961, p. 1.

live animals (some for food, some for other purposes), meat and meat preparations, eggs, sugar and sugar preparations, and bakery products.

Communist Asia

The famines of 1960 and 1961 in mainland China have brought on "food riots" and widespread starvation. The Peiping government announced in January 1961 that more than half the cultivated acreage of China has been stricken in various degrees by drought, typhoons, and floods; 8 of the 12 main rivers in Shantung province were said to have dried up completely.

The extent of the food deficit is not clear because of the lack of reliable statistics. In 1957, the Chinese reported output of grain and other food products, expressed in grain equivalents, amounting to 185 million metric tons. On this accounting, the per capita daily availabilities for a 640-million population would amount to something over 1.8 pounds, as compared to an official ration of slightly over 1 pound per day in the 1960–61 period.[4]

Nevertheless, mainland China has continued to export food to the West and to the less developed area. Among its exports in 1959—also a year of acute shortages—were rice, beans, peas, other pulses, soybeans, and nuts.

Imports from the West have been planned for 1961 at 5.87 million tons of cereal grains, to come largely from Australia and Canada. This would suggest, after netting the decline in exports and the increase in imports, that the 1961 deficit of cereals may amount to 10 or 20 million tons—the food supply, at rationed levels, of some 50 to 100 million Chinese.

The costs of these grain purchases will amount to about $340 million, of which the West has extended credits of $120 million.

In 1962, it is anticipated that the Chinese will attempt to purchase, on credit, another 6 million tons of cereal grains. The availability of such an amount may reduce disorder and, perhaps, prevent revolt in the cities; it will probably do little for the large rural populations, however, which are most seriously affected.

The principal question arising in this contetx is whether the West should extend credit to an insolvent enemy. Humanitarian considerations may preclude an embargo. However, in view of the $4 to $9 billion of gold reserves possessed by the U.S.S.R., it would seem unnecessary for the West to extend credit.

Famine conditions in Communist China appear to be only at the beginning. The Economist, June 17, 1961 (p. 1212), reported that as a result of the forced slaughter of millions of draft animals in 1960, more than 20 million men were recruited from the cities to assist in agricultural work. While forced labor in agriculture is not without precedent in the Communist area, this is a retrogressive development, in that draft animals are a more efficient form of draft power than human beings, and involve a lower maintenance cost.

In the Soviet famines—during the period of military communism, 1917–22, during the collectivization in 1930–32, and during World War II—the populations affected could be measured in tens of millions. In China, famine now affects hundreds of millions. In the West, catastrophes of this dimension are hardly comprehensible.

[4] U.S. Department of Agriculture estimates of Chinese production of the main cereals are not consistent with reported Chinese estimates, which appear to be most inflated. See appendix table A–8; and also, USDA, Foreign Agricultural Circular, March 1961, and Far Eastern Economic Review, "China's Third Bitter Year," September 1961.

CHAPTER 4

LESS DEVELOPED AREA: INCREASING FOOD DEFICITS

In the less developed countries, with 1.4 billion people and increasing food deficits, viable agricultural programs might well be made the first consideration in developmental policy.

Most countries of the less developed areas are plagued—though to differing degrees—by similar hindrences to immediate, large-scale improvement in the output of food and fiber.

A substantial proportion of the population is tied to unproductive agriculture. Most farmers produce little more than that required for bare subsistence. The amount of arable land per capita is steadily shrinking and the soils are being depleted.

Where large farms exist, they usually are cultivating commercial crops for export; and they usually are the only farms with modern machinery and agricultural practices. The governments often offer guaranteed prices or other incentives for export crops, because of their great need for foreign exchange. The small farmers, however, produce mainly for themselves, not for the urban areas. And in many countries, the high rate of illiteracy makes it difficult to change existing production patterns rapidly.

An enormous amount of capital will be required for farm machinery, fertilizer plants, irrigation works, improved seeds and pesticides—and related power and transportation facilities—in order to build up agriculture in all these areas. Only an intensive educational and training program will make it possible for farmers to shift from their traditional, sometimes stubbornly retained, farm and marketing practices.

In the less developed countries, as cereal grain acreage has increased, the ratio of cultivated land to output has remained about the same. In the West, the total area in cereal grains has declined while output has risen over 50 percent. In the past quarter century production of cereals on a per capita basis has declined 14 percent in the less developed area and increased about 25 percent in the West. In the less developed area, 72 percent of the population is on the land; in the West only 20 percent.

As stressed earlier, the basic factors in the present food crisis in the less developed area are rapidly growing populations with only slight increases in food production. In the 25-year period through 1960, population increased by over 50 percent. This compares with population increases of 20 percent in the West and slightly less than 30 percent in the Communist bloc.

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TABLE 6.—*Cereal grains and starches in the less developed area*

Year	Population (millions)	Area planted in cereals (million hectares)	Average yield, cereals (quintals per hectare)	Total output, cereals (million metric tons)	Cereal output per capita (kilograms)	Total output, starches (million metric tons)	Starch output per capita (kilograms)
1935-39	914	162	11.1	179	196	247	270
1950	1,129	168	10.1	170	150	234	207
1953	1,202	186	11.5	214	178	286	237
1956	1,279	191	11.1	212	166	293	229
1959	1,362	203	11.4	230	169	325	238
	Percent						
Change, 1935-39 to 1959	48	25	3	28	−14	30	−12

Source: Derived from appendix tables A-1, A-7, A-8, A-9, and A-10

The picture with regard to production of grains and pulses, roots, and tubers in the major areas of the less developed world are given in table 7. Within each of these areas, naturally, some countries have made more progress than others in increasing agricultural productivity. In all, however, there is much room for improvement. In 1960, for example, total Government and commercial shipments of foodstuffs from the United States to the less developed area amounted to about $1.3 billion. From July 1, 1945 through December 31, 1960, the U.S. Government's economic and technical assistance to the less developed area amounted to about $19.1 billion. Additional figures, also prepared by the Department of Commerce, indicate that the total aid program (including aid to some Western countries) from July 1, 1945 through December 31, 1960, took the following forms:

	Billions of dollars
Mutual security and related programs	26.6
Development loan fund	.4
Under authorizations for farm products disposals (the majority under Public Law 480)	5.7
Under Export-Import Act	3.0
Total net economic and technical assistance	49.9

Under these programs, substantial amounts for aid to agricultural development, in addition to food shipments under Public Law 480, have gone to the less developed area.

TABLE 7.—*Less developed area: Selected grains and all grains, pulses, roots, and tubers, 1935–39, 1956, and 1959*

Area and year	Population (millions)	Selected cereals			Total output of all grains, pulses, roots, and tubers (thousand metric tons)	Total output per capita (kilograms)
		Average yield (quintal per hectare)	Area (thousand hectares)	Total output (thousand metric tons)		
Latin America:						
1935–39		11.0	26,992	29,684	34,422	(1)
1956	188	11.8	34,527	40,357	50,207	267
1959	202	12.2	35,381	43,128	53,441	266
Africa:						
1935–39	(1)	8.0	19,704	15,676	45,159	(1)
1956	233	9.5	26,015	24,676	57,925	249
1959	250	9.0	27,274	24,428	58,710	235
West Asia and Far East:						
1935–39		11.8	101,899	120,468	151,292	(1)
1956	798	11.2	118,114	132,835	167,079	209
1959	848	11.5	127,418	146,498	193,833	229

[1] Not available.

Source: Appendix tables A–7, A–8, A–9, and A–11.

In its "World Food Budget," the Department of Agriculture reports that food is available for above-standard diets in Argentina, Brazil, Chile, Cuba, Mexico, and Uruguay. In the remaining countries, with 32 percent of Latin America's population, there are distressing food deficits. In 1958, total deficits are estimated to have been the equivalent of 2.5 million metric tons of wheat, 10,000 tons of nonfat dry milk, and 100,000 tons of vegetable oil. Calorie levels ranged from a substandard 1,900 in Bolivia and Haiti to more than 3,300 in Argentina. Other figures given in the Department's report indicate the underlying problems in developing Latin American agriculture:

Latin America

Further, the population of Latin America is growing faster than in the other parts of the less developed area—at a rate of more than 2.5 percent annually. As a whole, Latin America's agricultural productivity has been increasing in the last 25 years, and it is using increasing amounts of farm machinery, fertilizer, improved seeds, and breeding stock. However, this is mainly taking place on the large farms which produce grain, livestock, sugar, cotton, coffee, bananas and other fruits for export.

The use of averages in connection with Latin America's agriculture is somewhat misleading because of the wide differences from country to country. For example, Mexico has had a good production record. Cereal output has increased, on the average, more than 200,000 tons a year, but dependence on imported food tends to increase year by year. The population increase amounts to somewhat less than a million a year. Guatemala is in a serious situation. Production of cereals in the last decade has increased little, while a million people have been added to the population.

Per capita availability of arable land, hectares	0.5
Percent of world fertilizer production	1.4
Labor force in agriculture, range from:	
Argentina and Uruguay (percent)	25
Haiti, Bolivia, and Central America (percent)	over 60
Literate population (percent)	40
Average income per capita, all Latin America	$254
Highest income per capita, Venezuela	$600
Lowest income per capita, Haiti	$65

Cuba's situation is interesting for a number of reasons. Nearly half of its food grain requirements normally were imported, somewhat over 400,000 tons. The cost of the grain imports was about half that of sugar exports to the United States. Cuba's sugar production went to the United States at a premium price. Half the market for its sugar—the United States—disappeared in the course of a year. Today, the value of Cuba's sugar exports in the world market are not significantly different from the cost of wheat imports. The U.S. producers of sugarbeets and foreign cane producers can meet any U.S. demand. The increase in productivity of U.S. sugarbeet producers has been a remarkable development—40 percent in a period of 5 years.

However the course of Cuban affairs may turn, the increasingly critical concern of U.S. policy is with the non-Communist less developed countries that are gradually moving toward the disorder that hunger and crowding create.

Africa

With about 240 million inhabitants, Africa has the soil and climate required to meet the food needs of its growing population if the resources were only used effectively. At present, Africa is a diet-deficit area, and in some areas there are critical nutritional shortages. The Department of Agriculture lists the Republic of South Africa and the Federation of Rhodesia and Nyasaland as the only two African countries where food consumption meets nutritional standards.

Wheat production is lagging behind population growth, and in 1958 import needs amounted to about 2 million tons. Production of other major foods have been keeping pace with population increases in Africa as a whole. However, there have been shortages of animal proteins, pulses, and fats in some areas and countries. Part of the problem is the lack of an adequate marketing system—there may be a deficit in pulses in one area, while nearby there is a surplus.

Most of Africa's modern agriculture is in export crops. Its leading exports—averaging about $3.4 billion annually during the late 1950's—were cotton, tea, tobacco, and hard fibers. The production of coarse grains and vegetable oils is increasing and these foods are expected to become important exports during the next decade. Food accounts for most of Africa's imports, which amount to about a third of the value of exports. Among these are grain and grain products, the most important, and sugar and dairy products.

North Africa imports large amounts of grain since calorie deficiencies are greater there than in other parts of Africa. Egypt, where the population has been increasing at an annual rate of more than half a million, has more need for wheat imports than any other African country. During the past decade, in which about 5 million people were added to the population, the Egyptian output of food grains

increased only 200,000 tons, an amount sufficient for little over a million people.

The following figures from "The World Food Budget" are relevant to Africa's future success in improving agriculture:

Per capita availability of arable land, hectares	[1] 0.9
Percent of world fertilizer production (percent)	[1] 1.6
Literate population (percent)	15 to 20
Average income per capita	$100

[1] Average for Africa and west Asia.

West Asia and the Far East

Since the mid-1940's, west Asia's population has been increasing at a rate in excess of 2 percent a year. Over half of the people in the area are in Turkey and Iran; the others are in Iraq, Israel, Jordan, Lebanon, Syria, and other small countries.

Wheat is the basic food in west Asia—accounting for two-thirds of the total energy intake—and the area's most important agricultural products are grain and livestock. Sugar, fats and oils, fruits, and vegetables also are important in the diet. In recent years, its annual agricultural exports—mainly fruits and nuts, cotton, and tobacco—have averaged about $560 million and imported agricultural products have amounted to about $375 million.

The area as a whole was below nutritional standards in calories, even with the addition of substantial imports of foods. About 12 percent of the average intake of energy foods for the area as a whole was supplied by imports; in Israel, Lebanon, and Jordan imports supplied about two-thirds of the total. Protein needs are met in most countries of the area but the use of fats and oils is below nutritional standards in several.

A small net export position in coarse grains probably will be reversed as the livestock and poultry industries continue to be developed, and increased needs of milled rice and vegetable oil are expected. Substantial increases are expected for imports of wheat, which in 1958 amounted to 625,000 tons.

Relevant figures to the general agricultural outlook in west Asia include:

Per capita availability of arable land, hectares	[1] 0.9
Percent of world fertilizer production	[1] 1.6
Literate population (percent)	33
Average income per capita	$175

[1] Average for West Asia and Africa.

The Far East contains almost half of the world population and its population is increasing at a rate almost as great as Latin America. Although food production has been increasing in recent years, the amount of food per capita still is less than it was before World War II. The food deficit is so great throughout the area that maintenance of current substandard nutritional levels, even with increased imports, will be difficult in the years ahead.

Food consumption levels in the area are lower than those in the other less developed areas. Diets are high in carbohydrates and deficient in fats and animal, pulse, and other proteins. In 1958, these deficiencies were the equivalent of 20 million tons of wheat, 100,000 tons of dry beans and peas, 670,000 tons of nonfat dry milk, and 1.5 million tons of vegetable oil.

Most of the agricultural resources of the Far East are devoted to food production, but per capita yields are among the lowest in the world. This is the result of the small amount of agricultural land per capita, the low capital inputs in agriculture, and the inefficient subsistence farming which characterizes the area. Per capita income is lower than any other region of the world except Communist China.

Some Far Eastern countries have to export foods in order to buy other necessities; others divert land to nonfood crops for export in order to obtain foreign exchange. Even so, the area—a net exporter before World War II—now is a net importer of over 10 million tons of food grains, mainly wheat, but also pulses, fruit and vegetables, and dairy products.

India's problem is conspicuous. Over the past 25 years, during which the population increased 120 million, cereal production has increased only 20 million tons. In the years immediately ahead with population increasing by nearly 8 million new Indians a year, India will need to import at least 4 million tons of grain and by 1970 as much as 8 to 10 million tons.

Pakistan, with an annual population increase of 2 million or more, was once an exporter of wheat and rice. It is now an importer of both. In a recent interview while in the United States, Ayub Khan of Pakistan conceded that Pakistan will require 1.5 million tons of food from the outside to feed 2 million new mouths added to the population each year.

The population of Indonesia is increasing at a rate of 1.5 million a year; imports of cereal grains are increasing. The situation is similar throughout the Far East.

The Department of Agriculture sees little prospect that there will be large production gains over the next few years for the Far East as a whole, although India has better prospects than other countries for improvement. The estimate is that imports of wheat will go up 50 percent between 1958 and 1966; nonfat dry milk imports will double; the net importers of vegetable oil will triple imports.

The difficulties to be overcome before the food deficits are reduced significantly are indicated by these figures:

Per capita availability of arable land, hectares	0.3
Percent of world fertilizer production	0.8
Labor force in agriculture (percent)	70
Literacy of rural population, examples:	
Afghanistan (percent)	5
Pakistan (percent)	15
India (percent)	20
Average income per capita	$80

The problem posed in the Far East is serious. Even if supplies were available from other areas in sufficient quantities to fill the need and if foreign exchange were not required to pay for imports, there are other barriers to an early solution. People have to learn to prepare and eat foods to which they are not accustomed. Usually, unloading facilities at ports, storage and processing establishments, and transportation are inadequate. While some gains along these lines are being made, particularly in India, the food deficiency could very well become more severe in the next few years. The area is in urgent need of outside financial and technical assistance, and new ideas on ways to meet the crucial danger of increasing hunger for millions of people.

APPENDIX

Notes on Appendix Tables

(1) Unless indicated otherwise, the three areas referred to in the appendix tables are composed of the following countries and regions:

Industrialized West includes the United States (excluding Hawaii and, prior to 1959, Alaska), Australia, Austria, Belgium, Canada, Denmark, France, Federal Republic of Germany (West Germany), Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom.

Sino-Soviet bloc includes the U.S.S.R., mainland China, Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, North Korea, Outer Mongolia, Poland, Rumania, North Vietnam, and Yugoslavia.

Less developed countries are the rest of the world, including Africa, residual European countries, Latin America, West Asia and the Far East, and other Oceania.

(2) When "selected cereals" are referred to in the tables, unless noted to the contrary, the cereals are wheat, rye, rough rice, barley, and oats.

(3) Tables A–1 through A–5 were obtained from the same source. A–7 through A–13 are from the source given on table A–6.

(4) Weights and measures used in the tables may be converted as as follows:

1 hectare=2.471 acres.
1 metric ton=1,000 kilograms, 2,204.6 pounds.
1 quintal=100 kilograms, 220.46 pounds, about 3⅔ bushels of wheat.

TABLE A–1.—*Estimated population of the industrialized West, the Sino-Soviet bloc, and the less developed countries: 1935–39 and 1950 to 1959*

[Midyear population in millions; figures relate to the present territory]

Area	1935–39 (average)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
World	2,173.2	2,478.1	2,522.3	2,568.7	2,615.9	2,665.9	2,716.6	2,768.9	2,823.1	2,878.4	2,935.0
Industrialized West	459.8	490.2	496.6	502.9	508.6	515.0	521.1	527.5	534.1	540.6	547.6
Sino-Soviet bloc	799.7	859.0	873.1	888.9	905.5	923.8	942.5	962.0	982.6	1,003.8	1,025.2
Less developed countries	913.7	1,128.9	1,152.6	1,176.9	1,201.8	1,227.1	1,253.0	1,279.4	1,306.4	1,334.0	1,362.2

Source: Prepared by the Foreign Manpower Research Office, Bureau of the Census, U.S. Department of Commerce. Figures appearing in the various issues of the United Nations, Demographic Yearbook, Monthly Bulletin of Statistics, and Population and Vital Statistics Report were used except for those countries for which the Foreign Manpower Research Office prepared alternate series.

TABLE A–2.—*Annual rate of population growth for the industrialized West, the Sino-Soviet bloc, and the less developed countries: 1935–39 and 1950 to 1959*

Area	1935–39 (average)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
World	1.1	1.8	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0	1.9
Industrialized West	.7	1.3	1.3	1.1	1.2	1.2	1.2	1.3	1.2	1.3	1.3
Sino-Soviet bloc	1.2	1.6	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.1	2.0
Less developed countries	1.3	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1

TABLE A–3.—*Projected population of the industrialized West (by country), the Sino-Soviet bloc, and the less developed countries: 1960, 1965, and 1970*

[Midyear population in millions]

Area and country	1960	1965	1970
World	2,991.6	3,274.2	3,582.9
Industrialized West	554.6	586.4	620.5
United States [1]	180.7	196.6	214.8
Australia	10.3	11.4	12.7
Austria	7.1	7.2	7.4
Belgium	9.1	9.4	9.6
Canada	17.8	19.6	21.1
Denmark	4.6	4.7	4.9
France	45.5	47.1	48.7
Germany, Federal Republic	53.4	55.3	56.8
Italy	49.4	51.0	52.6
Japan	93.7	98.6	103.7
Luxembourg	0.3	0.3	0.3
Netherlands	11.5	12.0	12.6
New Zealand	2.4	2.6	2.8
Norway	3.6	3.7	3.9
Sweden	7.5	7.7	8.0
Switzerland	5.3	5.7	6.1
United Kingdom	52.4	53.5	54.5
Sino-Soviet bloc	1,045.4	1,143.0	1,247.6
Less developed countries	1,391.6	1,544.8	1,714.8

[1] Includes Alaska and Hawaii

TABLE A–4.—*Projected population of Brazil, Canada, China (mainland), Egypt, France, Guatemala, India, Pakistan, and the United States: 1960, 1965, and 1970*

[Midyear population in millions]

Country	1960	1965	1970
Brazil	65.7	73.9	83.2
Canada	17.8	19.6	21.1
China (mainland)	688.8	760.5	839.6
Egypt	26.1	29.6	33.6
France	45.5	47.1	48.7
Guatemala	3.7	4.3	4.9
India	431.3	474.8	522.7
Pakistan	92.7	102.8	114.1
United States	180.7	196.6	214.8

TABLE A–5.—*Estimated population of Brazil, Canada, China (mainland), Egypt, France, Guatemala, India, Pakistan, U.S.S.R., and the United States: 1935–39 and 1950–59*

[Midyear population in millions]

Country	1935–39 (average)	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Brazil	38.6	52.0	53.2	54.5	55.8	57.1	58.5	59.8	61.3	62.7	64.2
Canada	11.3	13.7	14.0	14.5	14.9	15.3	15.7	16.1	16.6	17.1	17.5
China (mainland)	474.7	547.1	558.0	569.9	582.6	596.3	610.6	625.7	641.3	657.4	673.6
Egypt	16.1	20.4	20.9	21.5	22.0	22.6	23.1	23.6	24.2	24.8	25.4
France	41.2	41.7	42.1	42.4	42.7	43.0	43.3	43.6	44.1	44.6	45.1
Guatemala	2.1	2.8	2.9	3.0	3.1	3.2	3.3	3.3	3.5	3.5	3.7
India	304.3	358.3	362.5	369.5	377.0	384.3	391.8	399.4	407.1	415.0	423.1
Pakistan	(1)	75.3	76.9	78.5	80.1	81.8	83.5	85.3	87.1	88.9	90.8
U.S.S.R.	187.9	182.4	185.2	188.1	190.9	193.9	197.0	200.3	203.5	207.0	210.5
United States	129.1	151.7	154.4	157.0	159.6	162.4	165.3	168.2	171.2	174.1	177.3

[1] Data not available. The population of roughly the present area of Pakistan is reported to have been 70,300,000 at the time of the Mar. 1, 1941, census of British India. Assuming that during the 1930's the Pakistani population grew at the same rate as that of British India as a whole, the 1935–39 average population can be estimated to have been about 66,500,000.

TABLE A–6.—*Per capita daily caloric intake, by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1958* [1]

[In calories]

Major areas	1935–39	1950	1953	1956	1958
Industrialized West	2,950	2,900	2,900	2,950	2,950
Sino-Soviet bloc	(2)	(2)	(2)	(2)	2,400
Less developed countries	(2)	(2)	(2)	(2)	2,300

[1] Comparable data was only available in 1958 for the Sino-Soviet bloc and the less developed countries. Figures for 1958 include 95 percent of the world population. Data rounded to nearest 50 calories for industrialized West, and to nearest 100 calories for other two areas.
[2] Not available.

Source: Tables compiled by Department of Agriculture.

TABLE A–7.—*Total area in selected cereals, by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In thousand hectares]

Major areas	1935–39	1950	1953	1956	1959	1960
Industrialized West	140,130	137,242	137,298	126,682	131,378	138,033
Western Europe	29,511	27,348	27,607	27,632	27,826	(1)
Japan	4,825	5,106	4,739	4,990	4,931	(1)
Australia and New Zealand	6,484	6,053	6,118	5,354	6,985	(1)
Canada	17,855	18,897	18,661	17,780	17,706	(1)
United States	81,455	79,838	80,173	70.926	73,930	(1)
Sino-Soviet bloc	198,840	195,237	206,388	234,728	223,249	(1)
U.S.S.R	101,740	91,806	97,126	116,783	112,830	106,653
Eastern Europe	37,297	36,517	35,504	35,435	35,979	(1)
Mainland China and other Communist Asia	59,803	66,914	73,758	82,510	74,440	(1)
Less developed countries	161,506	167,620	186,445	191,192	202,730	(1)
Other Europe	12,903	12,225	12,749	12,484	12,626	(1)
Latin America	26,992	27,954	31,061	34,527	35,381	(1)
Africa	19,704	22,197	24,618	26,015	27,274	(1)
West Asia and the Far East	101,899	105,214	117,985	118,114	127,418	(1)
Other Oceania	8	30	32	52	31	(1)

[1] Not available.

TABLE A–8.—*Total production of selected cereals, by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In thousand metric tons]

Major areas	1935–39	1950	1953	1956	1959	1960
Industrialized West	191,830	232,612	251,407	262,365	289,439	308,858
Western Europe	52,717	52.764	61,900	65,733	70,333	(1)
Japan	15,350	15,306	13,758	17,262	19,413	(1)
Australia and New Zealand	5,708	6,437	7,348	5,931	9,391	(1)
Canada	16,063	23,463	29,952	30,468	23,228	(1)
United States	101,992	134,642	138,449	142,971	167,074	(1)
Sino-Soviet bloc	246,454	209,635	243,956	295,552	287,843	(1)
U.S.S.R	86,900	73,135	75,148	106,567	96,943	89,627
Eastern Europe	52,364	39,717	46,741	47,011	59,177	(1)
Mainland China and other Communist Asia	107,190	96,783	122,067	141,974	131,723	(1)
Less developed countries	179,304	169,714	213,552	211,850	230,1160	(1)
Other Europe	13,460	12,341	13,844	13,870	16,006	(1)
Latin America	29,684	30,453	36,767	40,357	43,128	(1)
Africa	15,676	18,371	22,100	24,676	24,428	(1)
West Asia and the Far East	120,468	108,505	140,793	132,835	146,498	(1)
Other Oceania	16	44	48	112	56	(1)

[1] Not available.

TABLE A–9.—*Average yield per unit area of selected cereals, by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In quintals per hectare]

Major areas	1935–39	1950	1953	1956	1959	1960
Industrialized West	13.7	16.9	18.3	20.7	22.0	22.4
Western Europe	17.9	19.3	22.4	23.8	25.3	(1)
Japan	31.8	30.0	29.0	34.6	39.4	(1)
Australia and New Zealand	8.8	10.6	12.0	11.1	13.4	(1)
Canada	9.0	12.4	16.1	17.1	13.1	(1)
United States	12.5	16.9	17.3	20.2	22.6	(1)
Sino-Soviet bloc	12.4	10.7	11.8	12.6	12.9	(1)
U.S.S.R.	8.5	8.0	7.7	9.1	8.6	8.4
Eastern Europe	14.0	10.9	13.2	13.3	16.4	(1)
Mainland China and other Communist Asia	17.9	14.5	16.5	17.2	17.7	(1)
Less developed countries	11.1	10.1	11.5	11.1	11.4	(1)
Other Europe	10.4	10.1	10.9	11.1	12.7	(1)
Latin America	11.0	10.9	11.8	11.7	12.2	(1)
Africa	8.0	8.3	9.0	9.5	9.0	(1)
West Asia and Far East	11.8	10.3	11.9	11.2	11.5	(1)
Other Oceania	20.0	14.7	15.0	21.5	18.1	(1)

[1] Not available.

TABLE A–10.—*Production of selected cereals per capita of total population and rural population: by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In kilograms]

Major areas	1935–39	1950	1953	1956	1959
Total population:					
Industrialized West	417.2	474.5	494.3	497.4	528.6
Sino-Soviet bloc	308.2	244.0	269.4	307.2	280.8
Less developed countries	196.2	150.3	177.7	165.6	168.9
Rural population: [1]					
Industrialized West	970.3	1,282.3	1,412.4	1,507.0	1,704.6
Sino-Soviet bloc	380.4	317.0	354.5	415.2	390.0
Less developed countries	251.6	205.9	246.8	236.5	248.4

[1] This is more than farm population as it includes persons living in rural areas and small villages. Farm population in the United States was 22 percent in 1940 and 13 percent in 1955, whereas the rural population used in this table was 47 percent in 1935–39 and 31 percent in 1956. In the less developed countries, farm population and rural population are more nearly synonymous.

TABLE A–11.—*Combined production of all grains, pulses, roots, and tubers:* [1] *by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In thousand metric tons]

Major areas	1935–39	1950	1953	1956	1959	1960
Industrialized West	219, 242	271, 042	285, 477	300, 621	333, 875	
Western Europe	71, 274	74, 908	83, 821	88, 663	89, 757	
Japan	17, 431	18, 350	16, 538	20, 603	22, 973	
Australia and New Zealand	5, 840	6, 702	7, 670	6, 250	9, 797	
Canada	17, 376	25, 778	31, 732	32, 380	25, 046	
United States	107, 321	145, 304	145, 716	152, 725	186, 302	
Sino-Soviet bloc	334, 151	294, 016	334, 391	401, 685	399, 493	
U.S.S.R.	113, 605	100, 370	97, 657	137, 430	122, 170	
Eastern Europe	71, 563	55, 097	61, 865	61, 296	75, 877	
Mainland China and other Communist Asia	148, 983	138, 549	174, 869	202, 959	201, 446	
Less developed countries	247, 477	234, 163	286, 136	292, 679	325, 414	
Other Europe	16, 547	15, 647	17, 327	17, 378	19, 330	
Latin America	34, 422	38, 680	45, 406	50, 207	53, 441	
Africa	45, 159	46, 881	52, 960	57, 925	58, 710	
West Asia and Far East	151, 292	132, 894	170, 370	167, 079	193, 833	
Other Oceania	57	61	73	90	100	

[1] Weighted by relative caloric value: ¼ of roots and tubers to 1 of grain and pulses. Included are all grains, dry beans and peas, lentils, chickpeas, brood beans, grains, soybeans, and peanuts not crushed for oil, white potatoes, sweet potatoes, yams, and cassava.

TABLE A–12.—*Production of all grains, pulses, roots, and tubers per capita of total population: by major areas of the world, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In kilograms]

Major areas	1935–39	1950	1953	1956	1959
Industrialized West	476. 8	552. 9	561. 3	569. 9	609. 7
Sino-Soviet bloc	417. 8	342. 3	369. 3	417. 6	389. 7
Less developed countries	270. 9	267. 4	238. 1	228. 8	238. 9

TABLE A–13.—*Total production of selected cereals: By selected countries, for the prewar period, 1935–39, and for selected postwar years, 1950, 1953, 1956, and 1959*

[In thousand metric tons]

Countries	1935–39	1950	1953	1956	1959
United States	101, 992	134, 642	138, 449	142, 971	167, 074
Canada	16, 063	23, 463	29, 952	30, 468	23, 228
Soviet Union	86, 900	73, 135	75, 148	106, 567	96, 943
Mainland China	103, 565	93, 510	117, 939	137, 173	127, 269
France	15, 056	13, 655	16, 228	19, 023	21, 740
India	45, 279	43, 711	54, 879	57, 780	63, 554
Pakistan	14, 758	17, 677	17, 374	17, 677	18, 984
Brazil	6, 993	9, 662	10, 911	12, 948	13, 871
Guatemala	414	564	515	459	414
Egypt	3, 791	3, 644	3, 806	4, 657	4, 449
Japan	15, 350	15, 306	13, 758	19, 122	18, 459

CLOSING THE WORLD'S NUTRITIONAL GAP

By

LOUIS H. BEAN

I. SUMMARY

This report points to steps that could hasten the closing of the world's nutritional gap. The world's food budget is unbalanced, with a great deficiency of high-protein foods in the less developed counties. It is likely to remain so for many years to come because much of the past and prospective benefits of economic and technical assistance in agricultural and industrial production is offset by rapid increases in population.

Ten to twelve years hence the countries comprising the industrialized West—the free West European countries, Canada, Japan, Australia, and New Zealand—will show an increase of about 100 million people; the Sino-Soviet bloc, an increase of about 300 million; and the rest, the less developed countries of non-Communist Asia, Africa, and Latin America, an increase of over 400 million. The total world population will rise from about 3 billion today to nearly 4 billion in the early 1970's. The Sino-Soviet bloc will then have about twice as many people as the Western industrialized countries, and the less developed countries about three times as many.

In spite of projected increases in production and in food aid, the world will continue during the 1960's to be short of proteins and calories equal to over a billion bushels of wheat. In addition, it will continue to be short of animal proteins in terms of nonfat dry milk of about 2 million metric tons, and short of fats in terms of vegetable oils of approximately 3 million metric tons.

The inevitably slow pace of industrialization in the face of rising populations will tend to perpetuate per capita food consumption in the less developed countries at about 40 to 45 percent of the average in the industrialized countries. It is about 41 percent today.

However, the closing of this gap can be hastened by stepping up the feeding activites of the Food for Peace Program at the same time that long-range economic development programs are being projected and put into effect. The world's nutritional gap is largely concentrated among infants and children of preschool age, who within a few years will become part of the labor force. Their health is a basic economic asset.

The present Food for Peace Program directed toward preschool and school children is limited by the shortage of high-protein foods. We have an abundance of cereals, feed grains, and vegetable oils. But the great need is supplementary protein foods which has been met only moderately by our donations of dry skim milk, the supply of which is limited and costly. To step up the donation of dry skim milk by increasing domestic production would bring on costly surpluses of butter for which the domestic demand is shrinking.

Additional sources of high-protein foods for supplementing both the low-protein content in cereal foods and the limited supply of dry skim milk are now available. The outstanding new sources of high-protein foods are flours derived from cottonseed, peanuts, sorghums, and soy-

beans. Outside the United States, there is also a great deal of interest in fish flour as a potential high protein food additive.

As a result of research and technological advances beverages for child feeding, nutritionally the equivalent of cow's milk, now can be made from cottonseed flour, particularly from soybean flour, and a completely adequate protein supply can be obtained solely from vegetable sources with the addition of essential amino acids.

Soybeans as a protein source outrank in volume all the other oil seeds. Its human food products have ready acceptability in the Far East and elsewhere. Converted into flour, it is now available as a high-protein additive to standard foods consisting largely of wheat, or corn, or rice, or other starchy foods deficient in protein. High-protein soybean products have for years been available in the United States as food additives, or as soy milk prescribed for infants or persons allergic to cow's milk, and more recently, as weight-restraining beverages. Soybeans now are the fourth largest U.S. cash crop and likely to be in abundant supply. As a result, processors are actively engaged in bringing the new uses of soybeans to the attention of many of the less-developed countries. In combination with cereals and other widely used starchy foods and with nonfat dry skim milk, these products can materially reduce the cost of protein per person receiving food aid. For the same protein efficiency, 100 pounds of wheat flour can be replaced by 40 pounds of wheat flour and 5 pounds of soy flour with a reduction in protein cost of over 50 percent.

The facts highlighted in this report—especially the recent progress in combining different products to produce low-cost, high-protein foods; the emergence of one of our crops as a major source of low-cost protein for humans; and the possibility of increasing our foreign feeding activities without necessarily increasing costs—all suggest that we are now in a better position than ever before to plan foreign feeding operations on a stepped-up, stable, continuing basis. The several agencies with responsibilities in the food for peace program should become more aware of these current developments, should appraise their significance in terms of cost and nutritional importance and, depending on their common findings, should make them part of expanded feeding programs under Public Law 480 in line with our officially declared intentions.

Much of what has been recently developed in food technology, in new foods, and in nutritional experiments is as yet not generally known at the top levels of policy and administrative responsibility. Partly, this is because the developments are new, and partly because there has been no provision in the executive branch for centralizing this information for the foreign feeding operations. Furthermore, to make these programs more effective, specific year-to-year increased objectives as well as long-range objectives are lacking. It is, therefore, recommended that—

(1) The Food for Peace Program should have the responsible agencies draw up a balance sheet of food needs for the less developed countries, and match them with the current and potential supplies of animal and vegetable proteins, pulses, cereals, and vegetable oils, with special attention to the new sources of low-cost vegetable proteins.

(2) It should have the agencies prepare a long-range (5- or 10-year) program of feeding operations under Public Law 480

on the assumption that foreign feeding operations for some years to come will be a continuous outlet for our low-cost, high-protein foods.

(3) It should also set up short-range goals in terms of specific quantities, such as doubling the present volume of food donations, or doubling the number of recipients, or doubling the rate of feeding in 1962 or 1963.

(4) It should present these short- and long-range goals to the voluntary relief agencies, on the assumption that they will carry out the enlarged programs, for estimates of the additional personnel costs and other problems that would be involved.

(5) Similarly, processors should be asked to submit proposals as to new low-cost products to be included in the expanded and regularized program.

(6) Consideration should be given to the proposal that these foreign relief activities be made part of foreign policy operations rather than part of the agricultural production adjustment and price support programs.

A quantitative goal of this kind would make it possible for the responsible agencies to bring together the latest usable knowledge in food technology, in available foods, and in nutrition, now nowhere centralized. It would also make it possible for food processors who have developed products that could be used in the Food for Peace Program to plan their capacities and figure their costs more realistically. It would make it possible for Government agencies and the voluntary relief agencies to plan their activities more effectively. This would be true not only in planning feeding programs, but in developing the supply and uses of indigenous products and in establishing small-scale vegetable beverage plants and other food-processing enterprises. Thus, our food programs could accomplish a great deal more to meet the world's needs in aid and, ultimately, its needs in trade.

II. CURRENT AND PROSPECTIVE TRENDS IN WORLD POPULATION AND AGRICULTURAL PRODUCTION

U.S. foreign policies of the past decade have had the twofold objective of helping the less developed countries improve their economic well-being and of laying the basis for expanding our world trade in agricultural products. For the future, these objectives will need to be pursued with even greater intensity. The gap between food production and consumption of the less developed countries and of the western industrialized countries is basic. There is little evidence in the current and prospective trends in agricultural production that the gap will be materially reduced during the next decade without a greater sense of urgency both in the industrialized countries and in the less developed countries.

The much publicized population eruption is progressing at an annual rate 50 percent greater in the less developed countries and in the Sino-Soviet bloc than in the industrialized Western countries. While food production in the less developed countries has increased since World War II, it has not been sufficient to materially overcome the persistently rising requirements. If the experience of the past 10 years is taken as a guide the per capita production of grains, pulses, roots, and tubers of the less developed countries 10 years hence will still be only 40 to 45 percent of the per capita production of the industrialized West. It has been about 41 percent in recent years.

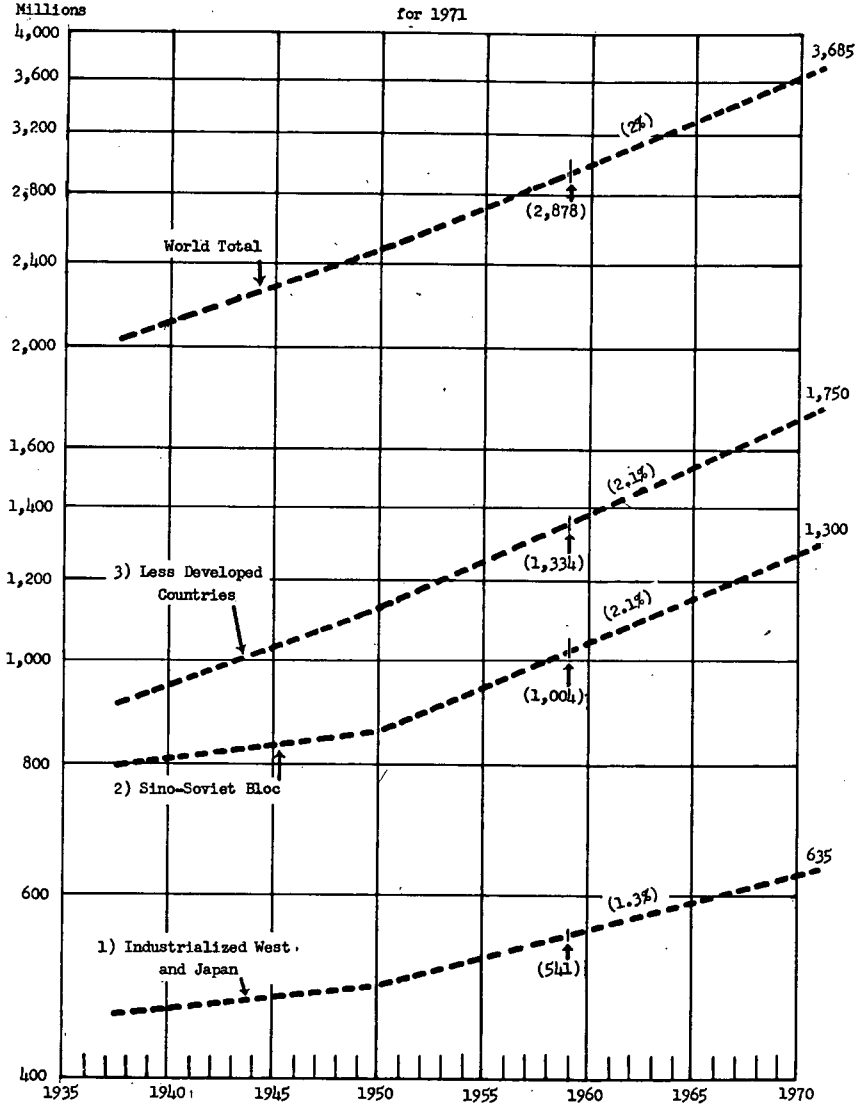
The population trends in the less developed countries may be taken as a reasonable guide as to what to expect during the decade of the 1960's. This does not mean that the population growth must continue its pace unchecked, but it is extremely doubtful that material progress can be achieved in changing the social and economic factors involved in the next few years. But agricultural production and consumption trends can be tilted upward by the foreign aid programs and Food for Peace activities if they can capitalize on the experience of the past decade and on the more recent developments in agricultural production technology and food processing.

The population trends that we will have to live with during the 1960's are shown in chart I. For the countries included in the group, industrialized Western countries, the yearly rate of population increase is 1.3 percent. At this rate, the total of 541 million persons in these countries will rise to about 635 million 10 years hence. During the 12-year span, 1959 to 1971, the increase here will probably be nearly 100 million. For the countries in the Sino-Soviet bloc the current annual rate of increase is 2.1 percent or about 50 percent greater than that of the Western countries. The bloc's population increase from 1959 to 1971 may be about 300 million, from 1,004 million to 1,300 million, or about three times as great as the increase for the Western area. For all the other countries, the annual rate of increase is also about 2.1 percent and at this pace we may see an increase here from 1,334 million in 1959 to about 1,750 million, or about 420 million. This

CHART I

World Population For Three Major Areas

1935-1939, 1950-1959 and Projection for 1971



would mean an increase in the world population of over 800 million (from 2,878 million in 1959 to 3,685 million in 1972). The prospect is that the Sino-Soviet bloc will have about twice as many people as the industrialized West and the less developed countries close to three times as many. Both the Sino-Soviet bloc and the less developed countries will gain in population relative to the industrialized West.

The agricultural production trends show even greater contrasts for these three world areas. It may be said that the agricultural picture is the population picture turned upside down. The countries in the Western area, with the smallest number of people and the slower rate of annual increase, has the highest per capita agricultural production and the fastest annual rate of increase. The less developed countries as a group, with the largest share of the world's population, shows the slowest rate of annual increase. The Sino-Soviet bloc is in the middle. These per capita production trends are shown in chart II.

Before World War II (1935–39), the industrialized West and Japan produced about 475 kilograms per capita of grains, pulses, root, and tuber crops. By 1959, this had increased by about 30 percent to 620 kilograms. At this rate of expansion, per capita production of these products would go to about 665 kilograms, an increase of 9 percent between 1959 and 1971.

Both the Sino-Soviet bloc as a group and the underdeveloped countries as a group suffered setbacks in agricultural production during the war years. In the Sino-Soviet bloc, per capita production of grains, pulses, tubers, and roots dropped from 420 kilograms in 1935–39. By 1950, it was still down to 340 kilograms but subsequently recovered to the prewar per capita level by 1956. The lower figure shown here for 1959 reflects adverse growing conditions, particularly in Russia and China. Recovery in grain production did not begin in Russia until 1961 but the poor crops in China in 1960 and 1961 suggest that the total per capita production for the Sino-Soviet bloc is at present (1961) probably no greater than in 1956 or in the prewar years, but still substantially greater than in 1950.

This irregular record makes it difficult to point to the probable increase in Sino-Soviet production by 1971. Perhaps as good a guess as any, based on the 1950–59 figures, is that the bloc may experience an increase of 10 to 12 percent per capita. Its production would then be about 470 kilograms per capita and about 30 percent below that of the industrialized West.

Similarly the per capita production of these selected crops in the less developed countries fell from 270 kilograms in 1935–39 to less than 210 kilograms in 1950. Recovery to the prewar level has been slow, held down in part by the increase in population. Here, too, the 1950–59 record is not adequate for judging the probable 1971 production level, but as good a guess as one may make would point to about 285 kilograms per capita or about a 5-percent increase over the prewar figure.

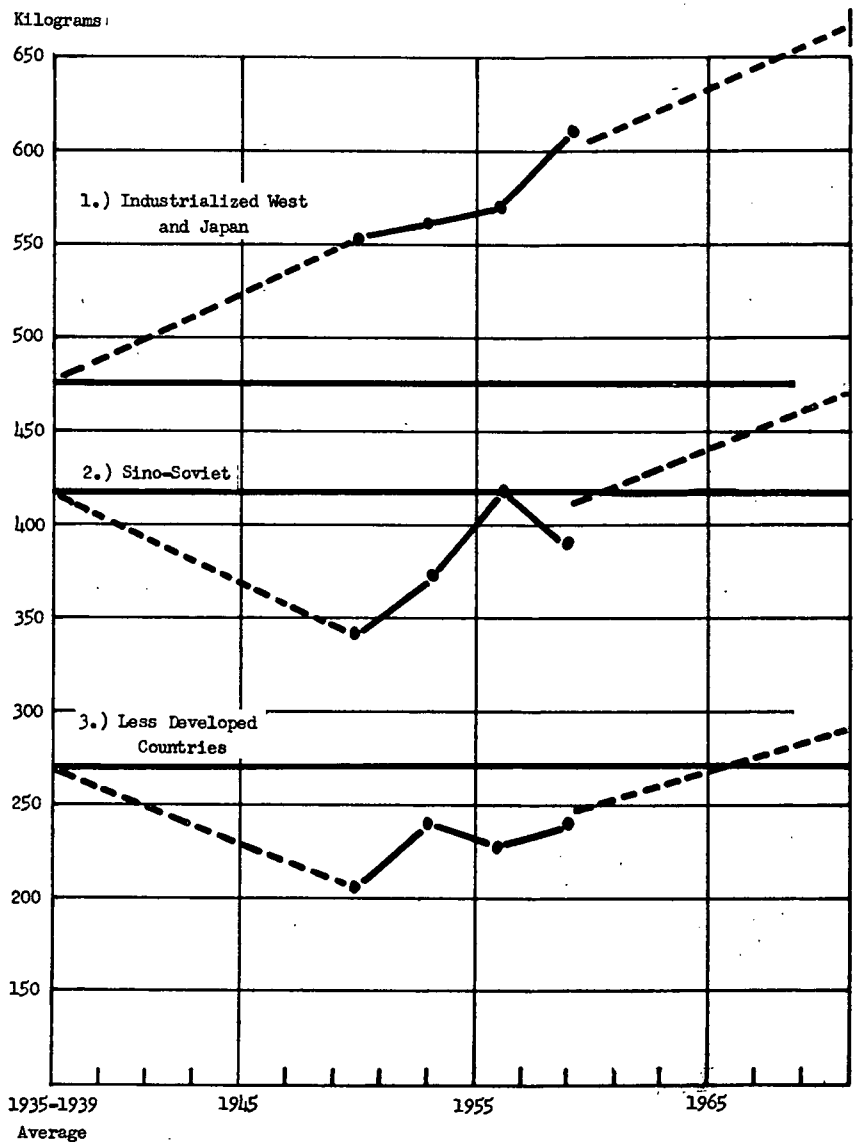
If these trends materialize, the world will still face the great issues generated by the food gap, 285 kilograms per capita in the underdeveloped countries, 670 in the industrialized West, and in between, but advancing faster, the Sino-Soviet group with 470.

A more comprehensive analysis of world agricultural production trends in relation to population changes is presented by the U.S.

CHART II

World Production of all Grains, Pulses, Roots and Tubers, Per Capita, 1935-1937, 1950, 1953, 1956, 1959

For Three Major Areas



Department of Agriculture in its October 1961 report on "The World Food Budget, 1962 and 1966." [1] Whereas the foregoing trends in agricultural production are based on selected items of grains, pulses, roots, and tubers, the U.S. Department of Agriculture report presents indexes of total agricultural production. Table I summarizes the annual average changes in total and per capita production for the 23-year span from 1935–39 to 1960–61 and for the 7-year period 1952–54 to 1960–61.

TABLE 1.—*Annual percent change in total and per capita world agricultural production by major regions, 1935–60*

Regions or country	Total production		Per capita production	
	1935–39 to 1960–61	1952–54 to 1960–61	1935–39 to 1960–61	1952–54 to 1960–61
Latin America	3.1	3.4	0.04	0.6
Africa and west Asia	2.5	3.0	.2	.7
Far East (excluding Japan)	1.5	2.7	−.3	.7
Communist Asia	1.0	2.4	−.4	.3
East Europe (including Soviet Union)	.9	4.4	.5	2.7
Western Europe	1.8	2.1	.8	1.3
United States and Canada	3.0	2.4	.9	.6
Japan	3.3	6.4	1.3	4.9
Australia and New Zealand	2.7	3.4	.3	1.0
World	1.8	3.0	.3	1.0

Source: Appendix table 6.

The outstanding facts in table 1 are the production increases now taking place in Japan and in eastern Europe, including the Soviet Union. Compared with a world annual average increase in total production of 3 percent, Japan has been experiencing a 6.4 percent increase and east Europe, 4.4 percent. For Japan, this represents a per capita increase of 4.9 percent annually, and for east Europe, 2.7 percent compared with a worldwide increase of only 1 percent.

The less developed countries (Latin America, Africa, west Asia, and the Far East (excluding Japan) have rates of increase per capita of 0.6 to 0.7 percent and Communist Asia only 1 percent.

There is little evidence in these increases in per capita production of less than 1 percent per year in the less developed countries that their food consumption levels can approach adequacy in the next decade. The gap between potential production and adequacy is so wide that the world's food budget will remain unbalanced for many years to come. The obligation and effort to help close the food gap will continue to play a major role in our foreign economic policies.

[1] Foreign Agricultural Economic Report No. 4 (Washington).

III. THE NUTRITIONAL GAP

It is possible to obtain an impression of what the world food situation may be as a result of current trends in world agriculture, including the influence of foreign agricultural programs and policies of the United States and of other countries. These facts recently made available by the USDA report on "The World Food Budget, 1962 and 1966" may also point to changes required in our agricultural production programs, to new programs in the distribution of our food products abroad, and to improvements in food processing technology so as to speed up progress toward balancing the food budgets of underdeveloped countries.

To understand the nature of the world's food deficiencies, it will be helpful to note the differences between the major areas of the world in the composition of the daily average consumption in 1958 given in table 2. The areas of deficit diets are clearly identified as those where calories consumed per day fell below 2,700.

TABLE 2.—*Food consumption: Daily average per capita levels, by regions, 1958*

Country or region	Countries in region	Calories	Protein				Fat
			Animal	Pulse	Other	Total	
	Number	*Number*	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*
Canada	-------	3,080	62	2	30	94	138
Latin America	20	2,640	24	9	33	66	60
Mediterranean Europe	4	2,660	25	6	44	75	74
Other Western Europe	12	3,040	48	1	32	81	120
Soviet Union	-------	2,985	26	3	63	92	70
Other Eastern Europe	7	2,925	28	3	47	78	83
West Asia	7	2,365	13	5	55	73	40
Africa	21	2,454	11	10	43	63	44
Far East	11	2,100	8	12	36	56	32
Communist Asia	4	2,200	6	15	44	65	32
Oceania	2	3,210	67	5	31	103	136
United States	-------	3,220	66	5	26	97	149

Source: Appendix table 5.

From the USDA study, five regions emerge with countries that are labeled diet deficient. The deficiencies, of course, vary by country and by commodities. The diet-deficit regions are found to be Latin America, Africa, west Asia, the Far East, and Communist Asia. For these diet-deficit countries as a group, estimates of production and consumption, as well as estimated requirements to meet nutritional standards, are given in table 3. These are all expressed in terms of four commodity groups: wheat, pulses, dry skim milk, and vegetable oils.

TABLE 3.—*Production, consumption, and import needs for diet-deficit countries*

Food	1958	1962	1966
Wheat (million metric tons):			
Production	69.4	72.8	79.7
Consumption	81.1	93.6	105.0
Import needs:			
For projected consumption	11.7	20.8	25.3
To meet nutritional needs	41.4	50.2	54.5
Dry beans and peas (million metric tons):			
Production	33.5	39.8	44.0
Consumption	35.0	39.8	44.1
Import needs:			
For projected consumption	1.5	.0	.1
To meet nutritional standard	1.8	.2	.3
Nonfat dry milk (thousand metric tons):			
Production	21.0	29.0	36.0
Consumption	208.0	330.0	479.0
Import needs:			
For projected consumption	187.0	301.0	443.0
To meet nutritional standard	1,656.0	1,819.0	1,995.0
Vegetable oils (million metric tons):			
Production	9.9	11.2	12.3
Consumption	8.2	9.7	10.9
Import needs:			
For projected consumption	−1.7	−1.5	−1.4
To meet nutritional standard	1.8	1.9	1.8

Source: Appendix tables 2 and 3.

The unbalanced food budgets are here revealed in protein shortages expressed in terms of wheat and nonfat dry milk and in fats expressed in terms of vegetable oils. It is surprising that the situation in 1966 in these diet-deficit regions is likely to show so little improvement by 1966.

In the case of proteins and calories that could be derived from wheat, production is expected to increase by 10 million metric tons by 1966 over 1958, consumption is expected to increase by 24 million tons (from 81 to 105 million tons). To meet this consumption deficit, imports will need to exceed twice what they were in 1958. But measured against the nutritional standard, the deficit will continue to mount from 41.4 million tons in 1958 to 50.2 million tons in 1962, to 54.5 million tons in 1966.

In the case of proteins which can be obtained from pulses, production will just about balance requirements both in 1962 and 1966.

In the case of animal proteins that can be derived from nonfat dry milk, the estimated deficits are most striking. Production in these diet-deficit countries is practically negligible. Consumption is expected to increase noticeably, through imports, chiefly from the United States. But consumption in 1966 is not expected to equal more than a fourth of the requirements to meet nutritional standards.

The foregoing comparisons deal with all diet-deficit regions as a group. Marked contrasts show up in the several regions and even greater ones by countries. Some of these contrasts appear in the following summary of diet deficiencies by regions not satisfied by the projected consumption for 1962 and 1966.

TABLE 4.—*Dietary deficiencies of diet-deficit regions not satisfied by projected consumption for 1962 and 1966*

[In thousands of metric tons]

Area	Animal protein in terms of nonfat dry milk		Pulse protein in terms of beans and peas		Other protein and calories in terms of wheat		Fat in terms of vegetable oil	
	1962	1966	1962	1966	1962	1966	1962	1966
Latin America	0	0	0	0	2,714	2,665	49	38
Africa	89	64	69	75	2,365	2,361	20	20
West Asia	0	0	0	0	1,283	1,297	48	15
Far East	714	698	81	90	20,285	19,735	1,568	1,299
Communist Asia	715	790	0	0	2,710	3,250	1,660	1,860
Total	1,518	1,552	150	165	29,357	29,308	3,345	3,232

Source: Appendix tables 2 and 3.

The shortage in animal protein in terms of nonfat dry milk is chiefly in the Far East and in Communist Asia, with some in Africa. In the case of pulse protein, the deficiencies are almost entirely in Africa and the Far East. In the case of other protein and calories in terms of wheat, the deficit is predominantly in the Far East with some in each of the other four diet-deficit regions. The shortages of fat in terms of vegetable oil are chiefly in the Far East and Communist Asia.

Why are the prospects for closing these nutritional gaps in the near future so disappointing? Some of the reasons and problems are suggested in the U.S. Department of Agriculture comments on the four items of shortages. The following are excerpts from the report on "The World Food Budget." [1]

Animal protein.—The reference standard for animal protein is 7 grams per day per person, or about 12 percent of the total protein. This is a minimum. Where a deficiency occurs it may be critical for it affects lower income persons and, most adversely, preschool children and pregnant and lactating mothers—the most in need of this food nutrient.

The deficiency ranges from about 1 grain in Nigeria, India, and Communist Asia to 3 grams in Indonesia and 4 grams in Liberia. Because of inadequate purchasing power of lower income groups and faulty distribution of foodstuffs within countries, deficits may be more serious than indicated by the foregoing figures.

World production of nonfat dry milk only slightly exceeds consumption. Canada, the United States, Australia, and New Zealand account for all excess production by region over domestic consumption.

If larger shipments from surplus to diet-deficit regions are to occur, production in surplus regions will have to be increased proportionally. Such an increase would probably be used primarily in expanding school lunch programs. Such programs do not reach the persons most in need of animal protein.

Countries with animal protein shortages would be exceedingly reluctant to establish and operate countrywide free food distribution programs. If the required animal protein is to be consumed by those most in need, purchasing power of consumers must be increased. This can come about only through further economic development. As such development occurs every attempt should be made to increase the efficiency of milk production and to expand the fisheries industry.

[1] Op. cit., pp. 24-27.

Much can be done on both approaches in all animal protein shortage areas, particularly milk in India and fisheries in Indonesia.

Pulse protein.—The reference standard for pulse protein is an amount which, when added to available animal protein, equals 17 grams. This protein supplements cereal protein and is especially important in the diet when animal protein is less than 17 grams.

A deficiency in pulse protein in 1962 appears only in Ceylon at 5 grams, in Malaya and Thailand, each at about 1 gram, and in scattered areas of central and western Africa, ranging from about 1 gram in Nigeria to 7 grams in Liberia. The pulse protein deficit in 1962, expressed in terms of dry beans and peas, is 69,000 tons for Africa and 81,000 tons for the Far East. Somewhat larger tonnages are indicated for 1966.

Pulse protein shortages could perhaps best be met by increasing production in the deficit regions. This does not appear to pose any formidable problems. It may be noted that Thailand is a substantial exporter of pulses and Nigeria of peanuts. In both countries the shortage in consumption appears to relate more to low personal income, faulty internal distribution, and Government export policy than to a shortage of supply.

"Other" protein and calories.—The reference standard for total protein is 60 grams. The standard for calories varies from 2,300 for the Far East and Communist Asia to 2,710 for Canada and the Soviet Union. Deficiencies in "other" protein (protein other than animal and pulse) and in calories are expressed in terms of wheat.

In the projected 1962 and 1966 food budgets, calorie shortages occur in 36, and "other" protein shortages in 31 of the 60 less developed countries and areas included in this study. The two shortages generally occur together in the same country. Principal exceptions are the nine countries and areas of central and western Africa where no calorie shortage occurs, but where animal and pulse protein and fat shortages are widespread. The reason for this is that in this tropical area cassava, other root crops, bananas, and plantains are generally plentiful so that food energy sources are readily at hand.

Calorie and "other" protein shortages, expressed in terms of wheat, total over 29 million tons for both 1962 and 1966. The 1962 food budget for the five diet-deficit regions includes 93.6 million tons of wheat from domestic production and 20.8 million from imports, including accelerated concessional purchases and grants. This is 9.1 million tons more wheat than the regions imported in 1958. The 1956 food budget provides for imports of 25.3 million tons. These tonnages are about as much as these regions can and are willing to receive and move into consumption. The remaining deficit therefore of over 29 million tons for each of the 2 years cannot be further reduced by imports. Even if it could, it would seem unwise to create dependence on outside sources for a larger share of the food supply.

The diet-deficit regions should therefore be encouraged and assisted to increase their own wheat and other cereal production, first to erase the nutritional shortage, and then to reduce imports. It is only by such means that the diet-deficit nations can assure the food supply essential for their survival, and establish the conditions necessary for economic growth and advancement of their material well-being.

In the densely populated Far East, where land resources are limited, population is expanding rapidly, and the nutritional deficit in "other"

protein and calories in terms of wheat is 20 million tons. Ever-increasing availabilities of plant nutrients and larger and larger expenditures for irrigation will be necessary to increase cereal production sufficiently to erase this deficit. Over the next 15 years, this means the expenditure of some $3 billion for construction of fertilizer plants and a similar expenditure for irrigation works.

Fat.—The reference standard for fat is the amount that will provide 15 percent of standard calories. This is regarded as a nutritional floor rather than a desirable standard. For the diet-deficit area, the standard ranges from 38 grams per person per day for the Far East and Communist Asia to 42 grams for Latin America.

This nutritional shortage occurs in 27 of the 60 countries studied in the diet-deficit area. The total deficit expressed in terms of vegetable oil is 3.3 million tons in 1962 and 3.2 million in 1966. The shortage is primarily in the Far East and Communist Asia.

The Far East, which shows a shortage in consumption of 1.6 million tons in 1962 and 1.3 million in 1966, is the world's third largest net exporter of vegetable oil and oil-bearing seeds and materials, exceeded only by the United States and Africa. The major Far East exporting countries—Malaya, the Philippines, Indonesia, and Ceylon—do not show shortages in consumption. In the remaining countries, therefore, the problem appears to be lack of foreign exchange for imports and lack of consumer purchasing power.

In countries where effective demand for vegetable oil is weak, because of a relatively high price compared to other food and living necessities, imports of vegetable oil under concessional terms would only increase the oil consumption of those whose present intake is probably well above the fat standard. This would leave persons with a fat shortage generally unaffected.

Since fat-deficit countries are unlikely to engage in countrywide free food distribution programs, the problem can only be resolved by increases in personal income through economic development. Such increases will tend to spur production of vegetable oil within the countries and may also encourage further imports.

It may be generally concluded from this analysis that nutritional shortages are closely related to low per capita production of food and goods that can be traded for food. These shortages can only be erased by substantial and sustained increases in agricultural production that make for balanced economic development in the diet-deficit regions themselves.

ILLUSTRATION AND FEEDING PROGRAMS GO TOGETHER

There is a common theme in all of the foregoing USDA comments bearing on these nutritional gaps in the various regions and countries, namely, the lack of purchasing power. Insofar as this is one of the basic reasons why both urban and rural populations in the less developed countries are undernourished in terms of proteins, calories, and fats, closing the nutritional gaps is bound to be a very slow process. What is involved here is the slow rate of speed with which predominantly rural countries can industrialize. For example, pre-World War II experience all over the world indicates that per capita purchasing power of a country tends to double when the complex and usually slow processes of industrialization succeed in producing a 20-point reduction in the proportion of the labor force engaged in agriculture.

Thus a country may expect its per capita national income to double gradually when it succeeds—through advances in industrial and agricultural production, and distribution, and through the general spread of technical and scientific education—in bringing the agricultural share of the labor force down from 80 to 60 percent or from 70 to 50 percent or from 60 to 40 percent.[2] There is reason to think that this formula still holds.

Unfortunately, even under the favorable condition which promoted the industrialization of the United States, it required at least two decades to attain a 20-point gain in industrialization. Consequently the closing of nutritional gaps in a matter of only a few years cannot wait on the industrialization of a country.

The real question, bearing on greater and speedier progress in closing nutritional gaps, is how soon can the economies of underdeveloped countries show a 20-point gain in industrialization without help. Further, how much sooner can this be brought about by help from the industrialized countries by means of capital, industrial and agricultural technology, *concurrently* with direct aid to the undernourished, especially the young, who are the future entrants into the labor force and the vital element in greater productivity.

[2] See paper on "International Industrialization and Per Capita Income" by Louis H. Bean, in vol. 8 on "Income and Wealth," National Bureau of Economic Research.

IV. LONG-RANGE ECONOMIC DEVELOPMENT AND HUMAN FEEDING PROGRAMS

Many projects have been, and are being, launched to help close the nutritional gap among the less developed countries. United States agricultural production is being made to play an increasingly greater role. There are projects aimed at making our surplus wheat, cotton, and other crops available under concessional arrangements, at prices below domestic supports and for foreign currencies where dollars are not available. There are technical assistance projects that aim at helping the less developed agricultural countries improve their agricultural productivity. There are economic development projects for countries that are willing to accept and make use of our surplus wheat to supplement wage payments. There are projects in which we stand willing to donate some of our surplus feeds to assist persons to enter into feed processing operations and the production of livestock in order to help build up their own sources of animal protein. There are the additional food relief programs both to meet emergencies and to provide food to undernourished persons carried out by private voluntary relief agencies. These agencies in many countries are distributing food obtained from the CCC through schools and institutions and directly to families and individuals. Details of these activities will be available in the President's next report to Congress on Public Law 480 operations for July–December 1961.

The Outlook for closing the nutritional gap

In spite of all of these current and prospective efforts on our part and the agricultural programs planned by the recipient countries themselves, the USDA appraisal of the world's food balance are no real outlook for closing of the nutritional gap in the next 5 years. The dietary deficiencies of the diet-deficit countries not satisfied by projected production and consumption for 1966 appear to be practically the same as those estimated for 1962. For the five diet-deficit areas of Latin America, Africa, west Asia, Far East and Communist Asia, the estimates are as follows:

TABLE 5.—*Food deficits, in thousands of metric tons, in diet-deficit countries*

Food	Total		Excluding Communist Asia	
	1962	1966	1962	1966
Protein, in terms of nonfat dry milk	1,518	1,552	803	762
Protein, in terms of beans and peas	150	165	150	165
Other protein and calories in terms of wheat	29,357	29,308	26,647	26,058
Fat, in terms of vegetable oil	3,345	3,232	1,685	1,372

Source: Appendix tables 2 and 3.

The only noticeable shrinkage in these deficits appears in the projections for fat in terms of vegetable oil in the non-Communist countries. For the Far East where nearly half of the total vegetable oil shortage in diet-deficit countries prevails, the 1962 deficit of 1,568,000 tons is expected to be reduced to 1,299,000, probably as a result of stepped-up relief exports from the United States. For Communist Asia, the vegetable oil deficit for 1962 of 1,660,000 tons increases to 1,860,000 tons.

The view fairly commonly held that the world's malnutritional problems will be righted once higher living standards and purchasing power are attained has recently been stated by a respected nutritionist in these words:

> I can see no long-range advantage either to us or to people concerned in trying to meet the world's shortage in protein foods for man by supplying foods from the United States. The people who are suffering most severely from protein malnutrition are in lowest economic groups in the most underdeveloped countries. There is very little hope in the foreseeable future that they will have money enough to buy imported products. The solution seems to me to be to improve their protein supply within their own resources with U.S. technical assistance, make them stronger and healthier so that they can become more productive, and thus raise their economic level so that we can do business together to mutual advantage.[1]

This view seems to imply a neglect of millions of children destined to die of malnutrition in 1962, 1963, and far into the future, certainly during all the years that will be required "to improve their protein supply within their own resources." No realistic view of what U.S. technical assistance can accomplish in 1, 2, 5, or 10 years can see enough progress in the protein-deficit countries of Asia and Africa and Latin America to cause us to cease our concern for relating our agricultural production capacity to prevailing poverty and malnutrition.

Most of our foreign aid aimed at closing nutritional gaps is going to be chiefly and increasingly through economic development projects, while direct food relief operations may suffer from diminished interest since they are often mistakenly looked upon as not contributing to economic development. Many of these economic development projects are bound to be of the pilot-project type, which means that several years must elapse before demonstrated feasibility emerges into countrywide acceptance. This holds true for desired advances in agricultural practices to raise productivity as well as for the introduction of new foods and new food processes. The long-run benefits of many economic development projects do not meet the needs of starving and underfed children and adults today.

As a guide to what economic progress may normally be expected in underdeveloped countries two simple facts may be helpful. One is that it requires an annual increase of 3.5 percent per year in per capita real income to obtain a doubling in per capita income in 20 years. The other is that this rate of advance is most unusual. Even in the United States when it was predominantly an agricultural country, the rate of change in the economic balance between agriculture and industry was not as speedy as the impatient, less developed countries require today. Prior to 1900, when more than 40 percent of the United States work force was engaged in agriculture,

[1] "World Aspects of Protein Malnutrition" by Dr. W. H. Sebrell, Jr., M.D., director of the Institute of Nutrition Science, Columbia University—in proceedings of Conference on Soybean Products for Protein in Human Foods, Sept. 13-15, 1961. U.S.D.A. Agricultural Research Service.

the growth of industrialization showed up as an increase of 6 to 7 percentage points per decade in the proportion engaged in nonagricultural occupations.[2] And under these changing conditions, favorable to both agriculture and industry, our national income per capita did not double every 20 years.

Any country today that is 60 to 80 percent agricultural may have good reason to expect a rise in its per capita income during the present decade as it makes use of modern know-how and can make full use of the assistance the industrialized West is making available. But it is not likely that any such country, which typically has a per capita income of only $100 or $200, can expect to see in the next 5 or 10 years a doubling of even such low per capita incomes. Therefore no great immediate improvement in the nutritional gaps can be expected from economic projects alone.

Since it is the next few years that are crucial to countries subjected to Communist pressures, it is necessary to examine the nutritional gaps for more effective, more direct, more immediate ways of meeting the essential food requirements of undernourished people in the more immediate future, while the slower programs and processes of economic development lay the basis for greater improvement in living standards later on.

The need for additional sources of protein

When we examine the world's nutritional gap closely we find that the basic shortage is in protein food, that the shortage is concentrated very largely among infants and children of preschool age. The voluntary relief agencies, primarily responsible for carrying out our foreign feeding programs reach millions of needy persons, but these represent a very small part of the total needing nutritional help. Furthermore, the supply of protein foods that can be made available to the relief agencies actually is not in the abundance generally supposed. The hard fact is that if the relief agencies were to arrange with the governments of the recipient countries to distribute twice as much protein food as they are now distributing under title III of Public Law 480, we would not be able to supply the needed foods. The main item of food for the young among the needy is milk and we are not in a position today, and are not likely to be in the next 5 years, to materially expand the donations of dry skim milk. Here are some of the facts:

All responsible agencies and nutrition experts engaged in the problems of feeding the world's undernourished agree that the great need is in protein food. This is the view of the United Nations organizations dealing with food and agriculture, child feeding and world health, and of many nutritionists in the United States and all over the world. Speaking recently on the subject, Dr. W. H. Sebrell, Jr., M.D. and director of the Institute of Nutrition Science, Columbia University, said:

> There seems little doubt protein malnutrition is the most widespread form of deficiency disease today. Although nutritional anemia, goiter, and the various vitamin deficiencies continue to be major problems for certain segments of the population, from a world standpoint, protein malnutrition far exceeds these in importance.
>
> There is increasing evidence that protein malnutrition accounts for a major part of the deaths of children between weaning and school age in many parts of

[2] (See chapter on "Agricultural Capacity," by L. H. Bean in "America's Needs and Resources." (New York, 1955), p. 806.

the world. This situation has been recognized only in recent years because the effects of the deficiency have been complicated and hidden by the occurrence of infectious diseases.[2]

In spite of our farflung relief activities our food resources reach a relatively small proportion of needy persons. It is estimated that 22 million persons abroad receive our food distributed by the voluntary agencies through schools, about 20 millions more through families, and about 14 million more through institutions and maternal health centers. But these are only rough figures. They do not represent full-time feeding. On the basis of feeding an adequate daily ration every day of the year, these estimates would shrink considerably. While we do not have any adequate statistics on the number of children and older persons suffering from malnutrition, it is safe to assume that they run into several hundred millions.

Milk, in terms of costs to the Commodity Credit Corporation, is at present the largest item in our foreign relief program. During the first half of 1961, the CCC cost of foreign relief through the voluntary and intergovernmental organizations amounted to $113 millions, or $226 millions on an annual basis. Milk represented about 45 percent of the total; flour, about 30 percent; cornmeal about 9 percent; rice about 6 percent; wheat, 4 percent; shortening, 4 percent; and cottonseed oil and corn about 2 percent.

Cost of commodities shipped for foreign relief, January–June, 1961 (at annual rate)

	Millions
Milk	$102
Flour	68
Cornmeal	20
Rice	14
Wheat	9
Shortening	9
Cottonseed oil	3
Corn	1
Total	$226

For the current fiscal year 1961–62 much larger donations of vegetable oil, chiefly soybean oil, are being made.

We do not know how many children and adults are reached by the relief milk programs or any of the other programs intended to alleviate the protein shortage. But assume that a rate of feeding of about 30 pounds per person per year and that the total amount of dry skim milk now being made available though title II and title III of Public Law 480 operations is approximately 600 million pounds. Then, it would appear that we are supplying milk to about 20 million children—a very small proportion of the several hundred million needy children over the world.

Since nonfat dry milk is the main high-protein item made available to our voluntary relief agencies, plans for a more effective Food for Peace program must recognize that there are basic economic factors which limit the availability of U.S. nonfat dry milk.

[2] See "Proceedings of Conference on Soybean Products for Protein in Human Foods," Sept. 13–15, 1961, Peoria, Ill., from USDA Agricultural Research Service.

TABLE 6.—*Foreign donations and noncommercial sales of nonfat dry milk, 1959–60*

[Million pounds]

Calendar year	Donations	Noncommercial export sales	Total	Calendar year	Donations	Noncommercial export sales	Total
1949	----------	141	141	1956	401	49	450
1950	71	187	258	1957	521	63	584
1951	55	83	139	1958	540	45	594
1952	----------	20	20	1959	332	53	385
1953	80	99	179	1960	399	83	482
1954	186	143	329	1961 (estimated)	----------	----------	(500)
1955	365	75	440	1962 (estimated)	----------	----------	(600)

Source: Department of Agriculture.

The prospect of a limited expansion of donations of nonfat dry milk does not trace to the lack of opportunity for the voluntary agencies or to their inability to expand their operations. Rather, it is because of the prospect of limited production of nonfat dry milk and the creation of surpluses of butterfat if production of dry skim milk were additionally expanded. Total milk production is increasing at a very slow pace, the increase in production per cow being practically offset by the continuing decline in the number of cows. The USDA estimates that "at the present rate, the shift from marketing cream to marketing whole milk should about have run its course by 1965. Thus, the rate of increase in marketings of nonfat solids will slow approximately to that of total milk production." [3]

By 1966, the rising domestic demand for nonfat dry milk is likely to amount to about 9 pounds per capita compared with 7 pounds in 1961, to 4.1 in 1951, and to 2.5 in 1941. With total population increasing, total domestic demand in 1966 will probably be 35 to 40 percent greater than it is today. This would call for an increase of, say, 400 million pounds. Estimates of production over the next 5 years will not be sufficient to meet this increasing domestic demand. Consequently it is not possible to visualize greater foreign relief donations except at the expense of domestic consumers and probably higher costs per pound than the 16 to 18.5 cents now being paid by the CCC. Thus, there is little prospect of doubling the present volume of nonfat dry milk under the Food for Peace program, either in 1962 or by 1966.

We must therefore turn our attention to other possible sources of high-protein foods in both beverage and solid form for infants, preschool children, and older persons. The interest in nutrition problems on the part of many Government and non-Government agencies, private food processing corporations, and nutrition experts has brought to the fore a number of new high-protein products and product mixes which can now be utilized to make immediate progress in greatly diminishing the nutrition gap. Protein inadequacy of staple foods for children and adults can now be corrected if special attention is given to the very recent developments in the production of high-protein crops, in the processing of high-protein foods, and in the results of nutrition experiments here and abroad.

[3] See "Farm Production Trends, Prospects and Programs," USDA Bulletin 239, Agricultural Research Service, May 1961, p. 75.

V. HOW TO BALANCE THE WORLD'S FOOD BUDGET

From the standpoint of world politics as well as humanitarian considerations, it would be most unfortunate if in the next 2, 3, or 4 years we make no more progress in meeting the world's nutritional deficits than we have done in the past few years. Yet, this is the prospect if we wait on the essential but slow-moving economic development programs to increase living standards enough to do away with malnutrition. We have already noted that creating job opportunities, raising industrial and agricultural productivity, and promoting trade must, of course, be the great preoccupation. But there must also be a concurrent preoccupation with the masses of underfed people who, for a long while, will not achieve adequate economic or nutritional benefits from the inevitably slow-spreading processes and progress that flow from economic development programs.

Reviewing the plant protein sources of the world, one must come to the oilseeds for help in closing the protein gap. The great food staples, wheat, rice, and corn, contain only 7.5 to 13 percent of protein; legumes, 26 percent; cottonseed and sunflower seed, 20 percent; peanuts and sesame, 25 percent; but soybeans, 38 percent.

Soybeans dominate the world supply of protein from oil seeds. Excluding the U.S.S.R., soybean production provides twice as much protein as peanuts, cottonseed, sesame, and sunflower seed combined. Two additional facts are important here. One is that the United States accounts for more than half of the world's soybean production. The other is that in the United States soy protein is used predominantly in livestock feeding, whereas in the Orient it is used in many ways as human food. Cottonseed, both in the United States and elsewhere, is also used chiefly as livestock feed.

In the United States, soybeans hold an even more dominant position among the oilseeds. The 1961 production of peanuts and cottonseed together represent less than 1 metric ton of protein, whereas the 700 million bushel soybean crop represents about 7 million metric tons. Our soybean crop now exceeds probable uses in 1961–62, and a continued rise in production will make it possible to supply additional quantities of soybean oil and soy flour for humans as well as meal for livestock in the Food for Peace Program. Thus, soybeans dominate the following review of current developments in new protein foods and processes, since they present the great potential means for balancing the world's food budget.

New protein foods

What are these new food products and food processes that promise so much?

Let us turn to a most timely and authoritative report just off the USDA press entitled, "Proceedings of Conference on Soybean Proucts for Protein in Human Foods." [1] The sponsors of this conference were

[1] Op. cit.

three agencies of the USDA—the Northern Utilization Research and Development Division, the Agricultural Research Service, the Foreign Agricultural Service—and the United Nations Children's Fund and the Soybean Council of America. This document deals authoritatively with these topics:

(1) "Nutritional Deficiency Problems in Developing Areas of the World."

(2) "World Marketing of Soybeans and Soybean Products."

(3) "Research and Development on Soybean Foods."

(4) "Nutritional and Biological Studies."

(5) "Processing and Feeding Value of Fluid and Dry Soy Milks."

(6) "Problems Involved in Increasing Worldwide Use of Soybean Products as Foods."

While the report is devoted mainly to soybean products in human foods, it deals also with other high-protein foods. It brings to date the latest findings with regard to processes and nutritional values.

The prospective world supply of important protein foods may be put, according to Dr. Sebrell, of Columbia University, into five classes of products: (1) animal, (2) marine, (3) cereal grains, (4) oilseed press cakes, and (5) legumes.

The following comments on current developments relating to animal products, marine products, and cereal grains are taken from Dr. Sebrell's paper on "World Aspects of Protein Malnutrition."

"*Animal versus vegetable protein.*—For many years, nutritionists tried to meet the intricacies of the problem by specifying not only a total amount of protein for an individual but also by saying that a certain proportion should be from animal sources. However, it is well known that a completely adequate protein supply can be obtained solely from vegetable sources if the supply of essential amino acids is carefully looked after.

"*Marine products, fish flour.*—The greatest possibility in this area lies in the production of a suitable fish flour which could be stored without refrigeration and with little odor and taste so that it would be suitable for mixing with other foods. The natural tendency of the industry is to try to convert the present fish fertilizers or animal food products to human use with a minimum change. Preliminary results in this direction have not been very successful in that the final product is of variable quality and may be of low biological value. The problems here appear to be largely economic and technical.

"A suitable product can be made, and has been made, that will meet the requirements for biological value, taste, color, and odor. Whether it can be produced at a price which will make it economically feasible is the question that remains to be solved. The chances appear to be good.

"*Cereal grains, incaparina and other low-cost, high-protein mixtures.*—The three cereal grains, rice, wheat, and corn, really constitute the foundation of the food supply of most of the world. Unfortunately the protein of these three cereal grains is deficient in one or more of the essential amino acids. Animal and marine protein foods cannot be made available in amounts sufficient to meet the need and at suitable prices. The most logical solution is a mixture of foods of vegetable sources or a mixture with a small amount of added animal protein. A large group of foodstuffs of relatively high protein value now largely wasted as human food immediately comes to mind. The

products of greatest importance are soybeans, peanuts, and cottonseed.

"These usually contain 40 percent protein products and therefore represent a wasted resource for human protein food which could be immediately utilized. There are no technical problems in the use of soybeans, cottonseed, and peanuts.

"The best known food mixtures that are now under study and development in various parts of the world are the following:

"Incaparina mixture #9, which consists of:

	Percent
Corn mesa	28
Sorghum	28
Cottonseed flour	38
Dehydrated leaf meal	3
Torula yeast	3
Calcium	1

with vitamin A added.

"This mixture developed for the Institute of Nutrition of Central America and Panama, primarily for use in Central America (as a beverage for children and as a food additive), has been thoroughly tested both for its biological value and acceptability. The mixture is now licensed by INCAP for commercial production. It illustrates a successful low-cost protein mixture of good biological value.

"Another product that has received extensive testing is known as Indian multipurpose food and consists of:

	Percent
Peanut flour	75
Bengal grain	25

with certain vitamins and calcium phosphate added. This is now being produced and given to schoolchildren in some parts of India.

"A third type of mixture has been used by Dr. Dean in Uganda as a biscuit for schoolchildren and contains:

	Percent
Dry skim milk	15
Sucrose	12
Cottonseed oil	6
Maize flour	26
Peanuts	41

"Dr. Bradford in Peru has developed a mixture made of:

	Percent
Cottonseed flour	30
Quinuia	10
Habas	10
Achita	10
Alfalfa leaf meal	2
Torula yeast	2
Wheat flour	35

"Dr. Wei in Taiwan has been experimenting with a mixture of:

	Percent
Soybean	60
Rice	20
Wheat	20

He is also trying:

	Percent
Soybean	40
Peanuts	20
Rice	20
Wheat	20

"American multipurpose food has been made in a variety of formulas based on soybean meal. The results of controlled experiments with these products are not yet available.

"Soybeans appear to offer one of the most attractive possibilities for making a suitable food mixture of high-protein value at low cost. Mixtures of various other products, such as corn, peanut flour with fish flour, meat powder, fish flour, dry skim milk, and the use of a variety of legumes would appear to offer the most attractive possibilities.

"We have on hand the knowledge and the resources to improve the health of millions of people in the world today. I do not see any practical problem in the world's supply that cannot be solved by education, research, and by good planning."

Nutritional studies relating to the development and uses of soy-containing foods.—The U.S. Department of Agriculture conference report contains considerable information on this subject. Two summary statements will suffice.

H. P. Sarett of the Mead Johnson Research Center has reported studies showing that soybean meals provide protein of good nutritional value for use in infant formula products, in precooked cereal products for the infant, and as an important constituent of nutritional specialty foods.

Commercial soybean milks have been tested on infants by Dr. Paul Geörgy, chairman of pediatrics, Philadelphia General Hospital, under the sponsorship of the National Research Council, the International Nutrition Research Foundation, and Mead Johnson Co. His report concludes that commercially available soy products, and, in particular, soy milk, may be used as a satisfactory source of protein for feeding young infants, even prematures.

Processing of soy liquid and powdered soy milk in Asia.—Under this topic, Harry W. Miller, M.D., director emeritus, International Nutrition Research Foundation, and the first to establish a soy-milk plant in the United States, reported:

> The first commercial development was a soy-milk dairy establishment in Shanghai in 1935. The process used was in bottle sterilized milk formulated to the standard of cow's milk; also a chocolate milk, and a soy-acidophilus milk, which was extensively marketed all over the city of Shanghai up until the plant was destroyed in 1937 by the bombing of Shanghai.
>
> Using the formula of animal milk, from 1 pound of soybeans we can obtain sufficient protein extracted to formulate a gallon of milk. This pound of soybeans yields all needed protein, half of the required oil, and some of the edible carbohydrate. The B vitamins, together with some minerals are present, and other vitamins can be added at low cost. At the market value of the sum total of constituents needed to constitute a gallon of formulated vitamized soy milk less than 15 cents is required, and these figures answer quite well for most parts of the world. Low-cost small pilot plants operated by cheap labor in countries of low economic resources seem very practical. These figures and statements are verified through the operation of several small pilot plants in south Asia countries.
>
> Soybeans incorporated in the national diets as a milk and cheese and its many other recipes, if supplied in adequate quantities, insures balanced nutrition. It is a bodybuilder from infancy to the age limit. It is unique compared with other agriculture products in that it is available as a liquid, curd, or solid, as whole beans and flour.

Dr. Miller advises that his soy-milk plants operating in the Orient and in Honduras represent an average investment of about $2,000. An additional investment of $1,000 would convert the plant into a tofu, or soy-cheese, as well as a milk plant.

Pilot-plant studies on soy milk in the United States.—Research on soy-milk processing plants to determine the feasibility of small-scale plants for processing whole soybeans by eliminating costly steps now in use has been sponsored by UNICEF in its search for low-cost soy milk. Dr. H. B. Hand, of the department of food science and technology, New York State Agricultural Experiment Station, reported his findings:

> Dry soy milk of superior quality can be made directly from whole soybeans without including a water-extraction step. The yield is better, and the powder and labor costs are reduced. In the direct manufacture of dry milk from whole soybeans a homogenizer is added to the processing line but the evaporator and filter press are eliminated.

Storage life of soy flour.—The storability of foods in foreign countries is a major problem. Mr. Fred H. Haffner, of General Mills, according to the conference report, indicated that:

> Storage life of soy flour is unusually long, far more stable than milk products, even at 140° F. if kept sealed. In polyethylene bags there has been no deterioration up to 5 years if kept dry and free from rodents and insects.
>
> In India after 7 weeks' storage at 90° to 104° F. at a relative humidity well over 75 percent there was a slight softening and loss of crispness of samples stored in open bowls protected only by refrigerator covers at night, but no deterioration. This applied to both extracted and full-fat flours if the lipase had been destroyed. Until a few months ago no stable full-fat flour was being sold. Now we have stable products.

The special role of soybeans in the Food for Peace Program

The foregoing excerpts from the latest research findings on the place of soy protein in human foods, both as additives to cereals and as a beverage for child feeding, gives soybeans the outstanding position among the various new sources of protein. It is providential that this trend of development on the human nutrition fronts has been accompanied by a persistent rise in soybean production in the United States. The latest estimate places the 1961 crop at 700 million bushels, compared with less than 500 million bushels only 3 years ago, and 300 million bushels 10 years ago. This is now in dollar value our fourth largest cash crop and, if one may judge by the trends of the past 15 years in acreage and production, it is not inconceivable that we will be harvesting a billion-bushel soybean crop about 1966.

With this increase in production, we have experienced a comparable increase in demand, both domestic and foreign, and so far have not been faced with any serious carryover problems. There is, however, considerable doubt that total disappearance in domestic uses and exports will take up the entire new supply as they have been doing so far. Total disappearance in 1960–61 reached a record of 570 million bushels, and it could, in line with the recent trend, amount to 640 million bushels in 1961–62. This would leave a carryover of about 60 million bushels.

While a carryover of this magnitude presents no major surplus problem at present, since it would represent only about 1 month's requirements, it has an important bearing for the Food for Peace operations concerned with malnutrition.

It has already been noted that the protein deficit for 1962 in the diet-deficient countries has been estimated in terms of dry skim milk, wheat, and vegetable oil. The annual protein shortage, setting aside Communist Asia, is estimated to be about 800,000 metric tons, or about 1.7 billion pounds. Now, a bushel of soybeans yields about 40

pounds of soy flour which can be used either as additive to other foods or as a beverage nutritionally equivalent to nonfat dry milk. Thus, the entire protein deficit of the diet-deficit areas, other than Communist Asia, is the equivalent of about 42 million bushels of soybeans.

This fact takes on even greater meaning in view of the difficulties that we would face if the present donations of nonfat dry milk were to be expanded in line with the world's needs. As a rough example, let us assume that, in line with the President's promise to expand our Food for Peace efforts with major concern for the malnutritioned, we attempt to double the present volume of dry milk donations, from 600 million pounds to 1,200 million. If this could be done, without having to pay more per pound, it would mean an additional CCC cost of about $100 million and in addition there would be a very large surplus of butter and the attendant price-support costs.

Relative costs of nonfat dry milk and soy milk in the Food for Peace Program.—By way of contrast, what would it cost if, instead of doubling the volume of nonfat dry milk, the relief agencies were asked to distribute the additional 600 million pounds in the form of an equivalent volume of soy flour to be reconstituted as a beverage?

Does the soybean processing industry have the necessary capacity? What would a pound of soy flour cost compared with the current price the CCC pays, about 16 cents per pound in 100-pound bags, and about 18½ cents in 4-pound containers?

Representatives of the industry have recently indicated to the Food for Peace Program that the industry has a present capacity to convert about 10 million bushels of soybeans into flour or grits. This capacity could be doubled in about 6 months, to process about 20 million bushels of soybeans for flour and grits. Since a bushel of soybeans yields about 40 pounds of soy flour which may be considered as nutritionally equivalent to 40 pounds of nonfat dry milk, this capacity would be ample to provide 600 million pounds of soy flour which, if distributed for beverage purposes, could in effect double the present volume of milk in the relief programs.

What would this cost? Industry spokesmen indicated that, with present capacity, soy flour and soy grits would probably cost the CCC about 5 to 5.5 cents per pound, but if processed for beverage use in substantial quantity the cost per pound would be less than 10 cents. This suggests that the Food for Peace Program could reach as many more undernourished children as it is now doing, but that the additional number could be serviced at say $50 million compared with the present cost of $100 million for the same number.

Perhaps it should be added that there are in fact three possible ways of doubling the volume of the milk relief programs: (1) we might, regardless of difficulties with domestic consumers and butter surpluses, double the donations of dry skim milk; (2) we might keep milk distribution at the 600-million-pound figure and add as much more by 1966 in the form of soy flour; or (3) we might cut down dry milk to zero by 1966 and step up the donations of soy flour to 1.2 billion pounds by 1966. The first assumption would involve an accumulated cost of $816 million, the second $654 million, and the third, $492 million.

Relative costs of wheat flour and soy flour additives in the Food for Peace Program.—There are other cost-saving opportunities afforded by the prospect of soybean crops of 700 million bushels or more and by the recent advances in soybean processing technology. As additives,

soy flour can now be embraced in flour distribution programs and in school lunch programs with considerable nutritional benefit and with considerable reduction in the cost of supplying protein.

This example will suffice to indicate the nature of these opportunities. In Japan, the school lunch program gives a child a 100-gram loaf of white bread so as to provide a certain quantity of amino acids. But the same protein requirement can be met by a combination of only 40 grams of wheat flour and 5 grams of high protein soybean flour, with a saving of about 55 percent in terms of protein. On an annual basis, feeding 10 million children 250 days per year would cut down the protein cost by about $27 million. This saving would need to be offset in part by the addition of some other low-cost product such as rice (in the Orient) to substitute for the carbohydrates in the 60 grams of wheat flour replaced by the smaller quantity of soy flour.

This is only one illustration of the use of soy flour as a protein supplement in cereal foods. The U.S. Department of Agriculture and the soybean industry are now engaged in an extended field survey in a number of countries to introduce soy flour as a new source of protein usable as an additive, tailored to the world's varied tastes and diets.

The foregoing facts and views, a mere sampling of the subject, should suffice to indicate that our foreign feeding programs should be reappraised and enlarged. They should take into account not only these new food developments in the United States, but also the comparable developments abroad sponsored by foreign governments, by United Nations agencies, and by our own technical assistance and trade promotion activities abroad.

VI. THE NEED FOR QUANTITATIVE GOALS FOR OUR FOREIGN RELIEF FEEDING PROGRAMS

It is probably no exaggeration to say that we are now in a better position than ever before to plan our foreign feeding operations on a stepped-up, stable, continuing basis. Once the nutritional requirements are spelled out in terms of the basic elements of proteins, calories, and fats the range of our supplies is no longer limited to stocks of wheat and corn and uncertain quantities of rice and nonfat dry skim milk. As we have seen, the list of food protein sources that can now be drawn upon includes these and more:

soybeans
cottonseed
peanuts
sorghums
wheat
corn
rice

Where the feeding programs must meet protein needs and low costs per unit of protein, these availabilities make it possible to devise low cost high protein food combinations in place of merely high cost low protein cereal foods.

But in order to make full use of this wider range of available foods in a more effective expanded foreign food aid program, a greater degree of central direction will be needed than is now given to our feeding programs. That direction could be obtained in large measure by the following action:

1. The Food for Peace Office should request the responsible agencies to draw up a balance sheet of food needs for the less developed countries and match them with current and potential supplies of animal and vegetable proteins, pulses, cereals and vegetable oils, with special attention to the new sources of low cost vegetable proteins.

2. It should request these agencies to prepare a long-range 5- or 10-year program of feeding operations, on the assumption that these operations will for some years to come be a continuous outlet for our low-cost high-protein foods.

3. It should also set up short-range specific quantity goals, such as doubling the present volume of food donations, or doubling the number of recipients, or doubling the rate of feeding in 1962 or 1963.

4. It should present these short- and long-range goals to the voluntary relief agencies on the assumption that they will make the necessary arrangements abroad for carrying out the enlarged programs.

5. Similarly, processors should be asked to submit proposals as to new low-cost products to be included in the expanded and regularized program.

6. Consideration should also be given to making foreign food aid a part of foreign policy operations rather than part of the agricultural production adjustment and price-support programs.

A quantitative goal of this kind would make it possible for the responsible agencies to bring together the latest usable knowledge in food technology, in available foods and in nutrition, now nowhere centralized. It would also make it possible for food processors who have developed products that could be used in the food-for-peace programs to plan their capacities and figure their costs more realistically. It would make it possible for our Government agencies and the voluntary relief agencies to plan their activities more effectively not only in feeding programs but in assisting in developing the supply and uses of indigenous products and in establishing small-scale vegetable beverage plants and other food processing enterprises. Thus our donation programs could accomplish a great deal more to meet the world's needs in aid and ultimately also its needs in trade.

VI. APPENDIX

TABLE 1.—*Agricultural production: Total output and comparison with population arable land, and per capita income, world by regions, 1958*

Region	Production			Population [2]		Arable land [3]		Income per capita [4]
	Total value [1]	Distribution	Production per capita	Total	Distribution	Total	Distribution	
	Million dollars	*Percent*	*Dollars*	*Millions*	*Percent*	*Million hectares*	*Percent*	*Dollars*
Southern area:								
Latin America	15,275	9.1	79	193.1	6.7	102	7.3	235
Africa and west Asia	15,450	9.2	49	314.7	11.0	290	20.8	137
Far East, less Japan [5]	23,925	14.2	31	766.0	26.7	257	18.3	73
Communist Asia	26,910	16.0	40	675.0	23.5	112	8.0	62
Total	81,560	48.5	42	1,948.8	67.9	761	54.4	95
Northern area:								
Western Europe	26,275	15.7	86	303.8	10.6	97	6.9	657
Eastern Europe [6]	23,900	14.2	74	322.8	11.2	277	19.9	474
United States	26,475	15.8	152	174.2	6.1	188	13.5	2,070
Canada	2,550	1.5	150	17.0	.6	41	2.9	1,430
Japan	3,575	2.1	39	91.7	3.2	6	.4	230
Australia and New Zealand	3,775	2.2	307	12.3	.4	28	2.0	1,075
Total	86,550	51.5	94	921.8	32.1	637	45.6	843
World total	168,110	100.0	59	2,870.6	100.0	1,398	100.0	352

[1] From "Table 3: World Agricultural Situation, 1961," U.S. Department of Agriculture. World market prices were taken to be average 1958 wholesale or export prices in major exporting countries (e.g., Canada for wheat, Thailand for rice, the United States for soybeans, Brazil for coffee, Australia for wool, and Mexico for cotton).

[2] Economic Research Service estimates based upon United Nations and other sources.

[3] From FAO Production Yearbook, 1960, vol. 14. Arable land and land under tree crops. This does not include permanent meadows or pastures.

[4] Average, 1955–57. Estimates derived from official population and national income data of respective countries, as reported to the United Nations.

[5] Includes Pacific Islands.

[6] Includes Soviet Union.

TABLE 2.—*Wheat and dry beans and peas: Requirements, production, and import need or export availability, world by regions, 1958 and projected to 1962 and 1966*

[In million metric tons]

Commodity and region	1958			1962					1966				
	Requirements		Production	Requirements		Production	Import need or export availability (−)		Requirements		Production	Import need or export availability (−)	
	Estimated consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard	For projected consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard
Wheat:													
Diet-deficit regions:													
Latin America	11.0	13.5	10.2	12.4	15.1	10.5	1.9	4.6	14.2	16.8	11.5	2.7	5.3
Africa	7.9	10.4	5.9	9.2	11.5	6.0	3.2	5.5	10.2	12.5	6.4	3.8	6.1
West Asia	12.0	13.6	11.4	13.7	15.0	12.5	1.2	2.5	15.3	16.6	13.9	1.4	2.7
Far East	23.5	43.5	15.3	29.1	49.4	18.6	10.5	30.8	34.2	53.9	21.8	12.4	32.1
Communist Asia	26.7	29.8	26.6	29.2	32.0	25.2	4.0	6.8	31.1	34.4	26.1	5.0	8.3
Total	81.1	110.8	69.4	93.6	123.0	72.8	20.8	50.2	105.0	134.2	79.7	25.3	54.5
Other regions:													
Canada	4.6	4.6	10.1	4.6	4.6	13.3	−8.7	−8.7	4.8	4.8	13.8	−9.0	−9.0
United States	16.7	16.7	39.8	15.9	15.9	29.9	−14.0	−14.0	17.1	17.1	29.9	−12.8	−12.8
Western Europe	45.2	45.2	37.3	46.8	46.8	38.5	8.3	8.3	48.1	48.1	41.2	6.9	6.9
Soviet Union	48.7	48.7	62.8	49.1	49.1	54.4	−5.3	−5.3	51.6	51.6	56.6	−5.0	−5.0
Other Eastern Europe	18.3	18.3	14.0	19.7	19.7	16.3	3.4	3.4	20.4	20.4	17.4	3.0	3.0
Oceania	2.7	2.8	6.0	3.0	3.1	6.3	−3.3	−3.2	3.2	3.3	6.8	−3.6	−3.5
Total	136.2	136.3	170.0	139.1	139.2	158.7	−19.6	−19.5	145.2	145.3	165.7	−20.5	−20.4
World total	217.3	247.1	239.4	232.7	262.2	231.5	1.2	30.7	250.2	279.5	245.4	4.8	34.1

Dry beans and peas:													
Diet-deficit regions:													
Latin America	3.0	3.0	2.8	3.4	3.4	3.3	.1	.1	3.8	3.8	3.7	.1	.1
Africa	4.8	5.0	4.8	5.3	5.4	5.4	−.1	(1)	5.7	5.8	5.8	−.1	(1)
West Asia	.9	.9	.9	1.0	1.0	1.0	(1)	(1)	1.1	1.1	1.1	(1)	(1)
Far East	14.1	14.2	12.8	17.0	17.1	17.0	0	.1	19.3	19.4	19.2	.1	.2
Communist Asia	12.2	12.2	12.2	13.1	13.1	13.1	0	0	14.2	14.2	14.2	0	0
Total	35.0	35.3	33.5	39.8	40.0	39.8	(1)	.2	44.1	44.3	44.0	.1	.3
Other regions:													
Canada	.1	.1	.1	.1	.1	.1	(1)	(1)	.1	.1	.1	0	0
United States	.8	.8	1.1	.8	.8	.9	−.1	−.1	.8	.8	1.1	−.3	−.3
Western Europe	2.7	2.7	2.5	2.8	2.8	2.5	.3	.3	2.8	2.8	2.5	.3	.3
Soviet Union	1.1	1.1	1.1	2.4	2.4	2.4	0	0	3.5	3.5	3.5	0	0
Other Eastern Europe	.5	.5	.5	.6	.6	.7	−.1	−.1	.6	.6	.7	−.1	−.1
Oceania	(1)	(1)	(1)	(1)	(1)	(1)	0	0	(1)	(1)	(1)	0	0
Total	5.2	5.2	5.3	6.7	6.7	6.6	.1	.1	7.8	7.8	7.9	−.1	−.1
World total	40.2	40.5	38.8	46.5	46.7	46.4	.1	.3	51.9	52.1	51.9	0	.2

[1] Less than 50,000.

Source: U.S. Department of Agriculture.

TABLE 3.—*Nonfat dry milk and vegetable oils: Requirements, production, and import need or export availability, world by regions, 1958 and projected to 1962 and 1966*

Commodity and region	1958			1962					1966				
	Requirements		Production	Requirements		Production	Import need or export availability (−)		Requirements		Production	Import need or export availability (−)	
	Estimated consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard	For projected consumption	To meet nutritional standard		For projected consumption	To meet nutritional standard
	Thousand metric tons												
Nonfat dry milk:													
Diet-deficit regions:													
Latin America	58	68	6	88	88	10	78	78	110	110	14	96	96
Africa	4	108	3	50	139	5	45	134	87	151	6	81	145
West Asia	10	10	0	112	12	(1)	12	12	14	14	(1)	14	14
Far East	136	807	12	180	894	14	166	880	268	966	16	252	950
Communist Asia	0	683	0	0	715	0	0	715	0	790	0	0	790
Total	208	1,676	21	330	1,848	29	301	1,819	479	2,031	36	443	1,995
Other regions:													
Canada	51	51	86	56	56	100	−44	−44	65	65	120	−55	−55
United States	433	433	776	578	578	953	−375	−375	669	669	1,043	−374	−374
Western Europe	288	288	204	441	441	356	85	85	556	556	463	93	93
Soviet Union	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Eastern Europe	0	0	0	0	0	0	0	0	0	0	0	0	0
Oceania	16	21	77	17	22	116	−99	−94	18	23	160	−142	−137
Total	788	793	1,143	1,092	1,097	1,525	−433	−428	1,308	1,313	1,786	−478	−473
World total [2]	996	2,469	1,164	1,422	2,945	1,554	−132	1,391	1,787	3,344	1,822	−35	1,522

Million metric tons

Vegetable oils:													
Diet-deficit regions:													
Latin America	1.0	1.1	1.0	1.2	1.2	1.1	0.1	0.2	1.4	1.4	1.3	0.1	0.1
Africa	1.7	2.0	2.5	2.0	2.1	3.0	−1.0	−1.0	2.2	2.2	3.4	−1.2	−1.2
West Asia	.4	.5	.3	.5	.6	.3	.2	.2	.6	.6	.4	.2	.2
Far East	3.7	5.2	4.7	4.6	6.1	5.4	−.8	.8	5.3	6.6	5.8	−.5	.8
Communist Asia	1.4	2.9	1.4	1.4	3.1	1.4	0	1.7	1.4	3.3	1.4	0	1.9
Total	8.2	11.7	9.9	9.7	13.1	11.2	−1.5	1.9	10.9	14.1	12.3	−1.4	1.8
Other regions:													
Canada	.2	.2	.1	.2	.2	.1	.1	.1	.2	.2	.1	.1	.1
United States	2.2	2.2	3.6	2.4	2.4	4.4	−2.0	−2.0	2.5	2.5	5.1	−2.6	−2.6
Western Europe	4.0	4.0	1.3	4.3	4.3	1.2	3.1	3.1	4.5	4.5	1.3	3.2	3.2
Soviet Union	1.7	1.7	1.6	1.8	1.8	1.5	.3	.3	2.0	2.0	1.8	.2	.2
Other Eastern Europe	.7	.7	.3	.8	.8	.5	.3	.3	.9	.9	.5	.4	.4
Oceania	(1)	(1)	.1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Total	8.8	8.8	7.0	9.5	9.5	7.7	1.8	1.8	10.1	10.1	8.8	1.3	1.3
World total	17.0	20.5	16.9	19.2	22.6	18.9	.3	3.7	21.0	24.2	21.1	−.1	3.1

[1] Less than half the unit.
[2] Consumption data do not include some substantial quantities that move under relief shipments and are not recorded in import statistics.

Source: U.S. Department of Agriculture.

TABLE 4.—*World population, by countries, 1958 and projections for 1962 and 1966* [1]

Country	Numbers			Change	
	1958	1962	1966	1958–62	1958–66
	Millions	*Millions*	*Millions*	*Percent*	*Percent*
Latin America:					
Argentina	20.2	21.8	23.6	7.9	16.8
Bolivia	3.4	3.6	3.9	6.5	15.1
Brazil	62.7	70.1	79.0	11.8	26.0
Chile	7.3	8.0	8.7	9.0	18.6
Colombia	13.5	15.0	16.7	11.1	23.7
Costa Rica	1.1	1.2	1.4	15.7	31.5
Cuba	6.5	7.1	7.8	8.3	18.8
Dominican Republic	2.8	3.2	4.5	13.2	24.3
Ecuador	4.0	4.5	5.0	11.4	22.7
El Salvador	2.4	2.8	3.1	14.0	27.6
Guatemala	3.6	4.0	4.5	13.2	27.9
Haiti	3.4	3.7	4.0	7.0	15.8
Honduras	1.8	2.1	2.3	13.1	26.8
Mexico	32.3	36.6	40.9	13.3	26.6
Nicaragua	1.4	1.6	1.8	13.8	28.3
Panama	1.0	1.1	1.2	11.6	24.6
Paraguay	1.7	1.8	1.9	7.7	14.2
Peru	10.2	11.3	12.3	10.8	20.6
Uruguay	2.7	2.9	3.1	7.4	14.0
Venezuela	6.3	7.2	8.1	13.3	27.8
Other	4.8	5.2	5.6	7.1	15.3
Total	193.1	214.8	239.4	11.1	23.3
Canada	17.0	18.5	20.0	8.8	17.6
United States	174.2	186.4	199.3	7.0	14.4
Western Europe: [2]					
Austria	7.0	7.2	7.3	1.7	3.3
Belgium	9.1	9.3	9.5	2.2	4.4
Denmark	4.6	4.7	4.8	2.6	5.3
Finland	4.4	4.5	4.7	3.2	6.8
France	44.8	46.2	47.2	3.0	5.2
Germany, West	54.7	56.8	58.9	3.8	7.7
Greece	8.6	8.9	9.2	3.6	7.3
Ireland	2.8	2.8	2.8	−1.1	−1.8
Italy	48.9	50.0	51.0	2.3	4.3
Netherlands	11.3	11.8	12.4	4.9	9.8
Norway	3.5	3.6	3.7	3.1	5.7
Portugal	8.3	8.5	8.8	2.5	5.7
Spain	28.9	29.8	30.8	3.2	6.6
Sweden	7.4	7.5	7.6	1.3	2.6
Switzerland	5.3	5.5	5.8	5.1	9.5
United Kingdom	51.8	52.7	53.5	1.6	3.3
Other	2.4	2.4	2.5	3.0	6.4
Total	303.8	312.2	320.5	2.8	5.5
Eastern Europe: [2]					
Bulgaria	7.8	8.1	8.4	4.0	7.8
Czechosolvakia	13.5	14.0	14.3	3.3	6.3
Germany, East	17.3	17.0	16.7	−1.7	−3.6
Hungary	9.9	10.2	10.5	3.2	6.2
Poland	29.0	30.9	32.3	5.0	11.0
Rumania	18.2	19.0	19.9	4.4	9.3
Soviet Union	208.8	222.6	236.4	6.6	13.2
Yugoslavia	18.3	18.8	19.7	2.7	7.6
Total	322.8	340.6	358.2	5.5	11.0
Africa: [3]					
Algeria	10.6	11.5	12.6	8.5	18.9
Angola	4.5	4.7	4.9	4.4	8.9
Belgian Congo and Ruanda-Urundi	18.3	19.6	21.0	7.1	14.8
Cameroun	3.2	3.5	3.7	9.4	15.6
Egypt	24.8	27.4	30.3	10.5	22.2
Ethiopia	19.0	20.6	22.6	8.4	18.9
French Equatorial Africa	5.0	5.2	5.5	4.0	10.0
French West Africa, excluding Guinea	17.2	18.1	19.1	5.2	11.0
Ghana	4.8	5.1	5.4	6.2	12.5
Guinea	2.6	2.7	2.9	3.8	11.6
Kenya	6.4	6.7	7.1	4.7	10.9
Liberia	1.3	1.4	1.4	7.7	7.7
Libya	1.2	1.3	1.4	8.3	16.7
Morocco	10.4	11.3	12.4	8.7	19.2
Nigeria and British Cameroons	36.6	39.1	41.5	6.8	13.4
Rhodesia and Nyasaland, Federation of	7.8	8.6	9.5	10.3	21.8
Sudan	10.9	12.4	14.0	13.8	28.4
Tanganyika	8.9	9.5	10.0	6.7	12.4
Togo	1.1	1.2	1.3	9.1	18.2

See footnotes at end of table, p. 71.

TABLE 4.—*World population, by countries, 1958 and projections for 1962 and 1966* [1]—Continued

Country	Numbers			Change	
	1958	1962	1966	1958–62	1958–66
Africa—Continued	*Millions*	*Millions*	*Millions*	*Percent*	*Percent*
Tunisia	4.0	4.3	4.7	7.5	17.5
Union of South Africa	14.4	15.9	17.4	10.4	20.8
Other	26.5	28.4	30.1	7.2	13.6
Total	239.5	258.5	278.8	7.9	16.4
West Asia:					
Iran	19.7	21.7	24.0	10.2	21.8
Iraq	6.6	7.3	8.0	10.6	21.2
Israel	2.0	2.2	2.4	10.0	20.0
Jordan	1.6	1.8	2.0	12.5	25.0
Lebanon	1.6	1.7	1.8	6.2	12.5
Syria	4.6	5.1	5.8	10.9	26.1
Turkey	26.2	29.2	32.6	11.4	24.4
Other	12.9	13.6	14.3	5.4	10.8
Total	75.2	82.6	90.9	9.8	20.9
Far East:					
Burma	21.3	23.2	25.5	8.9	19.7
Ceylon	9.4	10.4	11.4	10.3	21.5
India	415.9	452.2	494.2	8.7	18.8
Indonesia	87.3	94.6	102.5	8.4	17.4
Japan	91.7	94.8	97.2	3.4	6.0
Korea, South	22.8	25.0	27.8	9.6	21.9
Malaya	6.5	7.4	8.3	12.7	27.6
Pakistan	88.6	96.1	104.4	8.5	17.8
Philippines	25.4	28.9	32.9	13.8	29.5
Taiwan	10.5	11.9	13.4	13.3	27.6
Thailand	24.2	27.0	30.1	11.6	24.4
Other	51.1	55.2	59.9	8.0	17.2
Total	854.7	926.7	1,007.6	8.4	17.9
Communist Asia	675.0	725.0	786.0	7.4	16.4
Oceania: [2]					
Australia	10.0	10.8	11.6	8.0	16.0
New Zealand	2.3	2.5	2.7	6.0	15.0
Other	3.0	3.3	3.6	10.0	20.0
Total	15.3	16.6	17.9	8.5	17.0
World total	2,870.6	3,081.9	3,318.6	7.4	15.6

[1] Economic Research Service estimates based upon United Nations and other sources.
[2] End of year.
[3] Names and frontiers as they generally existed in 1958.

Source: U.S. Department of Agriculture.

TABLE 5.—*Food consumption levels per person per day, in terms of calorie, protein, and fat content, by country, 1958*

Country	Calories	Protein				Fat
		Animal	Pulse	Other	Total	
Latin America:	*Number*	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*
Argentina	3,360	62	1	37	100	121
Bolivia	1,880	14	4	32	50	28
Brazil	2,815	20	14	30	64	56
Chile	2,610	27	6	38	71	61
Colombia	2,225	20	3	28	51	43
Costa Rica	2,555	23	8	28	59	61
Cuba	2,870	28	9	31	68	69
Dominican Republic	1,950	12	5	20	37	45
Ecuador	1,935	10	7	28	45	32
El Salvador	1,975	12	13	32	57	38
Guatemala	2,175	9	9	37	55	38
Haiti	1,875	4	13	25	42	22
Honduras	2,190	9	8	41	58	33
Mexico	2,725	18	10	41	69	59
Nicaragua	1,985	18	5	27	50	38
Panama	2,370	19	6	32	57	51
Paraguay	2,335	35	7	28	70	60
Peru	2,040	13	6	33	52	34

TABLE 5.—*Food consumption levels per person per day, in terms of calorie, protein, and fat content, by country, 1958*—Continued

Country	Calories	Protein				Fat
		Animal	Pulse	Other	Total	
	Number	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*
Latin America—Continued						
Uruguay	2,945	59	1	50	110	118
Venezuela	2,255	18	9	29	56	48
Canada	3,080	62	2	30	94	138
United States	3,220	66	5	26	97	149
Western Europe:						
Austria	3,010	41	1	33	75	109
Belgium	2,890	42	1	33	76	112
Denmark	3,255	55	1	32	88	139
Finland	3,110	46	1	37	84	115
France	3,015	48	2	37	87	108
Germany, West	2,935	42	1	31	74	124
Greece	2,600	22	6	47	75	73
Ireland	3,375	46	1	42	89	112
Italy	2,755	27	5	46	78	73
Netherlands	2,895	43	1	28	72	119
Norway	3,180	43	1	33	77	131
Portugal	2,485	20	5	40	65	72
Spain	2,565	23	7	42	72	79
Sweden	2,935	50	1	26	77	124
Switzerland	3,040	50	1	31	82	110
United Kingdom	3,200	56	2	27	85	128
Eastern Europe:						
Bulgaria	2,780	20	6	63	89	61
Czechoslovakia	3,010	26	1	41	68	95
Germany, East	2,950	35	1	36	72	112
Hungary	2,925	26	3	42	71	85
Poland	3,100	35	1	43	79	97
Rumania	2,790	18	3	51	72	57
Soviet Union	2,985	26	3	63	92	70
Yugoslavia	2,770	24	5	59	88	60
Africa: [1]						
Algeria	2,230	15	5	39	59	28
Angola	2,215	8	17	31	56	44
Belgian Congo and Ruanda-Urundi	2,650	7	15	27	49	37
Cameroun	2,470	5	7	39	51	51
Egypt	2,340	7	12	51	70	45
Ethiopia	2,295	16	18	42	76	48
French Equatorial Africa	2,575	7	10	39	56	62
French West Africa, excluding Guinea	2,450	5	8	46	59	27
Ghana	2,605	9	5	37	51	52
Guinea	2,400	4	10	33	47	60
Kenya	2,240	13	6	45	64	37
Liberia	2,540	3	3	36	42	55
Libya	2,180	8	7	41	56	38
Morocco	2,480	17	1	54	72	30
Nigeria and British Cameroons	2,680	6	9	45	60	49
Rhodesia and Nyasaland, Federation of	2,500	12	13	51	76	46
Sudan	2,295	16	9	41	66	51
Tanganyika	2,175	9	14	41	64	26
Togo	2,645	4	10	34	48	65
Tunisia	2,170	15	4	48	67	27
Union of South Africa	2,620	24	3	47	74	73
West Asia:						
Iran	2,040	13	4	45	62	30
Iraq	2,255	15	7	52	74	38
Israel	2,715	30	3	46	79	76
Jordan	2,085	8	10	45	63	37
Lebanon	2,415	14	3	55	72	46
Syria	2,255	11	4	50	65	40
Turkey	2,650	12	6	66	84	45
Far East:						
Burma	2,150	10	7	34	51	26
Ceylon	2,060	8	4	34	46	59
India	2,050	6	15	36	57	34
Indonesia	2,125	4	10	34	48	38
Japan	2,310	13	11	42	66	23
Korea, South	2,040	11	10	39	60	19
Malaya	2,290	11	5	35	51	40
Pakistan	2,030	10	8	36	54	20
Philippines	2,145	15	4	37	56	39
Taiwan	2,340	12	12	36	60	37
Thailand	2,185	12	4	29	45	35
Communist Asia	2,200	6	15	44	65	32
Oceania	3,210	67	5	31	103	136

[1] Names and frontiers as they generally existed in 1958.

Source: U.S. Department of Agriculture.

TABLE 6.—*Indexes of world agricultural production: Total and per capita, by region, average 1935–39 and annual 1958–59 to 1960–61* [1]

[Average 1952–53 to 1954–55=100]

Region or country	Total production						Per capita production					
	Average 1935–39	1958–59	1959–60 [2]	1960–61 [3]	Average annual percent change		Average 1935–39	1958–59	1959–60 [2]	1960–61 [3]	Average annual percent change	
					1935–39 to 1960–61	1952–54 to 1960–61					1935–39 to 1960–61	1952–54 to 1960–61
Southern area:												
Latin America	72	121	123	124	3.1	3.4	103	107	106	104	0.04	0.6
Africa and west Asia	77	117	118	121	2.5	3.0	100	106	105	105	.2	.7
Far East, less Japan [4]	89	114	119	119	1.5	2.7	111	104	106	105	−.3	.7
Communist Asia	96	120	115	117	1.0	2.4	112	109	102	102	−.4	.3
Total	85	118	118	120	1.7	2.9	106	106	105	104	−.09	.6
Northern area:												
Western Europe	81	110	112	115	1.8	2.1	92	106	107	109	.8	1.3
Eastern Europe [5]	108	132	130	131	.9	4.4	106	123	120	119	.5	2.7
United States and Canada	69	113	114	117	3.0	2.4	87	104	103	104	.9	.6
Japan	83	132	140	145	3.3	6.4	102	125	131	134	1.3	4.9
Australia and New Zealand	76	120	121	124	2.7	3.4	100	107	106	107	.3	1.0
Total	84	118	119	122	1.9	3.1	93	111	110	111	.8	1.6
World total	85	118	119	121	1.8	3.0	101	108	107	107	.3	1.0

[1] Value of production at constant prices. Revised. Crops included in the index are harvested mainly between July 1 of the first year shown and June of the following year. For a few crops and most livestock production, estimates are for the calendar year of the 1st year shown.
[2] Preliminary.
[3] Estimated.
[4] Includes Pacific islands.
[5] Includes Soviet Union.

Source: U.S. Department of Agriculture.

TABLE 7.—*Protein content of selected foodstuffs (dry basis)*

Animal origin	Percent protein (N×6.25)	Plant origin	Percent protein (N×6.25)
Milk:			
Whole, dried	22–25	Rice, whole	7.5–9
Skimmed, dried	34–38	Rice, polished	5.2–7.6
		Wheat, flour	9.8–13.5
Beef:		Corn, meal	7–9.4
Dried	81–90	Chick pea	22–28
Roasted	72	Soybean	33–42
		Peanut (groundnut)	25–28
Egg:		Walnut	15–21
Whole, dried	35	Potato	10–13
Whole, dried, defatted	77	Tapioca	1.3
		Alfalfa	18–23
Herring	81	Chlorella	23–44
Salmon	69	Torula yeast	38–55

Source: Dr. Aaron M. Altschul, Southern Regional Laboratory, U.S. Department of Agriculture, New Orleans, La.

TABLE 8.—*Oil and protein content of oilseeds and oilseed protein concentrates*

[Percent]

Material	Oil	Protein (NX6.25)	Hulls	Fiber
Soybean	20.0	43.0	8.0	2.0–3.0
Soybean flour (low fat)	1.0	50.0–54.0	----------	2.0–3.0
Soybean protein:				
Concentrate	1.0	72.0–74.0	----------	3.0
Isolate	1.0	93.0	----------	.7
Tofu (soybean curd)	29.0	50.0	----------	----------
Cottonseed	16.5	16.5	44.5	----------
Cottonseed flour	2.0–6.0	55.0–58.0	----------	1.0–2.0
Peanut (groundnut)	46.0–52.0	25.0–30.0	----------	3.0
Peanut flour	.5–10.0	50.0–66.0	----------	2.0–3.0
Peanut protein (isolated)	1.0	95.0	----------	----------
Peanut "lipo-protein" (isolated from whole kernels)	33.0	65.0	----------	----------
Peanut protein (isolated from whole kernels)	9.0	85.0	----------	----------
Sesame	50.0	25.0	----------	4.0
Sesame meal	7.0	46.0	----------	5.3

Source: Dr. Aaron M. Altschul, Southern Regional Laboratory, U.S. Department of Agriculture, New Orleans, La.

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