

Food and Population: The Next Crisis

By Douglas N. Ross

A Special Report from The Conference Board

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Foreword

THIS REPORT originated in the deliberations of the Senior Executives Council of The Conference Board, a group of 37 business, university, foundation and public leaders. The group is entering a new phase of activities — beginning to plan, monitor and evaluate specific actions which the Members can undertake in their various public and private capacities. These activities would focus on a specific medium-term matter of urgent concern and would be supported by appropriate Conference Board or other research.

With this orientation, the staff was requested to develop a background paper on the prospects for a world food crisis, outlining the nature of the problem; efforts now under way toward addressing its various aspects, elements needing — but lacking — action; action options which Members might pursue; and suggestions for research which the Board, or others, might constructively perform.

While this paper responds to the Council's request, it is felt to be of sufficient interest to be made more generally available. Certainly findings such as these merit the attention of the industrial community:

- The high probability of a global food shortage.
- The prospect that the regions "in crisis" will be those where explosive population growth, lagging economic development, and limited access to energy resources coincide.
- The possibilities for a strong private-sector role in a

field where governments and the United Nations are already deeply involved.

• The wide range of options for the private sector to take initiatives in directing the massive capital investments needed to accelerate growth of the environmentally sound economic base essential to any long-term resolution of the food problem.

The Board would like to thank the following organizations for their cooperation in this study: General Foods Corporation, NABISCO, Ralston Purina Company, Research From Washington, Schnittker Associates, The Ford Foundation, International Bank for Reconstruction and Development, National Science Foundation, Overseas Development Council, and the Population Crisis Committee, United Nation's Food and Agricultural Organization, World Food Conference, Congressional Research Service, Office of Technology Assessment, Senate Agriculture and Forestry Committee, the Office of the Domestic Council of the Cabinet, United States Department of Agriculture, United States Department of State.

This report was written by Dr. Douglas N. Ross of the Board's Public Affairs Research Staff.

ALEXANDER B. TROWBRIDGE
President

Introduction

The Problem

OVER TWO BILLION people in the least industrialized, predominantly agrarian regions of South Asia, Central Africa and South America live at subsistence food levels. These regions are characterized by high human fertility rates, low per capita income, and low capital investment in agriculture. Even with maximization of food aid from the more affluent temperate regions, there is little hope of meeting the food needs of these poor and increasingly populous regions beyond 1985 without massive efforts at population control, increased indigenous food production, and broad-scale, environmentally sound economic development. There is an immediate need, however, for a World Food Security program.

The marginal regions divide into a Third World, which has leverage potential in the form of extensive natural resources essential to the industrialized regions, and a Fourth World – deficient in everything except people. This leverage potential of the Third World can, and is beginning to, force greater attention from the industrialized world to its food and economic development problems. The Fourth World has only the appeal of humanitarianism to attract the assistance it needs. Cultural inheritances further complicate introduction of solutions in all of these regions.

Poor crop yields in the USSR and Southeast Asia in 1972 led to a scramble for the modest grain surpluses in the industrialized regions, resulting in accelerating grain prices at the same time energy resource prices were more than doubled by the Mideast conflicts. This combination of developments has brought the food and energy plight of the less developed regions into earlier focus than would otherwise have occurred. One result is a reassessment of food production and a redefinition of "the problem." The developed, high-yield agricultural regions do, or can, produce more than enough food for the world population. Much of this output, however, is "wasted" by low efficiency conversion to meat (e.g., eight pounds of corn to produce one pound of beef) and through spoilage and losses in processing and distribution. "The problem," then, has several facets: a cultural and social attachment in the affluent regions to low efficiency forms of food utilization, which results in overconsumption in these regions; lack of efficient distribution systems to serve the poor regions from point of production to point of consumption; and the need to place the economic means to acquire necessary food supplies in the hands of those poor and populous regions unable to be self-sufficient in food production.

The Prospects

The "food crisis" ahead is a complex of: population explosion in low per capita income regions; persistent

growth in demand for inefficient food forms (meat) in affluent regions; inadequate distribution systems in poor regions; and inadequate nonagrarian, as well as agricultural, investment in the Third and Fourth Worlds.

The responses to the population aspects of "the problem" lie in sociological arenas, amenable principally to government and other nonbusiness leadership. The food production and distribution system aspects of "the problem," together with the general economic development aspects, do lend themselves to the capabilities of business leadership with appropriate government support (tax, foreign direct investment, monetary, and trade policies.)

The post-1985 "food crisis" facing the two-thirds of global population in the Third and Fourth Worlds will be intractable unless massive efforts on each of the major aspects are mounted in the intervening decade. Even so, some beginnings of mass starvation are likely to appear before 1985 if there are any falterings in crop yields. The ability of the industrialized one-third of the world to act in this brief period is complicated by massive internal requirements for capital and economic activity to correct environmental deterioration and to restructure both energy supply and use systems. One avenue of relief could be in close collaboration with the oil-producing regions which will be capital-rich during the coming decade.

Actions Underway

At the United Nations level, conferences in late 1974 will address both the population and food problems. These should provide better knowledge of the crisis and also give a much more serious sense of purpose to government activity. Most of the current explorations of international monetary problems, balances of trade and trade policy, and international aid mechanisms are taking the prospective food-population-energy crisis into account.

Within cultural constraints, governments appear to be moving on their parts of the task. Two areas, however, need government action. Firstly, little has been done to modify tax or other incentives to facilitate more aggressive private-sector anticipatory action. In fact, many pressures in the United States and Western Europe are focused on protectionist measures which would impede effective and timely private-sector action. Secondly, as Helmut Schmidt has observed: "On a worldwide scale, it will not be possible to reduce the differences in levels of wealth unless the more advanced industrialized nations develop their own resources in close coordination with one another and with primary producing countries. If they fail to do so, the result might be social storms which could seriously jeopardize world peace. . . . It would, therefore, serve the efforts to maintain peace . . . if a comprehensive policy of economic coopera-

tion were to be pursued rather than a policy of economic 'apartheid.' " (*Foreign Affairs*, April, 1974)

Private-sector efforts on the food supply and distribution and in the economic development aspects appear more diffuse. The appropriate private-sector role in bringing down birth rates and increasing the practice of family planning varies from nation to nation. Population is a far more complex problem than manipulating numbers implies. Consequently, private efforts can sometimes be catalytic — a stimulus to family planning programs at the takeoff point — at other times complementary, concentrating on education and training activities. At all times, the best combination of mutually supportive public- and private-sector activities is the goal.

Possible Action Course

Action options open to private-sector leaders include at least the following: (1) direct action through organizations which they "command"; (2) exercise of influence on organizations with which they have formal or informal affiliation; (3) exercise of influence on governmental and quasi-governmental bodies to induce needed policies and actions (for example, a policy of a "most favored nation" type of foreign tax credits to foster agricultural development in selected developing nations); (4) support of research projects or private development corporations (for example, the Latin American Agribusiness Development Corporation); and (5) support of family-planning clinics.

Food and Population: The Next Crisis

THE PAST 200 years, especially in the temperate zones of the world, have seen people getting very much richer, if per capita income is the measure. The basics of food, clothing and shelter, as well as information and the means to travel, have been in ample supply for about one-third of mankind. The other two-thirds of the human race remain in the condition that man has lived in for most of his history – severest poverty.

Warnings as to the frailty and interdependency of the global food system issue forth on the heels of each new crisis. Following two Asian crop failures in 1965 and 1966, the Paddocks in *Famine 1975* counseled their readers that world population growth was outstripping food production. The spectre of Malthus' dismal theorem had again arisen: population tends to breed to the level of misery and starvation, that is, until "positive" (death, starvation) and "negative" (birth control) checks occur. Indeed, C. P. Snow at the time shocked a Missouri convocation by suggesting that the "Have" nations (such as the United States in which 6 percent of the world's population consume 40 percent of its natural resources) would soon be watching starving "Have Nots" on television.¹

Approximately two-thirds of the world's 3.7 billion people are in the regions which are characterized by relatively low income per capita, low agricultural investment per hectare (1 hectare = 2.47 acres), and relatively high human fertility rates. Global surveys measuring food supply per person indicate severe undernutrition (too few calories, a quantity measure) and malnutrition (too few proteins, a quality measure) in these regions which lie principally in South Asia, Central Africa and South America² (see Exhibit 1).

These countries' rate of population increase is estimated at 2.2 percent per annum in the Communist-influenced countries and 2.7 percent per annum in the non-Communist influenced countries.³ Four-fifths of an estimated 70 million annual increment to world population occurs in these regions (see Exhibit 2). If population growth does not dramatically decline, within a generation food production will have to double, just to maintain current per capita consumption.⁴

¹ Charlton Ogburn, Jr. "Why the Global Income Gap Grows Wider," *Population Bulletin*, June, 1970.

² A Report of the President's Science Advisory Committee, *The World Food Problem*, The White House, May, 1967. Vol. 1, p. 11.

³ Walter A. Pawley, "In The Year 2070," *Ceres: FAO Review*, July-August, 1971.

⁴ Lester R. Brown, "The Next Crisis? Food," *Foreign Policy*, Winter, 1973-74.

By developed country standards, these are not economically viable regions. Per capita income is typically less than \$200 per year, and capital investment in these fundamentally agrarian areas is not more than \$150 per hectare. In addition, 90 percent or more of the arable land in these regions, by current technological measure, is already in production, though yields are typically less than half that obtainable with proper crop selection and fertilizer use. Capital costs of land and water development vary depending upon project size and complexity. For example, in 1967 average costs for irrigating new lands in Colombia were \$1,150 per hectare.⁵ The point here is that the easy things have been done. Hence, regions which have modest, but accelerating, food shortages and population pressures now face steeply rising capital costs both to bring their more marginal land into use and to improve the productivity of existing cultivated land.⁶

The high-income, low-human fertility regions are those typically called developed countries, which together have a population growth rate of about 1.5 percent per year. These regions are now North America, Western Europe and Russia, Japan, North Africa, the Mideast, Australia and, marginally, China. They typically have a capital investment of upwards of \$1,000 per hectare and on net generate a modest annual food surplus.

The World Food Problem: A Report of the President's Science Advisory Committee

The 1967 White House Conference on the World Food Supply (see Appendix A, Principal Findings and Recommendations) led to four basic and still valid conclusions:

- The scale, severity and duration of the world food problem are so great that a massive, long-range, innovative effort unprecedented in human history will be required to master it.

- The solution of the problem that will exist after about 1985 demands that programs of population control be initiated now. For the immediate future, the food supply is critical.

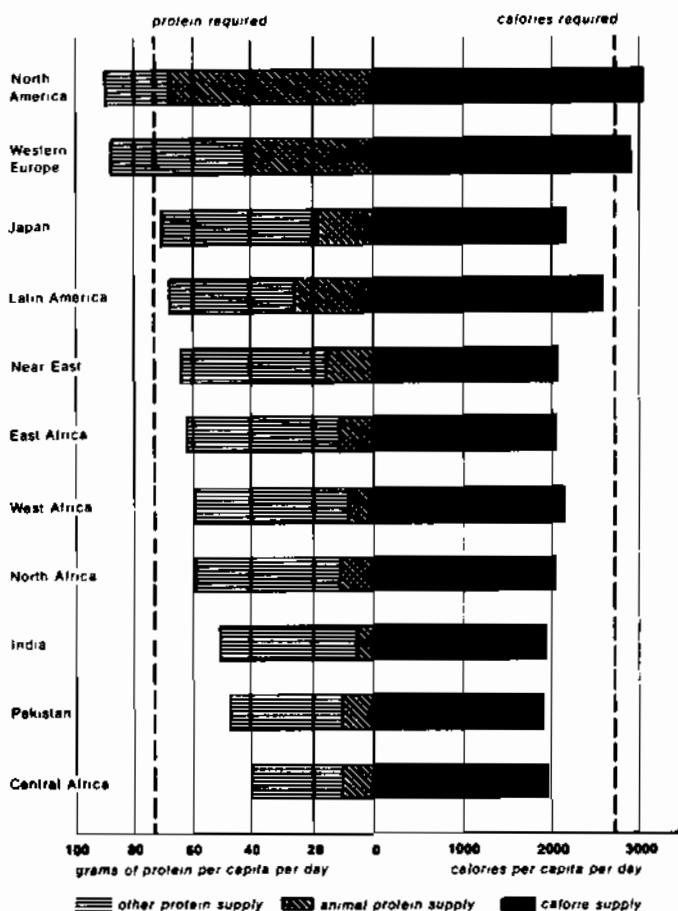
- Food supply is directly related to agricultural development and, in turn, agricultural development and overall economic development are critically interdependent in the hungry countries.

⁵ *World Food Problems, op. cit.*, Volume II, p. 460.

⁶ *Ibid*, page 423. Of the world land area of 32.5 billion acres (excluding ice-covered areas), 24.2 percent is potentially arable (7.186 billion acres), 27.8 percent in grazing (27.8 billion acres), and 48 percent in nonarable (15.6 billion acres).

OSOL

Exhibit 1: Protein and Caloric Intake



Dash-lines indicate estimated North American protein and caloric requirements, based on diets sufficient to enable people to attain full body weight.

Source: Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, *The Limits to Growth*, A Potomac Associates Book (New York Universe Books, 1972), page 47. Based on U.N. Food and Agriculture Organization *Provisional Indicative World Plan for Agricultural Development* (Rome: UN Food and Agriculture Organization, 1970).

A strategy for attacking the world food problem will, of necessity, encompass the entire foreign economic assistance effort of the United States in concert with other developed countries, voluntary institutions, and international organizations.

Foreign Agricultural Assistance

Food production is only one part of economic development. The great expectations of foreign agricultural-assistance programs, based on Marshall Plan performance, were backed by billions of foreign aid dollars; donations and concessional sales of millions of tons of food to developing nations; high productive technical-assistance programs of foundations; and activities of international

organizations – the International Bank for Reconstruction and Development (IBRD), the Food and Agriculture Association (FAO), the World Health Organization (WHO), the United Nations Economic and Social Council (UNESCO), and the United Nations Children's Fund (UNICEF). Western organizations have impatient notions about progress and results which may account for the Science Advisory Committee's statement: "Despite chronic reiterations of the need to involve private industry in economic assistance, no significant progress in engaging this rich reservoir of resources and skills can be reported at this time."⁷ (It is interesting to note that only 13 of the 134 panelists were from that "rich reservoir" of private industry.)

Further, any eventual solution to the twin problems of food and population imbalance is critically dependent upon individual action by millions of citizens in many different nations. Fertility control does not come about by fiat; nor do farmers adopt improved techniques because of government policy. Personal incentives are needed. They differ within and between countries, and encompass many political, economic and social considerations.

The cornerstone of economic progress is the development of resources: people, land, agriculture and raw

⁷Op. Cit. Volume I, p. 13.

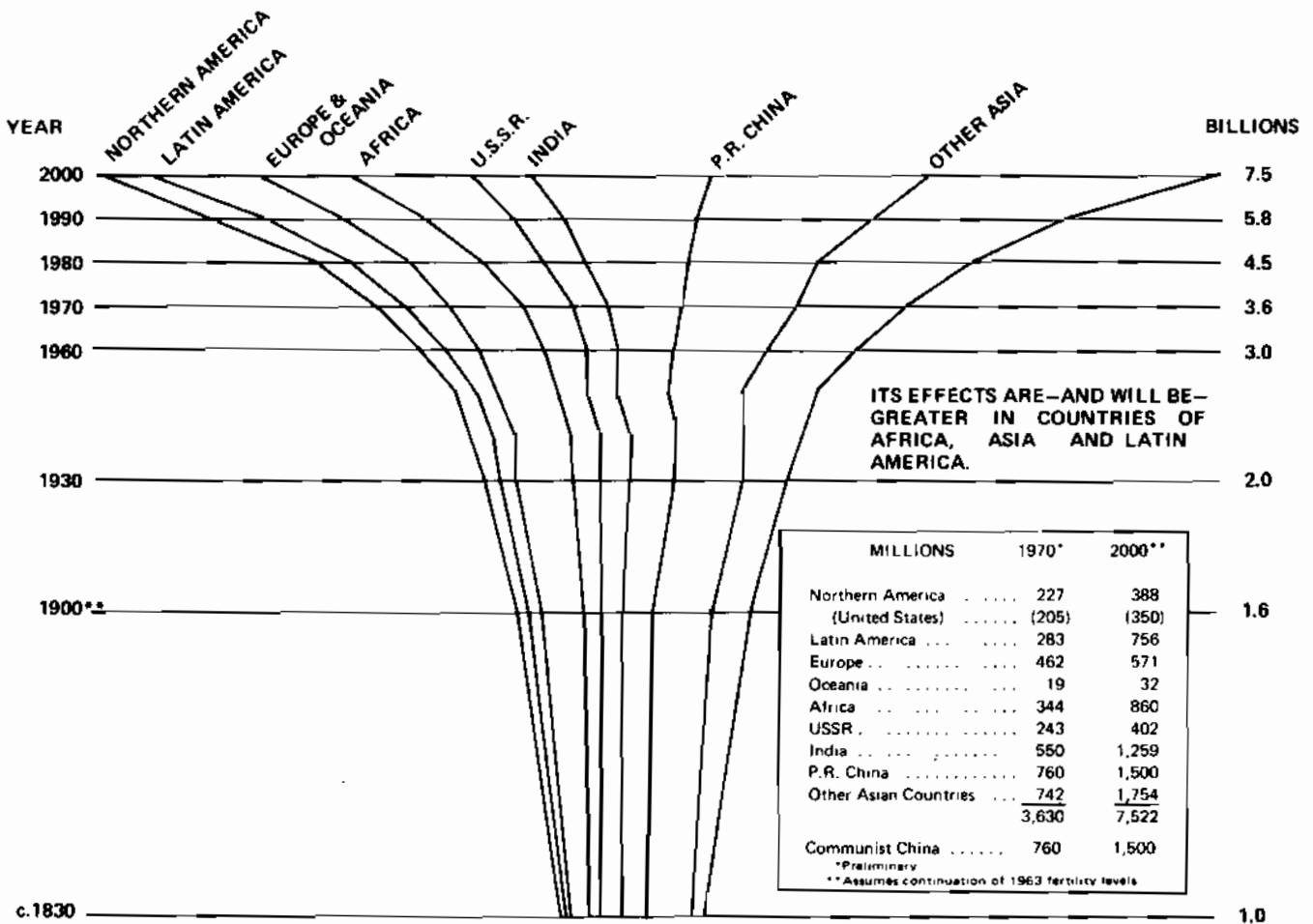
Table 1: Food Consumption in "Population Equivalents"*

Using "population equivalents" ("based on a standard man weight of 70 kilograms as a unit and assuming a disposal of 70 grams of protein per day as a standard figure"), George Borgstrom has concluded that in addition to feeding 3 billion humans, the feeding burden of livestock worldwide is equivalent to an additional 14.6 billion persons. Cattle alone consume nearly triple the amount of food energy of humans. Yet red meats derived from cattle supply only a small portion worldwide of human food consumption. The following partial tabulation of "global biomass" shows that domesticated animals consumed almost *five times* more food than human beings:

<u>Consumer</u>	<u>Population equivalents</u>
Cattle	8,760,000,000
Man	3 billion
Hogs	1,842,000,000
Sheep	988 million
Buffalo	940 million
Poultry	654 million
Horses	653 million
Mules	375 million
Goats	288 million
Camels/asses	100 million

*Table derived from John McHale, *World Facts and Trends* (New York, Collier Books, 1972) p. 10, by Graham T. T. Molitor, Director, Government Relations, General Mills, Inc.

Exhibit 2: The Population Explosion: Where the People May Be in the Year 2000



Source Robert C. Tetro, "World Food Prospects and Problems," Food and Agriculture Organization, Washington, D.C., Spring, 1974

materials. The Third World owns many strategic (wasting and nonwasting) natural resources – ranging from metals to proteins to petroleum – upon which the current patterns of affluence in the developed nations depend. And it does have a reserve of manpower for labor-intensive industry.

Appropriate Agricultural Techniques

The establishment of modern agricultural practices has had spectacular food crop production results in Mexico, Taiwan, Israel and the Philippines. Yet there is a difference between the adaptation of existing methods to host-country conditions and the wholesale transplant of existing American agricultural techniques. In addition to political difficulties in recipient countries, there are obstacles posed by traditional culture and social structures:

“A more productive variety of rice cannot be introduced in part of Nepal, where it is needed and very well suited to climate and soil, because the grains cling a bit more to the

stalk and a new threshing technique would be used. But threshing is a family or community undertaking involving social and ritual as well as mechanical activities. Running water in peoples’ houses is not accepted because the village well is a social center, as well as source of water . . . It would not be difficult to put together a large list of such minor failures nor to include in it some major ones. If these seem improbable or easily overcome, the reader might review the introduction of an innovation, say the fluoridation of water, into our own technologically highly sophisticated society. He might also consider the willingness with which Christians, out of Christian motives, will help to reduce infant mortality and disease in a distant, non-Christian country and how unwilling they may then be to help control the population explosion that inevitably results.”⁸

⁸ Francis E. Dart, "The Rub of Cultures," *Foreign Affairs*, January, 1963.

A Short History of the World Food and Grain Situation

The decade of the 1960's closed on an optimistic note: grain stocks were at record highs in Canada, the United States, Australia and Argentina, and the Green Revolution had had a real per capita effect in Asia on grain production. Grain is the principal item in most less-developed countries' diets; it is the principal ingredient in animal-product production in the developed countries; and grain is the principal foodstuff moving in international trade (see Table 1).

In 1970-71 the world food and agricultural situation began to tighten. The Green Revolution lost some of its momentum; Europe and Japan increased their demands for feed grains and protein meats because of demand for animal products. On the supply side, because of the surplus the United States, Canada and Australia cut back on grain production.

In 1972, poor crops in the USSR and Southeast Asia led to intense efforts in the world markets to acquire grain. Although the shortfall was not great, the resulting scramble for supplies, given an inelastic demand for grain, caused

substantial price changes. Thus, depending upon the view, the agricultural world was either near balance with regard to grain production and utilization or teetering on the brink of famine.

There is also another set of less common perceptions in various "food problem" studies and reports. Perhaps one-third or more of the food which would otherwise be available for human use is consumed by pests, insects, vermin, fungi, various plant diseases, and such other poachers as rabbits.⁹ Thus greater research efforts could perhaps be made into "food stock preservation" through insecticide usage or better storage and handling. A caveat must be entered: "broad-range" pesticides may have second- and third-order effects about which little is known.

Importantly, however, the worldwide feeding burden of livestock is equivalent to 14.6 billion persons (see Table 1, page 4). There is thus, technically, no food resource shortage today. But there are political, financial and cultural barriers to food allocation and distribution.

⁹Harrison Brown, James Bower and John Weir, *The Next Hundred Years* (New York: The Viking Press, 1963), p. 57, as cited in a speech by Graham T. T. Molitor to the World Future Society, April 24, 1974.

The Complex Food and Population Problem

ANY GROWTH in population will affect directly a number of things, including required food and water supply; rate of attrition of the world's nonrenewable resources; urban and renewal employment requirements; rate of increases of per capita income; arable land use (agricultural, transportation, housing, recreation); air, water and noise pollution; and social tensions. There is no single variable to be maximized or minimized. It is a complex process which results at any point in the "quality of life."

Ecological Scarcity

Ecological scarcity has to do primarily with complex trade-offs between present and future needs, with pollution and raw material constraints, rather than with Malthus' dismal theory. Agriculture, while a contributor to environmental problems, is itself subject to effects of population and economic pressures; air, soil and water pollution; biotic stresses on plants and animals; and noise.¹⁰

¹⁰ *The Impact of Environmental Stresses on Agriculture*. A publication of the Technical Guidance Center for Environmental Quality, No. 89, July, 1973.

Exhibit 3 graphically illustrates the "cut-throat" nature of the competition for land. As a domestic problem, the competition for the rural-urban fringe lands is a paradox of haphazard urban sprawl in the face of public desire for open space and environmental amenities. As a global problem, an increasing population's requirements for roads, housing and utility infrastructure makes land unavailable for food production. Even assuming a doubling of present agriculture productivity through capital investments in equipment, irrigation systems, and fertilizers (see dash lines in Exhibit 3), a land "scarcity crisis" develops within one population-doubling time period (about 30 years). Thus, between now and the turn of the century we may expect serious pressures for reconsideration of the institution of private property.

Water is another resource under increasing pressure as caloric and protein needs are met (see Exhibit 4).¹¹ It is crucial to improving agricultural yields but its increased supply must be balanced by other inputs (e.g., fertilizer) as well.

¹¹ Charlton Ogburn, Jr., *op. cit.*, page 9.

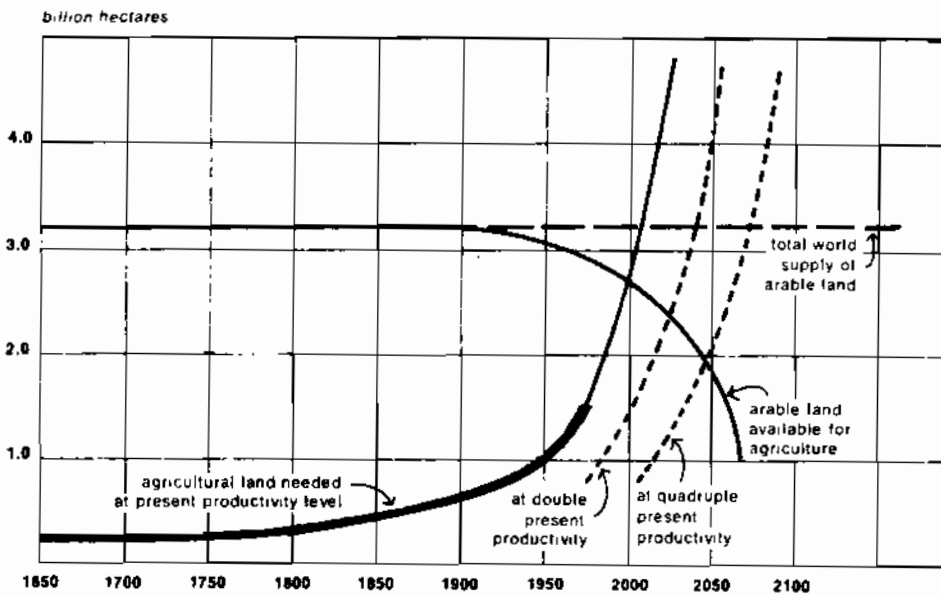


Exhibit 3: Arable Land

Total world supply of arable land is about 3.2 billion hectares. About 0.4 hectares per person of arable land are needed at present productivity. The curve of land needed thus reflects the population growth curve. The light line after 1970 shows the projected need for land, assuming that world population continues to grow at its present rate. Arable land available decreases because arable land is removed for urban-industrial use as population grows. The dotted

curves show land needed if present productivity is doubled or quadrupled.

Source: Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, *The Limits to Growth*, A Potomac Associates Book (New York: Universe Books, 1972), page 50.

Table 2: World Wheat, Rice, and Coarse Grain Production and Disappearance, 1960-61 – 1974-75, Mil. Metric Tons

	Wheat		Rice Prod.	Coarse Grains		Total Grains	
	Prod.	Dis.		Prod.	Dis.	Prod.	Dis.
1960-61	240.3	237.1	(236.5)	407.3	398.2	884.1	861.8
1961-62	226.1	238.0	(240.9)	388.5	402.9	855.5	881.8
1962-63	255.7	250.4	(243.0)	405.3	408.5	904.0	901.9
1963-64	236.2	244.7	248.9	414.7	411.1	899.8	904.7
1964-65	272.2	262.0	259.9	413.9	420.4	946.0	942.3
1965-66	262.0	280.8	290.4	431.1	446.6	943.5	977.8
1966-67	302.8	280.2	248.1	460.1	459.3	1011.0	987.6
1967-68	292.1	288.8	275.3	483.7	469.3	1051.1	1033.4
1968-69	324.4	299.3	281.0	488.4	485.9	1093.8	1066.2
1969-70	305.9	316.2	280.8	511.3	514.6	1098.0	1111.6
1970-71	308.9	327.7	298.2	506.4	521.2	1113.5	1147.1
1971-72	340.6	342.1	299.4	560.4	543.4	1200.4	1184.9
1972-73	330.9	356.6	285.5	545.3	564.8	1161.7	1206.9
1973-74 ¹	360.2	352.2	307.1	584.1	589.6	1257.7	1248.9
1974-75 ²	370.0		305.0	583.0		1260-1300	1270.1 ³

¹ Estimated by USDA.

² Estimated by USDA using expected average and yield trends.

³ Estimated by Dale E. Hathaway, The Ford Foundation, using the average growth rate in disappearance for the past 11 years.

Source: FAO for 1960-61 through 1962-63 USDA since 1963. For rice, production and disappearance are calculated as being approximately equal since few countries maintain appreciable stocks and world trade in rice runs around 5 percent of annual production.

Energy

Prior to the Yom Kippur war, the prospects were for the appearance of a rapidly rising food insufficiency in the low-income, high-fertility regions sometime after the mid-1980's. The quadrupling of energy resource prices has accelerated the arrival of the food crisis.

The low-income, high-fertility regions do not now generate sufficient economic earnings to acquire minimum energy resources and minimum food supplies in world markets. The prospect is for a rapid increase in the food supply deficiency in these regions. For example, the Masarovic-Pestel study (a sequel to the Club of Rome's *Limits to Growth* project) and Lester Brown's work with the Overseas Development Council indicate a prospect of 300 to 400 million deaths by starvation in South Asia alone in the balance of this century. These are highly uncertain estimates since the impact of massive starvation on fertility rates has never before been observed. What is known, however, is that Central American death rates, reversing a 20-year trend, are now rising.

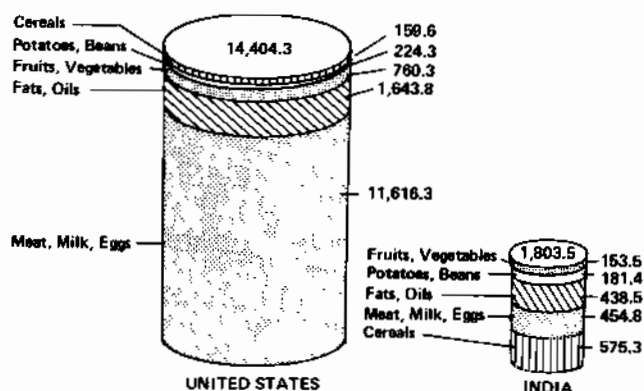
The Relationships between Per Capita Income and Nutrition; and between Per Capita GNP and Birth Rates

Exhibit 5 depicts the relationship of protein consumption to per capita income in about 50 countries.¹²

¹² Stanford Research Institute, *Food Products and Processes*, September, 1972.

Consumers in rich countries eat "better" than those in poor ones both because developed countries have attained higher agricultural productivity than the less-developed countries, and because the quality of food consumption is directly related to affluence. For example, in Organization for Economic Cooperation and Development (OECD) countries, per capita income in the highest (the United States – \$5,160) is more than fourteen times that of the lowest (Turkey –

Exhibit 4: Water Required for Daily Per Capita Food Production, United States and India



Producing the daily food for one person requires eight times as much water in the United States as in India. (Figures indicate liters. One gallon equals 3.785 liters.)

Source: Borgstrom, Georg. *Too Many: A Study of the Earth's Biological Limitations*.

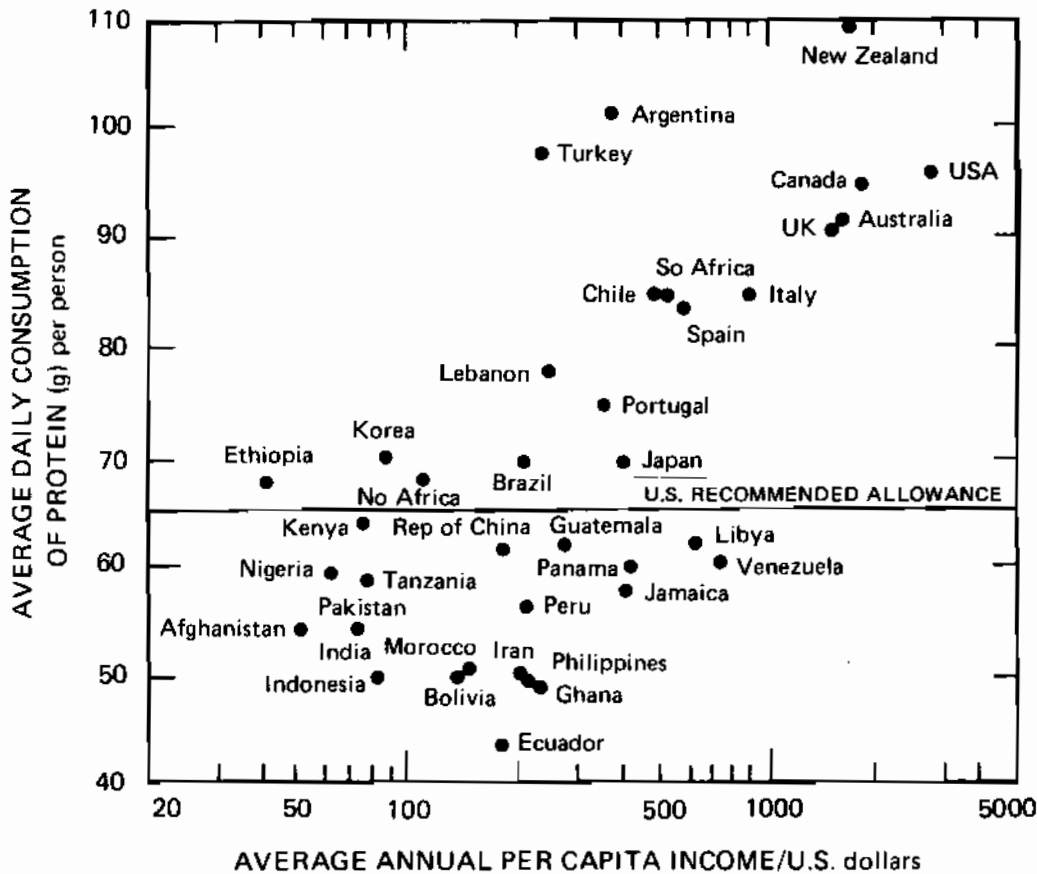


Exhibit 5: Average Daily Consumption of Protein (g) Per Person

Source: Stanford Research Institute, *Food Products and Processes*, September, 1972.

\$360). But the real problem is the lesser-developed nations — with annual population increases of 2.5 percent and GNP increases of 5 percent, it requires an estimated 25 years for per capita GNP to double from \$200 to \$400.¹³

The decline in birth rates is perhaps more closely related to social and educational changes accompanying industrialization than it is to industrialization itself. Yet the relationship noted in Exhibit 6 is striking. It also suggests that U.S. patterns of production and expenditure do not have to be emulated to “cause” a decline in the birth rate. The clustering of squares suggests that a \$1000-\$2000 per capita GNP range is the minimum social and economic infrastructure development level.

The World Food Situation: July, 1974

World grain stocks are at a 20-year low. The following table, developed by Lester Brown of the Overseas Development Council, shows the vulnerability of the world food picture today. The two principal “reserves” have been combined into an Index of Food Security.¹⁴ By these

¹³“The OECD Member Countries,” *The OECD Observer*, 1973 Edition. “The United States in the Changing World Economy, Volume II,” Council of International Economic Policy, 1971, p. 50. Cited in Graham T. T. Molitor, *op. cit.*

¹⁴Lester R. Brown, “The Politics of Food,” *Foreign Policy*, Spring, 1974.

calculations, reserves have steadily declined from three months’ to less than one month’s supply of grain (see Exhibit 7).

The world food situation is highly uncertain. Current projections of total world grain output still indicate that 1974 production will reach new highs. Output will exceed disappearance (use and loss) by a modest amount but most of the projected increase will be in North America and the problems of the less-developed countries will probably worsen. But these projections are based upon the outcome of crops not yet harvested (see Table 2, page 8).

World commodity markets continue to be highly unstable and are likely to fluctuate over rumors of weather and import-export decisions. Developed regions average much higher in total calories from sugar, vegetables, fruits, fats and animal products (see Table 3, page 12). Yet cereals, for the world as a whole, supply slightly more than half of the calories for humans and supply feedstuffs in the production of meat, milk and eggs. Meat consumption is increasing in all countries with trade policies and incomes that permit it. In the developed countries the per capita use of cereals for feed far exceeded the amount used for food (see Table 4, pages 12-13).

As the food and population squeeze materializes, the relative efficiencies (per acre per year) both of methods for recovering protein and of various food sources for calories will become more important (see Tables 5 and 6, page 13).

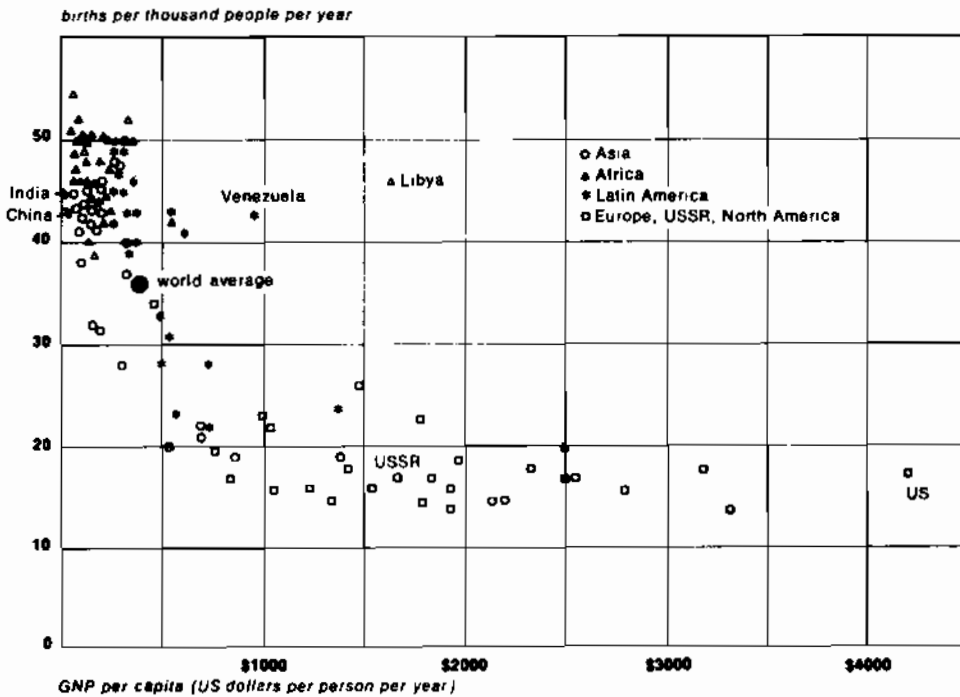


Exhibit 6: Birth Rates and GNP per Capita

Birth rates in the world's nations show a regular downward trend as GNP per capita increases. More than one-half of the world's people are represented in the upper left-hand corner of the graph, where GNP per capita is less than \$500 per person per year and birth rates range from 40 to 50 per thousand persons per year. The two major exceptions to the trend, Venezuela and Libya, are oil-exporting nations, where the rise in income is quite recent and income distribution is highly unequal.

Source: Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, *The Limits to Growth*, A Potomac Associates Book (New York: Universe Books, 1972), page 112, derived from U.S. Agency for International Development, Population Program Assistance (Washington, D.C.: Government Printing Office, 1970).

To summarize, the world grain situation will remain tight and could worsen if a series of events leads to shortfalls of either wheat or rice production elsewhere in the world.

years. The last cycle began in 1952. The last quarter-inch of rain in western Kansas was reported June 8, and since then temperatures have consistently been over 100°F.¹⁶

Rice production for 1974 is now at a projected 300 million metric tons (as compared with 286.4 in 1972 and 308 in 1973). There is great uncertainty, however, as 90 percent of the world rice crop is grown in Southeast Asia and the monsoon season is just beginning.

World course-grain consumption is expected to reach 607.3 million metric tons (in both 1972 and 1973 production fell short of consumption). World price levels are currently very firm. There is some hope for moderate decline.

Estimated world coarse grain production in 1974 is 614.8 million metric tons (note: a metric ton is 2,204.6 pounds) as compared with 597.8 in 1973.¹⁵ The estimate is a composite figure for 103 countries and includes all major producers. The two largest, the USSR and the United States, estimate production at 100 million metric tons and between 190.9 and 201.1 million metric tons respectively.

World oilseed (soybean, peanuts, etc.) production in 1972 stood at 42.9 million metric tons, declining to 42.2 in 1973, and rising to an estimated 45.9 million in 1974. The 45.9 figure is based on the 1973 crop. Thus 1973 increases in U.S. soya acreage, the Indian peanut crop, Russia's sunflower crop, and Malaysian palm oil offset other areas' decreases in peanut and coconut oils. Early estimates for 1975 are for a slight increase to 46.8; however, the United States will decrease.

Weather

This production estimate for the United States has been continually revised downwards as drought affects prospective yields. Indeed, the weather news dominates July forecasts. Students of domestic climatology know that droughts occur on the North American plain every 20 to 23

The consumption of oilseed products increases at a yearly rate of approximately 3 percent. In 1972 it was 42.0 million metric tons; in 1973, 43.1; and estimated consumption for 1974 and 1975 is 44.1 and 45.1 million metric tons respectively. Thus 1974 appears to be a time of replenishing

¹⁵ Foreign Agricultural Service, U.S.D.A., July, 1974.

¹⁶ "Drought Continues to Cut Prospects For Grain Crop," *The New York Times*, July 31, 1974, p. 41.

Exhibit 7: Index of World Food Security

Year	Reserve Stocks of Grain	Grain Equivalent of Idled U.S. Cropland	Total Reserves	Reserves As Share of Annual Grain Consumption (percent)	Reserves As Days of Consumption
	million metric tons				
1961	164	62	222	26	84
1962	131	61	212	24	86
1963	125	70	196	21	72
1964	128	70	198	21	77
1965	113	71	184	19	69
1966	99	79	178	18	68
1967	100	61	151	15	56
1968	116	61	177	17	62
1969	135	73	209	19	69
1970	146	71	217	19	69
1971	120	41	161	14	51
1972	131	78	209	18	66
1973	105	20	125	10	37
1974*	105	0	105	8	29

*Projected

Source: Lester Brown, "The Politics of Food," *Foreign Policy*, Spring, 1974, p. 33.

world stocks of oilseeds. Prices are setting new highs, but there is some instability; for example, soya (80 percent protein and 20 percent oil) producers face declining meal prices and increasing oil prices.

Fertilizer

World *animal fats* (lard, tallow, greases) are expected to amount to 13.3 million metric tons in 1974, compared with 12.9 in 1973. United States output, however, is declining, creating greater pressure on vegetable oils.

Fertilizer (nitrogen, phosphate and potash) is a crucial limit to world agricultural output. World output is expected to be up 8 percent this year. But, developed countries are both the major surplus producers and users; the amount available to the less-developed countries will be down appreciably and will fall well short of demand (see Tables 7, 8 and 9 on pages 14 and 15). Estimated fertilizer shortages could reduce rice output in Asia one to three percent, which would offset the hoped-for increase in world wheat production.¹⁷ High fertilizer prices are expected to persist.

¹⁷Dale E. Hathaway, "World Food Situation," The Ford Foundation, April, 1974.

The Trends

There is reasonable certainty that world population is going to increase in the next decade at a rate of about 2 percent per year and that upward trends in Japan and the European Economic Community (EEC) in real per capita income, meat consumption, and imports of protein meal and feed grains will continue.¹⁸ We thus have *rising affluence* joining *population growth* as major factors behind the burgeoning global demand for food.¹⁹

These trends suggest that international cooperation is vital in population control, managing oceanic fisheries, and maintaining world food reserves. They further demonstrate the urgency of agricultural-development assistance in poor countries.

The following Tables 3-9 contain supporting data cited in text.

¹⁸Willard W. Cochrane, *Feast or Famine: The Uncertain World of Food and Agriculture and its Policy Implications for the United States*, National Planning Association, February, 1974.

¹⁹Lester R. Brown, "The Changing Race of Food Scarcity," *Overseas Development Council Communiqué*, April, 1973.

Table 3: Calories Per Person Per Day from 11 Food Groups, 1964-66 Average

Region	Total	Cereals	Starchy Crops	Sugar	Pulses, Nuts & Cocoa	Vege- table	Fruit	Meat	Eggs	Fish	Milk	Fats & Oils
Developed:												
United States	3,156	649	95	513	103	73	101	598	71	26	397	530
Canada	3,142	670	155	520	73	62	101	622	57	23	378	481
Australia & N. Zealand . .	3,192	821	101	530	61	47	102	655	52	23	403	377
U.S.S.R.	3,182	1,544	265	412	60	41	27	240	27	21	252	293
EEC-9	3,111	878	179	391	68	59	109	474	50	30	305	568
Eastern Europe	3,080	1,498	183	307	59	49	58	314	31	13	189	379
Japan	2,416	1,397	134	197	146	90	53	53	38	85	62	174
South Africa	2,732	1,583	33	403	55	14	37	254	11	28	147	187
Other Western Europe . . .	2,897	978	191	304	103	69	126	288	36	50	267	483
Average	3,043	1,127	175	388	82	59	76	371	44	32	270	419
Less Developed:												
Argentina	2,885	999	180	378	28	30	88	614	24	12	206	326
Mexico & Cent. America . .	2,425	1,197	107	388	188	14	82	131	16	11	104	187
Other South America	2,276	898	291	363	80	23	62	203	13	21	152	180
West Asia	2,316	1,480	41	187	91	39	113	78	7	4	91	185
China	2,045	1,383	224	35	134	33	6	134	12	14	5	65
Brazil	2,541	861	410	401	312	11	48	203	18	13	135	129
East Asia & Pacific	1,969	1,271	245	99	107	27	31	58	7	31	8	85
North Africa	2,290	1,461	104	198	72	43	67	69	5	6	78	187
South Asia	1,975	1,300	29	192	176	35	26	8	1	5	89	114
Southeast Asia	2,121	1,589	70	84	78	29	58	77	8	39	18	71
Africa South of Sahara . . .	2,154	1,109	568	53	180	13	18	61	3	13	32	104
Average	2,097	1,300	191	135	146	30	30	89	8	13	50	106
World	2,386	1,247	186	212	127	39	44	175	19	19	117	201

Source: FAO Food Balances 1964-66.

Table 4: Grain Used, Total and Per Capita, 1964-66 Average

Region	Total Grain Used			Population Millions	Grain Used Per Capita		
	Total	Food	Feed		Total	Food	Feed
	- Million metric tons -				- Kilograms per year -		
Developed:							
United States	143.0	17.5	113.1	191.7	746	91	590
Canada	17.8	1.8	13.2	19.7	906	92	689
Australia & New Zealand . .	6.1	1.6	3.1	14.1	428	113	217
U.S.S.R.	128.3	50.0	39.0	230.6	556	217	169
EEC-9 ¹	99.4	29.6	58.6	246.4	404	120	233
Eastern Europe	70.0	25.1	34.3	121.4	576	207	283
Japan ¹	23.7	15.4	6.1	98.2	241	157	62
South Africa	5.9	3.6	1.6	20.2	294	178	61
Other W. Europe ¹	27.9	10.1	14.1	78.8	354	128	179
Total	522.1	154.8	283.1	1,021.1	511	152	277

Table 4: Grain Used, Total and Per Capita, 1964-66 Average (Con't.)

Region	Total Grain Used			Population	Grain Used Per Capita		
	Total	Food	Feed		Total	Food	Feed
	- Million metric tons -			Millions	- Kilograms per year -		
Less Developed:							
Argentina	8.7	3.1	3.9	22.5	388	138	173
Mexico & Cent. America . . .	15.7	11.7	2.8	77.9	204	151	36
Other S. America	9.1	7.1	.9	62.8	144	112	15
West Asia	29.8	18.9	6.2	102.3	292	185	60
China	150.8	125.4	11.2	764.1	197	164	15
Brazil	19.5	9.9	7.1	80.8	242	123	88
East Asia & Pacific	33.2	30.4	1.0	206.5	161	147	5
North Africa	16.3	13.3	1.4	74.3	219	178	19
South Asia	103.3	93.4	1.1	621.2	166	150	2
Southeast Asia	19.5	16.1	.3	98.9	197	163	3
Africa So. of Sahara	32.6	28.9	.5	217.3	151	133	2
Total	438.9	358.2	36.4	2,328.6	188	154	16
World	961.0	513.0	319.5	3,349.7	287	153	95

¹ The population figures shown were taken from OECD Food Consumption Statistics and generally refer to December.

Source: OECD Food Consumption Statistics 1960-68 and FAO Food Balances 1964-66, with adjustments for grains omitted by OECD and FAO. Rice included as milled rice.
 Compiled by Economic Research Service Foreign and Competition Division, U.S. Department of Agriculture in *World Food Situation - Trends and Prospects* - March 1974.

Table 5: Protein Per Acre

Method of Land Management	Method of Recovering Protein	Edible Protein (lbs. per acre per year)
Planted to forage, grain, fed to steers	as beef	43
Planted to forage, silage, fed to cows	as milk	77
Planted to soybeans	as soybeans	450
Planted to alfalfa, U.S. average crop	as extracted protein	600
Planted alfalfa, Western U.S. irrigated	as extracted protein	1500

In the light of chronic world protein dietary deficiency in an expanding population, perhaps more thought will be given to trade-offs (or alternative uses) between relative efficiencies in land use for protein production.

Source: (See footnote 9.) Harrison Brown, James Bonner and John Weir, *The Next Hundred Years*, p. 71.

Table 6: Acreage Required for Production of 1 Million Calories

Food Source	Acres of Land
Sugar	0.15
Potatoes	0.44
Corn - as corn meal	0.9
Wheat - as whole wheat flour	0.9
Wheat - as refined wheat flour	1.2
Hogs (pork and lard)	2.0
Whole milk	2.8
Eggs	7.8
Chickens	9.3
Steers	17.0

Edible food processed per acre is another way of looking at the relative efficiency of land use.

Source: Frederick J. Stare, "Fiasco in Food," *Atlantic Monthly*, January 1948. Cited in G.T.T. Molitor speech to World Future Society, Washington, D.C., April 24, 1974.

Table 7: Estimated World Nitrogen Fertilizer Production, Demand, and Balance, by Region, 1974

<i>Region</i>	<i>Production</i>	<i>Demand</i>	<i>Balance</i>
North America	11,100	10,500	600
West Europe	11,500	8,200	3,300
East Europe & USSR	11,600	11,200	400
Japan	3,800	1,000	2,800
Other Developed Countries ¹	700	600	100
Developed Regions	<u>38,700</u>	<u>31,500</u>	<u>7,200</u>
Latin America	1,400	2,100	-700
Developing Africa	500	1,000	-500
Developing Asia	3,700	5,100	-1,400
Developing Regions ²	<u>5,600</u>	<u>8,200</u>	<u>-2,600</u>
Other Asia ³	1,500	5,100	-3,500
World	<u>45,800</u>	<u>44,800</u>	<u>1,100</u>

¹ Includes South Africa, Israel, and Oceania.

² Excludes Other Asia.

³ Includes Peoples Republic of China (PRC), Taiwan, North Vietnam, North Korea and Mongolia.

Source: Based on TVA and unpublished USDA estimates; The Ford Foundation.

Table 8: Estimated World Phosphate Fertilizer Production, Demand, and Balance, by Region, 1974

<i>Region</i>	<i>Production</i>	<i>Demand</i>	<i>Balance</i>
North America	7,330	5,900	1,430
West Europe	6,640	6,750	-110
East Europe & USSR	8,010	6,800	1,210
Japan	920	920	0
Other Developed Nations ¹	1,880	2,020	-140
Developed Regions	<u>24,780</u>	<u>22,390</u>	<u>2,390</u>
Latin America	610	1,480	-670
Developing Africa	980	460	520
Developing Asia	900	1,910	-1,010
Developing Regions ²	<u>2,690</u>	<u>3,850</u>	<u>-1,160</u>
Other Asia ³	1,420	1,470	-50
World	<u>28,890</u>	<u>27,710</u>	<u>1,180</u>

See footnotes and source in Table 7.

Table 9: Estimated World Potash Production, Demand, and Balance, by Region, 1974

<i>Region</i>	<i>Production</i>	<i>Consumption</i>	<i>Balance</i>
North America	9,090	5,150	3,940
West Europe	5,810	5,630	180
East Europe & U.S.S.R.	7,720	7,180	540
Japan	0	750	-750
Other Developed Nations ¹	960	400	560
Developed Regions	<u>23,580</u>	<u>19,110</u>	<u>4,470</u>
Latin America	0	1,060	-1,060
Developing Africa	370	190	180
Developing Asia	0	790	-790
Developing Regions ²	<u>370</u>	<u>2,040</u>	<u>-1,670</u>
Other Asia ³	110	250	-140
World	<u>24,060</u>	<u>21,400</u>	<u>2,660</u>

See footnotes and source in Table 7.

The Aggravated Complex Problem of Food and Population

TWO RECENT happenings – the energy crisis, which greatly increased petroleum costs, and the depletion of food reserves, which threatens world food security – have hastened relatively new groupings of lesser-developed countries into the so-called Third and Fourth Worlds. The Third World nations are possessors of raw materials and are beginning to organize into commodity bargaining blocs. The most potent example is the Organization of Petroleum Exporting Countries.

Inflation

Commodity price rises affect the developed nations, but not nearly so much as they affect the Fourth World, which finds itself out of currency reserves for emergency grain or for purchases of fertilizer to increase productivity. A study of the U.N. Conference on Trade and Development (UNCTAD) stressed that inflation has particularly bad consequences on the “largest and poorest” developing countries and “could bring a serious deterioration in levels of food consumption.”²⁰ This is due to greater difficulty suffered from direct price increases in food, fertilizers and manufactured goods. For example, the report notes that food and fertilizer imports increased by \$5 billion in 1973 and are expected to increase by a further \$5 billion in 1974. The “corresponding increase” in the cost of oil imports is \$1.2 billion in 1973 and \$7 billion in 1974.

The Indian Situation

Norman Borlaug, in a recent talk to the World Food and Population Committee, illustrated the problems of Fourth World countries with the example of India: In 1972 crude oil, fertilizer and food grain cost \$500 million; today it is \$1.2 billion, and next year the cost is predicted to be close to \$2 billion (see Exhibit 8).

An agribusiness executive has stated a difficulty involving U.S. efforts: “It’s still a competitive world . . . [there is] not the habit or spirit of aid in the recently rich Third World countries.”²¹

In 1973 the United States paid for its oil imports with increased food exports. In a report based on the April 4, 1974 United Nations Conference in Trade and Development, it was reported that the United States imported \$14.1 billion worth of minerals and fuels and exported \$17.7 billion worth of agricultural products.²² While the price of U.S. fuel imports increased 22 percent, the price of

food exports increased 55 percent. U.S. farm income in 1973 rose \$5 billion over 1972. Agriculture Secretary Earl Butz has stated that the U.S. agricultural challenge “. . . is to pay for a lot of imports that . . . we have come to depend upon to maintain our standard of living.”

As the world’s food reserves decline, a third factor, climate, is assuming greater prominence. We do know, for example, that a shift in average temperatures in Russia of one degree centigrade will measurably affect nearly one-half of the Russian agricultural system. And, while world meteorologists seek patterns to drought by watching the advance of the Sahara desert, they see “not enough evidence to be certain, but enough to be concerned.”²³

World Population Pressures

World population pressures are acute and the prospects are worse. Nearly 42 percent of developing countries’ population (as opposed to 28 percent in developed countries) is under 15 years of age – soon to enter the most productive and the most reproductive years. And funds for family planning are limited – only about \$154 million was available worldwide for research, program assistance, and administration (in 1970 funding sources included: the Agency for International Development (AID); The Ford Foundation; The Rockefeller Foundation; and the United Nations, to name a few).²⁴

Of 165 national governments, only two – The People’s Republic of China and Singapore – have systematic family-planning approaches which include minimum marriage ages; widespread family planning, counseling and abortion; limits to tax deductions; limits to rationing cards and welfare; and enforced regulations on the role of women.²⁵ However, according to the Population Council, a New York-based research organization, about 30 of 120 developing nations have official policies aimed at reducing population growth rates. Thirty others, which include most Latin American countries, have some family planning policies; the other sixty are “indifferent.” Not even the United States Government has an official position on population stabilization, which hinders its credibility in dealing with developing countries.

²²U.N. General Assembly: *Study of Problems of Raw Materials and Development: Note by the Secretary General*, April 2, 1974 with addendum April 4, 1974 (A/9544 and A/9544/Add 1).

²³Statement by Lester Brown at the Senior Executives Council Meeting, May 30, 1974.

²⁴The Population Council, New York City.

²⁵The Victor-Bostrom Fund Report, *Family Planning: Improving Opportunities for Women*, Report No. 18, Spring, 1974.

²⁰United Nations Conference on Trade and Development: *Problems of Raw Materials and Development*, April 4, 1974. (UNCTAD/OSG/52 and UNCTAD/OSG/52/Add 1).

²¹Food and Population project research interview.

Exhibit 8: The Economic, Social and Political Dilemma of the Petroleum-Importing Food-Deficit Countries of the Developing Third World Nations

An Example: The Case of India

Foreign Exchange Expenditures expressed in U.S. Dollars for Three Essentials: Crude Oil, Fertilizer and Food

Product	1972 ²	1973 ³	1974 Alternative Choices		
			A ⁴	B ⁵	C ⁶
	in millions of U.S. Dollars				
1. CRUDE OIL IMPORTS ¹ : <i>Note:</i> 1973, 1974A and 1974B at same level of volume as 1972; except 1974C at 50% volume of 1972.	265	415	1,350	1,350	675
2. FERTILIZER IMPORTS: All at level of 1 million nutrient metric tons of Nitrogen except 1974B at 1/2 million nutrient metric tons and 1974C with no imports – including freight. Prices based on Urea (45% N) and adjusted for changes in prices and freight rates.	143	300	550	275	0
3. GRAIN IMPORTS (WHEAT):	180	500	500		
A. Volume of imports 1972, 1973 and 1974A all based on 2 million metric tons of wheat adjusted for changes in grain price and ocean freight rates.					
B. Volume and value of imports of grain adjusted:					
(1) to include 2 million tons as in above				250	
(2) plus increase of 5 million additional tons to compensate for reduction of fertilizer imports by 500,000 metric tons.				1,450	
C. Volume and value of imports adjusted:					
(1) to include 2 million tons and freight as above					500
(2) to include 10 million tons of import to compensate for elimination of 1 million tons of nutrient fertilizer imports					2,500
(3) to include 5 million tons of wheat imports to compensate for reduction of 500,000 metric tons of Nitrogen fertilizer resulting from 50% reduction in crude oil imports.					1,250
TOTAL	\$588	\$1,215	\$2,400	\$3,325	\$4,925

¹Crude oil import values – from "Energy Shock and the Development Prospect" by James P. Grant, Feb. 1974.

PRICES:

²1972 – Urea (45% N) = \$45/metric ton x 2.2 =
Price nutrient metric ton
Urea freight \$20/metric ton Urea x 2.2 =
Freight nutrient metric ton
Wheat \$70/metric ton
Wheat freight \$20/metric ton

³1973 – Urea (45% N) \$100/metric ton x 2.2
Urea freight \$50/metric ton x 2.2
Wheat \$200/metric ton

⁴1974 – Urea (45% N) \$200/metric ton x 2.2
⁵Urea freight \$50/metric ton x 2.2

⁶Wheat \$200/metric ton
Wheat freight \$50/metric ton

1974 Alternative A is a continuation, in so far as possible, of the same approach that was used during 1972 and 1973, whereas Alternatives B and C show the impact of changes in imports of fertilizer, grain and crude oil.

Source: The Population Crisis Committee, Washington, D. C.

Policy Choices

THE POLICY choices in the Food and Population dilemma involve massive efforts to decrease demand through population control and equally massive efforts to improve agricultural productivity. In the low-income, high-fatality regions, however, a first step is environmentally sound social and economic development aimed at improving per capita welfare and earning capacity.

Family planning is a culturally and politically sensitive subject. While there is considerable evidence that current rates of population growth in developing countries are a threat to economic development, there is much less agreement on the rationale for fertility control.²⁶ In population politics, even enlightened United States Government or multinational corporation activities are suspect. And these activities are suspect as much for "not attempting to see why others disagree" as for the disruptive effect of more equitable distribution of income in the social system of a developing country.²⁷ (There is also evidence for the proposition that fertility declines as income is more evenly distributed throughout society.) Hence, careful efforts to increase income among the poor of a developing country involve delicate "channeling" problems.

Efforts must be made to produce food increasingly within the natural scheme. This may include greater conservation measures, for example in the "farming" of organic wastes through the agency of yeasts or algae. And clear efforts must be made by this generation on behalf of the next. For example, corporate executives or government bureaucrats may be accountable for "economies" at the expense of the environment.

Policy decisions confront the leaders of developed regions. Massive capital inputs are needed to raise the floor of development in poor nations; at the same time, capital is required within the developed regions to prevent further environmental deterioration and to convert to nonwasting energy-resource supplies. Yet it is noteworthy that in terms of the U.S. food system, only one-fourth of the total energy input into food is there at the farm gate. Processing, packaging, distribution and transportation are the real energy consumers, according to Lester R. Brown of the Overseas Development Council. Thus internal shifts resulting in less energy-intensive patterns may be in the offing. The developed regions therefore face severe internal constraints in selecting policy responses to the massive prospective starvation.

The major remaining policy response involves acceleration of balanced economic development in the regions of

²⁶ *Food and Population* project research interview with T. King, Human Resources Division, The World Bank.

²⁷ *Ibid.*

low income and high fertility. In view of the intense competition in the developed countries for capital, the only readily identifiable source of investment capital needed in the less-developed regions appears to be the excess oil revenues in prospect in the oil-producing countries. These excess revenues have not as yet been committed in any large measure, although some initial steps to direct some portion of these to the less-developed countries through such mechanisms as the World Bank and the Arab Development Fund have begun to appear.

In any event, what is crucial for the less-developed countries is to increase their own food-producing capacity. Assistance could include: fertilizer (possibly from now wasted Arab flared gas); know-how of agribusiness and science (in identifying particular climatological, water or genetic problems of each region); and jobs (80 percent of the less-developed nations' population is in agriculture).

What Is Being Done about the Food and Population Problem

Excellent studies do exist. Perhaps the most comprehensive is the three-volume Report of the President's Advisory Committee on the *World Food Problem*, already cited (see Appendix A for excerpts). Recent Congressional Hearings of the Senate Committee on Agriculture and Forestry and of the Senate Select Committee on Nutrition and Human Needs, no doubt in the wake of perception-altering events concerning continued agricultural abundance, have rekindled research interest (see Appendix B, 1972 Survey of Environmental Activities, pages 31 to 34).

Much expertise and data stem from the United States Department of Agriculture (USDA), yet organizations such as the United Nations Association of the United States of America and the Stanford Research Institute have continuing efforts in the "food supply" and "food products and processes" areas. Many other groups are involved: the U.S. Marshall Fund, the Brookings Institution, the Overseas Development Council, and the National Planning Association, among other food-related interests, are looking into "food reserves."

The National Academy of Science and the National Science Foundation are jointly examining "perceptions of national problems and program priorities"; while the Committee for Economic Development is completing a policy paper, "Is There a Government Role in Agriculture?" The Office of Technology Assessment is developing a "comprehensive computer model for use in agricultural policy making."²⁸

²⁸ *Food and Population* project research interview with Emilio Daddario, Director, Office of Technology Assessment.

The massive food and population efforts though, are being made by the United Nations Food and Agriculture Organization, The Ford Foundation and The Rockefeller Foundation. Private-sector organizations are also beginning to see a larger role for themselves in any solution to the food and population problem (see Appendix C, "Extracts from Senior Executives' Council members' responses to: 'What are your food-related activities?'").

The United Nations Population Conference

The population control problem has been brought into focus through the United Nations World Population Year Program, culminating in Bucharest at the U.N. Population Conference in August, 1974. The conference is the first gathering of governments on this subject, and it is hoped that a common plan of action for the ensuing decades will be worked out.

Such a "plan" faces formidable hurdles. It is necessary to understand that, while the population problem is of global concern, it is an aggregation of many varied problems. For example, India sees its problem as one of too many people; Indonesia sees it as one of distribution (80 of its 120 million people live on the one island of Java when there are 3,500 other inhabitable islands in the Indonesia archipelago); the Philippines see distorted familial dependency — 50 percent of the population is under 15 or over 65 — as a burden for the producers to carry; developed countries see senescence as the problem: What are the needs of an aging population for education, insurance, health care, career stimulation, leisure?

The World Food Conference

The World Food Conference, to be held in Rome in November, 1974, will assess the magnitude of the world food situation and suggest national and international approaches for increasing food production and strengthening world food security through coordinated food-stock holding and emergency food aid. The Conference is being sponsored by the United Nations (which brings in the USSR because they are not members of FAO), the Food and Agriculture Organization, and the United Nations Economic and Social Council (UNESCO). It will not deal with population or land reform.

The United States (only governmental representatives will be attending) government coordinator is Ambassador Edward Martin, who will make recommendations dealing with an information system, storage stocks, food aid, raw material access, and openness of trade.

United States agencies will provide the documentation. For example: the Food Security — Reserve paper will come

from USDA, Department of State, AID, the National Security Council, with some Commerce Department representation; and the Food Security — Aid papers will include the above inputs, as well as those of the Office of Management and Budget.

In the U.S. Report there are three time phases:

(1) *The 1974 Crop* in which U.S. grain and corn exports are expected to increase 30 percent and 15 percent respectively. The developing nations, however, will be suffering from fuel, fertilizer and foreign exchange shortages — which means that "unrequited transfers" from the United States are a probability.

(2) *The Visible Future* deals with food and population projections to 1985 — aggregate per capita supply is projected at staying one step ahead.

(3) In *The Long, Long Term* "we must check population growth or there is no solution to the food problem."²⁹

The Third United Nations Conference on the Law of the Sea

The current Caracas sessions are focusing on the economic zone concept in the development of an international ocean regime and arms controls in the oceans. Some agreement has been reached on a 12-mile territorial sea and an economic zone of 200 miles. Within this zone the right of free passage was contemplated.³⁰ Other topics include the problems of special interest groups such as landlocked states; preservation of the marine environment including the prevention of marine pollution; scientific research; the peaceful use of ocean space; and the freedom of the high seas — navigation, fishing, flying over, and laying submarine cables and pipelines.³¹

What is heartening in the United Nations' efforts is the seemingly thorough, issue-by-issue approach which does not lose sight of the interconnected nature of the problems. Just as governments appear to recognize that problems of raw material scarcity, law of the seas, population and food all require their active cooperation, so also, domestically, the corporate social responsibility movement has highlighted the large private role in solving society's problems.

²⁹ Statement by Don Paarlberg, Research Director, U.S. Department of Agriculture at the Senior Executives Council Meeting, May 30, 1974.

³⁰ United Nation Press Release SEA 168, 17 July 1974.

³¹ Ambassador H.S. Amerasinghe, "The Third United Nations Conference on the Law of the Sea," *UNITAR News*, Vol. 6, No. 1, 1974.

What the Private Sector Can Do

IN ADDITION TO their own organizations, leaders in the private sector have opportunities to participate in a varying array of other leadership groups, with concomitant opportunities to influence everwidening circles.

Action options open to leaders thus include at least:

- . Direct action through the organizations which they "command";
- . Exercise of influence on organizations with which they have affiliation, to induce direct actions;
- . Exercise of influence on governments and quasi-public bodies to induce needed policies and incentives; and
- . Support of research and actions which lead to ecologically sound, balanced economic and agricultural development.

Direct Actions

Direct actions appear to lie principally in increased economic development of the poor and populous regions, or in actions which would have the indirect consequence of furthering such development. For example:

- . Marcona Corporation has recently organized a multinational project to utilize Brazilian iron ore, Marcona's tankers, Japanese technology, and Saudi Arabian flared gas and capital to build a massive new steel complex in Saudi Arabia, taking full advantage of available economies of scale.

- . General Motors has developed, and is assisting less-developed countries to initiate, production of very simple trucks – which can be built with indigenous labor skills and a minimum of imported materials – to improve internal goods distribution.

- . General Foods has long engaged successfully in developing higher nutritional and culturally acceptable foods which make it possible for existing food outputs to meet the nutritional needs of larger numbers of people. Ralston Purina and General Mills' work on proteins synthesized from soybeans is of the same nature.

A Past Lesson

The parallel between the food and population problem and the energy situation of 15 years ago was noted recently. The energy experts knew there was a problem but no strategy or alternative course of action to prevent the crunch was adopted. Once again the crisis in prospect is evident early and no clear strategy to avoid it or cope with it has been adopted. Given the prospects for mass starvation (rather than just the energy shortage inconvenience), there is a real challenge to economic and political leaders.

The private sector could consider:

- (1) Formation of groups, such as the Latin American Agribusiness Development Corporation, S.A., which lists as shareholders (among others): Adela Investment Co. (Peru), Bank of America, The Borden Company, Cargill, Caterpillar Tractor, Standard Fruit and Steamship Company and The Chase Manhattan Bank. And "... it is true that the prime purpose for its creation was development and not 'profits.'"³²

- (2) Joining, supporting and lending industry experts to the FAO-Industry Cooperative Programme which seeks to improve business management in the food-related activities of United Nation member countries.

- (3) Direct financial investment in food production pilot projects, such as the use of oysters as a tertiary sewage treatment stage and the use of power plant warm water effluents for algae-culture and fish production. (Such waste heat is today dissipated by cooling towers or by other nonproductive and costly means.)

- (4) Direct compensation incentive approaches to the employees of multinationals in the poor and populous countries to encourage family planning.

- (5) Direct provision of educational facilities and employment outside the home for women.

Exercise of Influence on Other Organizations

Exercise of influence on other organizations is a course already being employed by many private sector leaders. An example is the contributions support given to international planned parenthood efforts. Another is the "industrial statesman's" role of support, for example, of the Declaration on Food and Population. Such efforts can be expanded.

Exercise of Influence on Government and Quasi-public Bodies

The Senior Executives Council of The Conference Board is already supporting such an effort in the International Center for Industry and the Environment, which seeks to provide an industrial interface with the United Nations Environmental Program. Similar efforts could include:

- (1) Encouragement of World Bank and IMF efforts to redirect revenues in excess of the needs of the oil-producing countries, to agrarian economic investments in less-developed countries.

- (2) Encouragement of the creation of a World Food Bank.

³² Latin American Agribusiness Development Corporation, S.A. Annual Report, 1973.

(3) Sponsorship of research and organization of industry-labor-government forces to develop:

(a) improved tax policies and tax incentives for foreign direct investment in food production and distribution facilities in the less-developed countries;

(b) new anti-inflation tools to stabilize trade balances and prevent erosion of food and energy resource purchasing power of the poor and populous regions.

Support of Research

There are "white spots" on the map of needed research — things which need to be done but which are not being done. These include:

. Development of a simplified information and data center to put all food- and nutrition-related facts on a common basis for prompt comparative analysis and to keep such facts timely, complete and relevant.³³ This could encompass such diverse activities as plant genetics, agribusiness (food production, processing and marketing),

³³O. V. Wells, "Improving World Food Situation Outlook Information, and Analysis," Working Paper II, International Division, The Ford Foundation, April, 1974.

nutrition, dietetics, and disease associated with malnutrition and dietary patterns.³⁴

. Examination of the energy content and relationship in the entire food chain, from land clearance through consumption, with the aim of identifying and removing barriers (legal, cultural, political) to improvements in energy use per unit of consumed food. (This could include examination of more efficient dietary patterns and substitution possibilities involved in the consumption of cereals and oilseeds.) An additional aim could be the identification of essential and nonessential nutrients and their interrelationships so as to develop a standard, rapid and accurate method of determining national values of food. (Note: the USDA is organizing a nutrient data bank, the Consumer and Food Economics Institute.)

. Examination of the possibilities for improving the nutritional values of plant and animal foods is imperative in the light of world food problems and domestic food costs. (For example: reduction of saturated fat in meat or reduction of cholesterol in eggs.)

³⁴*Food and Population* project research interview with Emilio Daddario, Director, Office of Technology Assessment.

Appendix A
Excerpts from *The World Food Problem**

*A Report of the President's Science Advisory Committee, Vol. 1, Report of the Panel on the World Food Supply, The White House, May 1967.

Chapter 3

3.1 Principal Findings and Conclusions

This report defines and directs attention to a threatening problem of the global environment in which the United States and all nations must dwell together – the declining condition of more than two-thirds of the human race.

The Panel's detailed analysis of the world food problem has led to four basic conclusions:

1. The scale, severity, and duration of the world food problem are so great that a massive, long-range, innovative effort unprecedented in human history will be required to master it.

2. The solution of the problem that will exist after about 1985 *demands* that programs of population control be initiated now. For the immediate future, the food supply is critical.

3. Food supply is directly related to agricultural development and, in turn, agricultural development and overall economic development are critically interdependent in the hungry countries.

4. A strategy for attacking the world food problem will, of necessity, encompass the entire foreign economic assistance effort of the United States in concert with other developed countries, voluntary institutions, and international organizations.

3.1.0 The Nature of the World Food Problem

The world's increasingly serious nutritional problem arises from the *uneven distribution* of the food supply among countries, within countries, and among families with different levels of income. Global statistical surveys based upon total food produced per person, suggest that there is no world-wide shortage of food in terms of quantity (calories) or quality (protein) at the moment. But in the developing countries, where two-thirds of the world's population live, there is overwhelming clinical evidence of undernutrition (too few calories) and malnutrition (particularly, lack of protein) among the people. Clearly, millions of individuals are *not* receiving the amounts of food suggested by average figures.

Many South Asian and Latin American countries, for example, have average diets which are nutritionally inadequate according to minimum standards of the United Nations Food and Agriculture Organization (FAO). In these regions, surveys show that the poorest 25 percent of the people consume diets with caloric and protein contents that are only about three-fourths of the country average and fall far below calculated nutritional requirements. It is in these low income groups that overt malnutrition is found, particularly among the most susceptible groups: infants and preschool children, pregnant women, and nursing mothers.

3.2.0 Population Growth and Food Needs

If the world population continues to increase at 1965 rates, 52 percent more calories will be required in 1985. This estimate is based on calories actually consumed and does not consider production, losses, quality, and wastage of food. If, as a result of family planning programs during 1965-85, one optimistically assumes a progressive decrease to 30 percent in the probability that a woman of given age will bear a child (fertility rate¹), the caloric requirements will still be 43 percent higher by 1985.

These projections of *world* food requirements, however, fail to depict the plight of the developing countries. India, at her present population growth rate, will require 108 percent more calories by 1985; with a 30 percent reduction in fertility, the increased nutritional requirement will be 88 percent. The corresponding figure for Pakistan's increased caloric needs in 1985, allowing for the same reduction in fertility, are 146 percent and 118 percent, and for Brazil, 104 percent and 91 percent.

These estimates portray two of the most crucial aspects of the relationship between population growth and food needs:

1. Population and food problems center directly in the already poor, already diet-deficient countries where food production is low and population growth rates are high. In these developing nations, under the best circumstances, food needs will at least double within the next two decades.

2. The disproportionate additional need for food in the developing countries cannot be solved by successful programs of family planning alone during the next 20 years. This mathematically demonstrable fact of demography *must not* be interpreted to indicate that population control measures are inherently ineffective or in any way secondary in importance to increasing food production. On the contrary, the Panel's estimates simply show that the impact of successful family planning is cumulative and makes itself felt in the size of the next generation.

For example, the difference in our high and low estimates for world population in 1985 is only 385 million (5.03 billion and 4.65 billion). The difference is greater in later decades and is 1.15 billion in the year 2000 (7.15 billion and 6.0 billion).

¹ The demographic techniques utilized by the Panel in projecting population growth are described in detail in Chapter 1, Volume II. Assumptions concerning future effectiveness of family planning were not made on the basis of an estimated reduction in *birth rate* (births per 1000 total population). Rather, a reduction in the *age-specific fertility rate* was assumed. Age-specific fertility is a more accurate reflection of success in family planning than is birth rate alone.

To avoid a continued worsening of the population-food situation during the years beyond 1985, that may even reach an economically or ecologically irreversible state of imbalance, *it is imperative to institute intensive programs of family planning now.*

The Panel is unanimous in supporting and urging, in the strongest terms, continuing and increasing emphasis upon research, technical assistance, and capital funding in family planning. Only by such continuing emphasis and effort can the outpacing of food production by population growth be avoided as a problem that might continue well into the next century. The long lag-period that necessarily precedes the main effect of programs of family planning adds to the urgency of the need for action now.

The world food problem is not a future threat. It is here now and it must be solved within the next two decades. If it is solved during this time, it will be manageable for the years thereafter. . . .

3.3.0 Nutrition, Infant Mortality and Family Planning

That reduction of population growth is essential to achieving a balance between food supply and food need is an obvious, easily understood, and widely appreciated fact.

There is, however, another more complex, less well-known, and crucially important relationship between nutritional needs and family planning. Surveys of the attitudes of married couples in developing countries show that the numbers of children desired are higher than in the developed nations. Furthermore, the average number of live births per woman in the developing countries is 30 percent greater than the desired number of children.

Emphasis on the desire for heirs leads to large families. Only one son may be needed for ritual or economic purposes but it is common to want two sons to insure against the death or incapacity of one. Couples must average four children to obtain two sons.

Availability and efficacy of pills, intra-uterine devices and other technical means for birth control are largely irrelevant until couples have secured the desired number of living children.

If we assume the necessary preconditions for reducing fertility rates in the developing countries are low infant and child mortality and a public awareness that mortality is low, then *we have the apparent paradox that a reduction in childhood mortality will reduce rather than raise the rate of population growth.*

In the United States, approximately 25 of every 1,000 liveborn infants fail to survive to the age of one year and most of the deaths result from prematurity or congenital defects. In the poor countries of Asia, Africa, and Latin America, published infant mortality rates range from 100 to nearly 200 per 1,000 live births. *Much of the higher death rate is the direct or indirect result of protein-calorie malnutrition.*

Protein-calorie deficiency, in the form of a disease called *kwashiorkor*, is a great killer. Acute diarrhea can be a dangerous illness for a well-nourished American baby; in

the malnourished infants of the developing countries, it has an appalling mortality. Common childhood diseases are catastrophic in protein-deficient children. In 1960, for example, the fatality rate from ordinary measles was more than 100 times greater in Chile than in the United States.

If lowered infant and child mortality is a precondition to acceptance of family planning, and the major underlying cause of excessive childhood deaths in the developing nations is malnutrition, it follows that an increase in both quantity and quality of food in these countries is essential to achieving stability of population growth.

Viewed in this light, alleviation of the world food problem must be accorded the highest priority in planning for the developing nations.

3.4.0 Subsistence Farming and Commercial Agriculture

In countries where, for centuries, farming has been traditionally at a *subsistence* level, intended to produce food and fiber only for family or local needs, the urgent problem of converting individual farmers to a *commercial* system in which production is primarily for markets at a distance from the farming area has been superimposed upon the other demands of modernization. The cornerstone of economic progress of any nation is the development of its natural resources and manpower. Many of the developing nations must concentrate on agricultural resources as the foundation for building self-sustaining, productive national economies. Conversely, the growth of the entire national economy will be essential in the future to increase agricultural production, which will depend critically on the farmer's ability to purchase fertilizers, tools, high-yielding seeds, pest controls, and irrigation water. To be able to purchase the required materials, farmers will need to sell a major portion of their harvests, which means that there must be increasingly prosperous customers who can buy farm products.

To persuade farmers to accept the techniques and methods of modern agriculture is a formidable and complex undertaking. Farmers in traditional subsistence economies are understandably wary of assuming new risks because they are so close to the margin of survival. If a farmer is to invest in the modern inputs of improved seeds, fertilizers, and pesticides that are essential to increasing the output of his land, then resources must be easily available to him, a system of farm credit must be established so that he can afford to purchase them, he must be instructed in the proper and economic utilization of these materials, he must be reassured that he will be compensated for possible losses incurred in the process of innovation, and, above all, he must be shown that the potential payoff is worth the risk. Land tenure policies should not be such that his landlord will profit and he will not. Government pricing policies should not favor the consumer at the expense of the producer.

All of these factors enter into the vital matter of providing incentives to the farmer to increase production for the market. Fundamentally, it appears that many

nations are under-utilizing the power of the market economy. Needed inputs for modern agricultural production are scarce, unreliable in availability, and expensive in relation to the prices of farm products. For example, a bushel of rice will pay for four times as much fertilizer in the United States as it will in Egypt and more than twice as much as it will in Thailand or India.

Both producers and consumers are responsive to prices and to income if governments will recognize and use the market mechanism. The Mexican government has recognized this fact in pricing policies and this is a major reason for the growing promise of the Mexican agricultural development program.

To induce farmers to change, the potential payoff must be high — not 5 to 10 percent but 50 to 100 percent. Adoption of deep wells for supplemental irrigation in West Pakistan is an example. In five years, nearly 32 thousand private “tube” wells were installed, at a cost of \$1,000 to \$2,500 each, on farms no longer than 25 acres in the cotton and rice regions of the former Punjab. A private investment of \$50 million was made by traditional farmers without government subsidy. Why? The wells typically paid for themselves in two years. If the payoff is large enough, farmers will change.

3.5.0 The Effects of Urbanization

The enormous increase in nonfarm population in the diet-deficient countries has aggravated the food problem further by making it necessary to develop distribution systems to move more and more food into the cities from the producing areas. This requires the establishment of transportation, storage, processing, and marketing facilities on an unprecedented scale in economies which are already stretched to their limits.

The growth of large cities is a well-recognized characteristic of developed nations but it is not generally realized that the trend toward urbanization is fully as strong in the developing countries. As early as 1950, more than one-third of this world's cities with populations exceeding 100 thousand were in Asia and the exodus from rural areas has accelerated each year since.

The shift of people from farms to cities in the United States and Western Europe has resulted primarily from the reduction in rural labor requirements brought about by advances in modern agricultural technology and increased labor requirements of industry. In the developing countries population growth alone has heightened the frequency with which families leave the overcrowded, poverty-stricken countryside, hoping to find a livelihood in the city. The results in most developing nations have been growing slums and unemployment since unskilled labor is overabundant in both rural and urban areas.

3.6.0 Food Customs and Taboos

Dietary habits are established early in life and, in the highly traditional cultures of the developing countries, food selection and diet more often reflect religious and social beliefs than they do the principles of human nutrition.

During the past several years, there have been many commercial programs intended to make unfamiliar new food products available to low-income groups in the developing countries. It has become abundantly clear that it is extremely difficult to change fixed food habits. Market research and feasibility studies must give proper attention both to family income and to existing habits and taboos. It has been demonstrated that dietary customs can be changed (e.g., people whose dietary staple has been rice have been persuaded to accept wheat as a supplement or substitute) but success in any such undertaking requires time and a carefully prepared program of consumer education. In summary, *any program to remedy malnutrition which involves changing traditional food habits is highly likely to be ineffective in the short-run and even a long-range plan must be carefully programmed for the specific local situation.*

3.7.0 Meeting the Need for More Food

For the next several years, any major expansion of the world food supply will be dependent on increased production from conventional sources and upon more efficient utilization of available foodstuffs through reduction of waste and spoilage. *The vast majority of the increased production must take place within the developing countries themselves.*

3.7.1 There is No Panacea

Periodically, the new media draw attention to ongoing research on systems which offer possibilities as new sources of human food. Because there is a strong tendency to portray these as possible “solutions” as the world food problem and because the public is drawn understandably to such panaceas, this publicity undoubtedly lessens concern about the seriousness of the food supply in the developing nations.

The Panel has examined carefully and in detail the several new processes which are under current study. . . .

. . . some nonconventional sources of food appear to offer great potential for the long-term but in the judgment of the Panel none of these can be expected to lessen the problem of increasing food production from conventional sources during the next two decades.

Furthermore, the magnitude of the world's food problem is so great that nonconventional sources, when and if they become available, may be needed to supplement rather than supplant modernized agriculture. The problem will be with us for so long, however, that every effort must be made now to invent new processes and develop known ones to produce novel foodstuffs. In order to provide a reasonable probability that the long-range potential of unconventional food sources may be realized within two decades, we must accelerate research on these methods now.

3.7.2 Animal Sources

There are good opportunities for improved production of livestock and increased utilization of fishery resources, including fish farming (aquiculture), in the developing countries. These deserve emphasis and exploitation because

animals are capable of converting to food different types of by-products and forages that cannot be consumed directly by people and for the significant contribution that they can make to improving the quality of protein in diets and earning foreign exchange. A process of producing fish protein concentrate (FPC) appears to hold promise for the future although major problems of scale, technologies for different species, and consumer acceptability must be solved before its usefulness can be evaluated.

3.7.3 Agricultural Production

It is, therefore, evident that the *bulk of the increase in food supply must come from increased production of farm crops*. There are two ways in which agricultural production can be increased: by bringing more land under cultivation or by increasing yields of land under cultivation.

Until the present time, most of the increase in food production in the developing countries has been achieved by extending traditional farming methods over a larger area of cropland. Substantial opportunities remain to bring additional land under cultivation in the less densely populated areas of Latin America and of Africa, but the vast majority of arable land in Asia is already in use. . . .

In Asia, a shift to increasing crop production by intensifying agriculture and using modern methods to improve annual yields on land under cultivation will be mandatory. Even in Latin America and Africa, the increasing cost of clearing additional land may well make it more economical in many regions to concentrate on elevating yields rather than expanding cultivated areas.

To increase yields, a major expansion of irrigation facilities will be necessary to make multiple cropping possible independent of wide variations in seasonal rainfall. It also will be necessary to develop and utilize new, high-yielding varieties of plants, to develop and utilize plants with a higher quality of protein, to increase the use of fertilizers and pesticides, and to employ improved farm machinery. Increased capital investments and increased expenditure on the part of farmers will be required to make these tools . . . available. These are the techniques that have been employed so successfully in the developed countries to transform farming into a *business*.

The transition from traditional farming to modern agriculture will be difficult and expensive for the hungry nations but it is absolutely essential if their food needs are to be met. There is no alternative.

3.8.0 The Need for Technical Assistance

The modernization of agriculture in the developing countries will involve capital investment, provision of inputs in the form of seeds, fertilizers, pesticides, water, and machinery, organization of distribution and marketing systems, education of agricultural specialists and extension workers, provision of production incentives for individual farmers in the form of land-reform and pricing policies, and other changes in social and economic structures. . . .

3.8.1 Agricultural Technology is Not Transferable

Modern scientific agriculture has been brought to flower

in the temperate regions of the developed world. In the tropical climates where the bulk of the world's low-income people live, scientific agricultural efforts have been concentrated on the traditional tropical export crops: sugar, tea, coffee, cocoa, bananas, and rubber. Only recently have food crops received serious attention.

The products of technology and "know-how" cannot be transferred directly to the developing nations. Many plant varieties transferred to different climates fail to flower or set seed if, indeed, they survive at all. Livestock may become non-productive or die. Adaptive research must be accomplished within the developing countries. A blueprint for a bicycle or a steel mill can be shipped overseas and utilized without alteration but the blueprints and architecture for a food crop must be developed overseas. There, as in the United States, new plant varieties, each better than the last, must be produced frequently. . . .

There is an urgent need to carry out this adaptive research, to establish strong indigenous institutions, and develop the manpower that will enable the poor, food-deficit nations to carry out the self-sustaining, continuing programs of research and development that are essential to modern food production.

3.8.2 The Task of Technical Assistance

Increasingly, United States foreign assistance should take the form of knowledge, technical aid, adaptive research, education, and institution building.

The scarcest and most needed resource in the developing countries is the scientific, technical, and managerial skill needed for systematic, orderly decision-making and implementation. Through technical assistance programs, the United States should emphasize guidance, education, and the development of indigenous capabilities – for the long term – because the task in the developing nations has only just begun and will continue for many decades to come.

In recent years, United States programs of technical assistance have largely given way to capital assistance and the purpose and value of each has become blurred. The important distinction between these two instrumentalities of aid should be recognized and each should be employed sharply and effectively to reinforce the other in helping those developing countries that are willing to make the effort to solve the complex problems of feeding their people and improving the quality of their lives.

3.9.0 Nutritional Need and Economic Demand

The Panel's approach to the world food problem has been almost the opposite of that employed by economists. It cost money to produce food, however, and someone must pay the bill. Therefore, no matter what the physiological *need* may be, the production of food is controlled by effective market *demand*.

Economists tend to relate income and food demand in a causal fashion. The Panel, of necessity, has quite literally reversed the usual economic approach by first estimating the food shortage and setting a future goal for food production. The next step was to calculate the rate of change in income that will be required to generate the

effective market demand for the targeted nutritional needs.

There are certain relationships between the demand for foodstuffs and the overall demand for goods and services in any economy. In order for "effective demand" for food to exist, the means of buying the food — purchasing power — must be available. In other words, aggregate income must grow at a rate which permits consumers to purchase the projected food requirements.

Likewise, on the production or supply side, there are relationships which link agricultural food production to overall production. The production of food crops requires manufactured inputs such as fertilizers, pesticides, and machinery which must be imported or produced domestically. If they are imported, the overall economy must generate sufficient exports or must rely on a net inflow of foreign assistance or private capital to pay for the imports. If these inputs are to be produced domestically, or paid for by industrial exports, the nonagricultural sectors must expand at rates consistent with the need of the agricultural sector. Similarly, various nonagricultural sectors are dependent on agricultural raw materials and, in some case, food products.

Because of the interdependence which exists among food need, food demand, overall income, agricultural (food) output, and total output (GNP), *it is meaningless to consider a nation's demand and supply of foodstuffs independently from overall economic growth.*

3.9.1 Tentative Economic Implications

The Panel's analysis of the overall problem indicates that the required compound annual growth rates (1965/66-1985/86) for the developing countries in aggregate will be:

	Percent
Increase in food demand	4.0
Increase in food production	4.0
Increase in gross national income	5.5

The achievement of such growth rates will require massive efforts which must be more successful than history has recorded in any previous 20-year period. Now the developing countries, in aggregate, are increasing their compound annual growth rates approximately as follows:

	Percent
Increase in food demand	3.0
Increase in food production	2.7
Increase in gross national income	4.5

Only countries such as Mexico and Taiwan are achieving growth rate of the order deemed necessary.

Additional investments for acceleration of agricultural output in the developing countries as a whole have been analyzed but not verified by detailed country studies. The direct capital requirement for fertilizers, seeds, mechanization, and pesticides for a 4.0 percent growth rate in agricultural output approximates \$300 million annually in the early years, increasing to almost \$4 billion per year by

1985. This estimate does not include direct investments in land and water resources nor does it include the necessary direct "infrastructure" investments in power, transportation, marketing, credit, food processing, storage, and distribution. It is estimated that to achieve a 4.0 percent annual growth rate in food demand and supply, capital investments will have to increase from the current 15 percent to 19 percent of the gross national products of the developing countries. This would be equivalent to a \$12 billion increase in investment above the 1965 base. To achieve such a feat will require capital and technical involvement of developed and developing nations alike on a scale unparalleled in the peacetime history of man.

3.9.2 A Framework for Further Study

Because of the inherent limitations of the Panel's aggregative approach which consisted essentially of estimating direct input requirements on a global scale, it is imperative that a country by country intersectoral economic analysis be undertaken. Input-output analyses should be developed so that estimates can be made of the *direct* and *indirect* investment requirements needed to achieve the food targets that have been set up by the Panel. Explicit attention should be given to the several institutional, policy, and technical considerations at the micro-economic level which are eclipsed in the aggregate global approach used by the Panel.

3.10.0 The Task Ahead

The Panel is convinced from its study of the world food problem that food shortages and high rates of population growth in the developing countries are not primary problems. Rather, they are manifestations of a more fundamental difficulty, *lagging economic development in the hungry countries.* We find the prospects for the future both sobering and alarming.

As we now view the situation, the United States faces two choices:

1. The first is for the United States to continue to provide technical and capital assistance and private investment to poor countries willing to make the self-help effort to achieve self-sustaining growth. Our foreign assistance program would then continue to be largely an American effort with coordinating relationships with the United Nations organizations and other international institutions. While this course might lead to some improvement over the status quo, it would not suffice to meet the food problem because, for all of its economic resources, the United States cannot possibly accomplish the immense task of alleviating the world food problem alone. *This course could be unsuccessful in halting or reversing the rapid deterioration of the population-food situation in the developing countries and the world would continue to lose ground.*

2. *The other alternative is for the United States to take the lead in mounting a global effort, in concert with other developed nations and with international organizations, that will bring to bear the technical skills and capital resources needed to reverse the downward course of the*

developing countries and to restore the chance of their peoples for a better life.

We are unanimous in the belief that, at this point in history, a new long-term policy direction is indicated urgently — a policy that deals massively, directly, and effectively with this central problem of today's world.

We are unanimous, also, in the belief that *the United States must assume leadership of the free world and all of its international institutions in a coordinated, long-range development strategy for raising the economic level of the poor nations, thereby meeting the threat of hunger, increasing the volume of world trade and economic activity, and contributing to the achievement of the goal of ultimate importance, a lasting peace.*

3.10.1 Why?

In the Panel's view, the concern of this country for the hungry nations is threefold:

1. *Humanitarian* — We should help the less fortunate simply because they need help and we are able to help them. The benefits of altruism are by no means unilateral. . . .

2. *Security* — Populations in the developing countries double in 18 to 27 years; 55 to 88 years are required for populations to double in the developed countries. By the year 2000, if present rates of growth continue, there will be more than four times as many people in the developing countries as are in the developed nations. To avoid a threat to the peace of the world as well as to our own national

security, we cannot afford to be too little and too late with our development assistance. The expectations of the poor are demanding fulfillment. [Hopefully,] some measure of their ambitions can be realized by peaceful means.

3. *A Better Tomorrow for Us, Too* — This is a long-range goal, an economic reason for investment. An important way to expand our own economy in the future will be through further specialization and trade. As nations develop they become trading nations and through trade, both parties to a transaction benefit. Trading partners are likely to be peaceful protagonists.

3.10.2 How?

If the United States is to deal seriously and productively with international development:

1. The American public must be convinced that the efforts merit investment of their taxes and that the efforts will be effective in meeting the overall problem.

2. The American public must have confidence in the substance of the programs which are implemented and in the arm of the government which is responsible for administration of those programs.

3. Funding and programs must be placed on a long-range basis, not budgeted and funded hand-to-mouth, from year to year. Foreign economic assistance is doomed to frustration and failure if the responsible agency is forced to deal only with quick payoff projects and to show results tomorrow in order to survive the next budget cycle.

Chapter 4

4.0 Recommendations

A. Population and Family Planning

Programs of Family Planning Should Be an Integral Part of Technical and Economic Assistance

This policy has been stated forcefully and adequately in recent messages by the President and the Panel strongly endorses these statements. Family planning should be encouraged because of the long-range need to decrease the rate of population growth and because of its value in improving economic benefits per capita. The Panel cautions, however, that family planning will not in itself be a solution to the world food problem, and that family

planning alone will probably not significantly reduce the problem of the food needs within the next 20 years in the developing countries. Population numbers in the developing countries will continue to increase rapidly during the next 20 years because nearly half of the present population is less than 15 years old. In spite of the fact that population control is one of the greatest problems facing mankind, there is an immediate need for increased supplies of food and better nutrition.

B. Food Production and Nutrition

The foremost problems for improved nutrition are how to provide adequate calories and proteins. Increasing domestic animal production, food from the sea, various

forms of aquiculture, and the harvest of wild animals will make important contributions, but these measures will not meet increased caloric requirements in the developing countries which in the next 20 years will double due to an increase of about 4 percent per year. By the end of the next two decades, requirements for calories and proteins are estimated to be about 100 percent greater in India and Brazil, and in Pakistan from 120 to 150 percent greater — the lower need is based on an optimistic estimate of the effect of family planning.

B1. The main goal for improving the world food supply must be that of increasing crop yields in the developing countries, especially in Asia — many developing countries must establish agricultural development as a national goal with relevant research, education, and extension programs to adapt the principles of plant and animal production to local conditions.

B2. The developing countries should be encouraged and assisted in increasing and improving protein supplies in the following ways if the specific country has the required natural resources and economic means.

a. Develop high protein foods, especially for preschool children, from indigenous products.

b. Increase the production and use of pulses and oil seeds such as soybeans, peanuts, and cottonseed.

c. Increase and improve domestic animal production, especially types that are not competitive for food used by human beings.

d. Utilize pond culture of fish, both by itself and in combination with agricultural practices such as rice culture and irrigation products.

e. Increase catch of sea foods.

f. Develop and utilize new genetic strains of plants that provide protein with a higher nutritional value.

g. Expand and intensify research and development related to fish protein concentrate (FPC).

B3. There should be more emphasis on the nutritional needs of the population in national food and agricultural programs.

B4. Research on protein from leaves, single-cell microorganisms grown on substrates such as petroleum, and microscopic algae should be continued.

C. Increasing Agricultural Productivity

C1. Major emphasis must be given to increasing productivity per unit of land if the world food needs are to be met in the immediate future.

C2. Since conventional crop plants are likely to be the chief source of food for meeting the immediate world needs, all possible emphasis must be directed toward improvement of strains and varieties.

C3. High priority should be given to providing production inputs essential to accelerating agricultural productivity in the developing world.

C4. Countries should be encouraged to concentrate their production efforts on crops that are well adapted to their soils and climate.

C5. The planning, authorization, and operation of irrigation projects should reflect the necessity for providing not only water but all the inputs and processes that are required if the high costs of irrigation projects are to be optimized in increasing agricultural productivity.

C6. Countries should develop long-range plans of livestock production based upon optimum utilization of total agricultural resources.

C7. The agricultural potential of vast areas of uncultivated lands, particularly in the tropical areas of Latin America and Africa, should be thoroughly evaluated.

C8. The world meteorological organizations and the United States Environmental Science Services Administration should provide technical assistance to the countries of South and Southeast Asia in applied meteorological and oceanographic research to improve long-range forecasting of the monsoon rains and explore the possibilities of precipitation enhancement.

C9. In each developing country analyses should be made of the cost effectiveness, needed level, and optimum sequence of expenditures and increasing agricultural production in alternative ways.

D. Food Aid

D1. Food aid should be administered to stimulate agricultural and economic development and to improve the food producing capability of recipient nations.

D2. If the fortification of wheat with lysine being studied on a large scale is found to be feasible and effective as a means of improving the protein supply to the target area, consideration should be given to fortification of all cereal grains and flours shipped from the United States.

E. Production Incentives for Farmers

E1. Attention should be focused on the entire range of problems affecting production incentives of farmers.

E2. Special efforts must be made to provide opportunities that are necessary both to allow and to induce farmers to make production-increasing changes.

E3. Imaginative experimentation is needed on ways to reduce the risks and uncertainty facing farmers in their decision-making and on ways to provide greater production incentives.

F. Transportation

F1. External aid agencies should couple any economic aid to transportation programs with insistence on experimental and demonstrational development of total transport systems to serve selected regions of high agricultural potential.

F2. Major attention needs to be given to modernizing and increasing the capacity of port facilities in many countries.

F3. The developed nations should help with plans for building rural roads which can be implemented with wage supplements from funds derived from food aid.

G. Marketing, Processing, and Distribution of Farm Products

G1. The governments of the developing nations should give special attention to the marketing services and distribution systems that are required to encourage economic development, including an information service for advising farmers, processors and distributors of the needs and availability of products.

G2. Private industry should be encouraged to develop and expand food processing, preservation, and distribution industries.

G3. Major emphasis should be given to the reduction of food losses from rodents, microorganisms, insects, and mechanical damage to increase availability of food.

H. Agricultural and Trade Policies

H1. Countries and areas should be encouraged to develop policies for freer trade, not for narrow national self-sufficiency or tightly protected regional trading blocs.

H2. International commodity organizations should maintain and intensify their efforts to forecast supply and demand conditions for their commodities and developed nations should provide technical assistance in efforts to shift production to items presently or prospectively in short supply.

H3. World price policies on wheat should be such that wheat can be competitive with feed grains.

H4. United States trade and agricultural policies must be such that the United States remains aggressive in the expanding commercial markets of the world.

a. As an incentive to continue growth in efficiency and productivity in the United States.

b. To obtain the foreign exchange with which to buy commodities for which foreign producers have greater comparative advantage.

I. Research and Education

I1. The central objective of the externally supported programs of education and research for the developing countries should be acquisition of knowledge and skills that will be applicable to and useful in advancing economic development.

I2. Very high priority must be given to research and education related to food supply and nutrition in the developing nations.

I3. Academic programs of the indigenous agricultural universities must be strengthened and in some cases reoriented to insure that they have a more significant role in increasing the world food supply.

I4. Special vocational training programs should be innovated and expanded to provide manpower trained in specific technical skills through organized vocational schools or through on-the-job training in industry and agriculture.

I5. Innovative educational techniques, such as television, transistor radio, and movies should be employed on a massive scale to decrease illiteracy, improve extension

education, and increase opportunities for communication of information on family planning, nutrition, food production, food preservation, and for generally increasing the educational level of the population.

I6. The United States Government and universities must develop policies and programs to carry out long-term commitments for overseas research and educational assistance.

I7. University-to-university contracts to assist in overseas agricultural development should be continued and expanded, provided greater continuity of staff and program can be obtained.

I8. International research institutes should be developed to focus on food, nutritional and agricultural problems of the developing countries.

I9. Private industry of the United States and of the developing countries must be encouraged to participate in overseas research, development, and training related to food supply and nutrition.

J. Private Sector

Private industry and the rest of the private sector must be enlisted in the economic development effort on a massive, effective, and lasting scale

Private industry's vast resources of capital, technical know-how, trained manpower and managerial capability are seriously underemployed in the economic development effort.

To ensure deployment of these vital resources on the scale required, policies and programs must be devised:

a. To provide the operating climate and the economic incentives to justify the allocation of private resources to areas that are unattractive for conventional investment.

b. To utilize private industry's analytical and planning skills in preparing country by country analyses of cost effectiveness, needed level, and optimum sequence of expenditures for increasing agricultural production.

c. To enable private industry to create new profitable business combinations that will provide this full range of material inputs in the minimum time required for increased agricultural production.

d. To enable private industry to create complementary profitable business combinations designed to carry the farmer's increased output to the consumer with maximum economy and dispatch.

K. Economic Implications

Detailed intersectorial economic analyses should be carried out for the major developing countries

The studies should be undertaken immediately and should include input-output information to estimate the *direct* and *indirect* input and investment requirements necessary to achieve the food targets in each country. Explicit attention must be paid to institutional policy and technical considerations at the microeconomic level.

L. Organization and Policy

L1. The United States should take the lead in concert with the free world and its international institutions in a coordinated long-term strategic plan for raising the economic level of the developing countries.

L2. If the present trend toward multilateral administration of economic assistance is to accelerate, the United States must take positive action in strengthening existing international institutions until their policies and criteria make them able to operate effectively and under conditions acceptable to the United States and other major donor countries.

L3. The United States should retain bilateral programs of capital and technical assistance to assure full participation of our personnel, industry, universities, and government agencies.

L4. The United States economic assistance effort should include in-house or through contract or interagency agreement, the capability for pre-investment research, analysis, measurement, appraisal, planning, and monitoring of economic development on a scale and with an accuracy far exceeding anything in the past. Eventually, this task may be assigned internationally but initially, the United States must carry it forward.

L5. United States technical assistance should be made an equal partner with capital assistance and the structure of the foreign assistance organization should reflect this emphasis.

L6. Each executive agency should be given an administrative and congressional mandate to "man for" long-term foreign assistance, rather than "squeezing out" projects from domestic personnel.

Appendix B

Excerpts from the 1972 Survey of
Environmental Activities of
International Organizations

Environmental Activities and Concerns of International Organizations

Organization	Agriculture, forestry, soil, and plant sciences	Air pollution	Climate	Education	Energy	Fisheries and wildlife	Health and medicine	Information exchange and research coordination	Legal research and reference	Marine pollution	Marine science	Measurements and standards	Minerals and mining	Monitoring	Noise	Pesticides	Population	Radioactivity/atomic wastes	Recreation: natural, historic, and cultural sites preservation	Regional, land, and economic planning	Solid wastes	Transportation	Urban affairs	Water pollution	Water resource development and management
UNITEO NATIONS																									
General Assembly and Economic and Social Council.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Conference on the Human Environment, Advisory Committee on the Application of Science and Technology to Development.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Secretariat.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Development Program.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Industrial Development Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Scientific Committee on the Effects of Atomic Radiation.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The Economic Commission for Europe.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The Economic Commission for Asia and the Far East.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The Economic Commission for Africa.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The Economic Commission for Latin America.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Research Institute for Social Development.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Institute for Training and Research.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
U.N. Educational, Scientific and Cultural Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
International Atomic Energy Agency.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
International Civil Aviation Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
International Bank for Reconstruction and Development.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
International Labor Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Inter-Governmental Maritime Consultative Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Food and Agriculture Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
World Health Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
World Meteorological Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
North Atlantic Treaty Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Organization for Economic Cooperation and Development.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Organization of American States.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Council of Europe.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The European Community.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Council for Mutual Economic Assistance.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Asian-Pacific Weed Science Society.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Association for the Taxonomic Study of Tropical African Flora.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Association of African Geographical Surveys.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Charles Darwin Foundation for the Galapagos Islands.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Committee on Space Research.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Commonwealth Agricultural Bureaux.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
David Livingstone Memorial Institute of International Studies.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eastern Regional Organization for Planning and Housing.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Europa Nostra Associations for the Protection of Europe's Natural and Cultural Heritage.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
European and Mediterranean Plant Protection Organization.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
European Atomic Energy Society.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
European Atomic Energy Society.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
European Atomic Forum.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
European Center for Population Studies.....	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Environmental Activities and Concerns of International Organizations (con't.)

International Organization	Agriculture, forestry, soil, and plant sciences	Air pollution	Climate	Education	Energy	Fisheries and wildlife	Health and medicine	Information exchanges and research coordination	Legal research and reference	Marine pollution	Marine science	Measurements and standards	Minerals and mining	Monitoring	Noise	Pesticides	Population	Radioactivity/atomic wastes	Recreation: natural, historic, and cultural sites preservation	Regional, land, and economic planning	Solid wastes	Transportation	Urban affairs	Water pollution	Water resource development and management
International Federation of Agricultural Producers	X																								
International Geographical Union																									
International Institute for Conservation of Historic and Artistic Works																									
International Institute for Environmental Affairs								X																	
International Law Association																									
International Mineralogical Association																									
International Office of Epizootics																									
International Organization for Biological Control of Noxious Animals and Plants																									
International Organization for Standardization																									
International Planned Parenthood Federation																									
International Radiation Protection Association																									
International Society for Plant Geography and Ecology																									
International Society for Research on Civilization Diseases and Vital Substances																									
International Society for Tropical Ecology																									
International Society of Biometeorology																									
International Society of City and Regional Planners																									
International Society of Soil Science																									
International Union for the Conservation of Nature and Natural Resources																									
International Union for the Scientific Study of Population																									
International Union of Biological Sciences																									
International Union of Forestry Research Organizations																									
International Union of Geodesy and Geophysics																									
International Union of Geological Sciences																									
International Union of Pure and Applied Chemistry																									
International Union of Pure and Applied Physics																									
International Water Supply Association																									
Inter-Parliamentary Union																									
North-East Atlantic Fisheries Commission																									
Organization for Co-ordination in the Control of Endemic Diseases in Central Africa																									
Pan Indian Ocean Science Association																									
Picard Foundation for the Study and Preservation of the Environment																									
Society for International Development																									
Woodrow Wilson International Center for Scholars																									
World Energy Conference																									
World Medical Association																									
World Peace Through Law Center																									

Appendix C

**Extracts from Senior Executives
Council Members Responses to:
*What are your food-related activities?***

**WILLIAM J. BATTEN, Chairman of the Board
J. C. Penney Company, Inc.**

“Our food-related activities fall into two areas:

“(1) Sales and services related to food are among the principal sources of revenue of Penney’s Belgian operations. These activities can be divided into three parts: wholesaling of food products; retailing of food products; and food services (restaurants, snack bars, etc.)

“(2) Supermarkets Interstate is a comparatively small chain of high-volume supermarkets operating 59 stores in seventeen states and the Caribbean.”

**BEN F. BIAGGINI, President
Southern Pacific Company**

“We concur in the broad analysis of the situation including the interplay with the energy picture, the needs of the undeveloped nations, and international economics in general. All of this underlines the crucial role that the United States food-growing capacity must play in the future.

“Southern Pacific has been closely involved with the highly productive agriculture operations in the West for sometime. We are increasingly concerned with certain local problems which are developing and which we feel merit further study. I have in mind efforts to introduce industrial collective bargaining to agriculture. Unfortunately the significant differences between industrial processes and farming are not apparent to much of the public or to our political representatives. Because of the growth cycle and the harvesting patterns, normal bargaining procedures would have the effect of placing control in the hands of one group without any semblance of “balanced” negotiation. If this situation is allowed to develop further, it can do nothing but place our agriculture production in jeopardy. Assurances of proper working conditions and wage levels for farm workers could come from a specially designated commission, or some other similar procedure, so as to avoid the threat of work stoppage during harvest.”

**McGEORGE BUNDY, President
The Ford Foundation**

“In recent years the Foundation has been investing around \$12 million annually in agriculture and rural development, primarily in projects and programs centered in the developing nations. We attempt here to convey the rationale of the Foundation’s principal program thrusts in this area.

“In the area of food production science and technology our efforts focus on the development, adaptation, testing

and use of improved production technology. The Foundation has helped develop the international agricultural research and training centers and the Consultative Group on International Agricultural Research which is central to their funding. These innovative institutions perform a critical role in an evolving global system for solving food-production problems. This worldwide network, imperfect as it now is, can extend from the farmer back through his state and national institutions to regional and international research centers — as well as to scientific institutes and universities in industrialized nations. International centers now exist, or are in development, to deal with most of the major food crops, forage-consuming animals, and associated production problems (see Annex I, page 38).

“A second program thrust is that of helping to build competence in the social sciences. The aim here is to strengthen national capacities for policymaking, analysis, and development management. Foundation assistance to the development of graduate programs in agricultural economics is extensive in Latin America and like initiatives are receiving increased attention in Asia and Africa. Our involvement in planning is of long standing.

“The actual advances made in most countries, however, in establishing strong policy analysis systems; in enlarging research, demonstration and food production services; and in developing sustained political commitment to rural change are still very small in relation to what is needed. While performance is uneven, enough useful economic analyses of agricultural and rural problems have been made in many countries to create an effective demand for economists. Undergirding the case for building competence in the rural social sciences is the more general argument that the policies a nation follows, the public and private institutions it creates, and the priorities it establishes are among the critical choices a country makes. The ability of a nation to feed, to house, to educate, and to provide health services to its people is directly keyed to these choices.

“At the level of international agricultural policy, a need exists for better international arrangements for analyzing and disseminating agricultural outlook and intelligence information. Because the world food situation is likely to remain extremely tight for many years, the welfare of millions will depend upon prompt and timely awareness of changes in the food outlook and on sensible policies by exporting and importing countries and by the international community. Existing international organizations appear to lack the capacity to perform the need analyses in a timely, nonpolitical fashion. And LDC governments have only limited capability to analyze the world food outlook.

“In view of the foregoing, the Foundation is among those private organizations which are now exploring the development of an independent, international source of

ANNEX I: Program Thrusts of International Agricultural Research and Training Centers, Operational and Under Development, 1974*

<i>International Center</i>	<i>Program Thrusts</i>	<i>First Year Funded</i>	<i>Location</i>	<i>Agroclimatic Area Served</i>
<i>Operational</i>				
IRRI	Rice Farming systems involving rice	1960	Philippines	Rainfed and irrigated areas – sub-tropical/tropical
CIMMYT	Wheat, maize, barley, triticale	1966	Mexico	Rainfed and irrigated – temperate/tropical
IITA	Alternatives to shifting cultivation Cowpeas, cassava, yams, maize, rice	1968	Nigeria	Rainfed and irrigated – low tropics
CIAT	Beef/forage, cassava, field beans, maize, rice, swine	1969	Colombia	Rainfed and irrigated tropics – 1000 meters to sea level
CIP	Potatoes	1972	Peru	Rainfed and irrigated areas – temperate to tropical
ICRISAT	Sorghum, millets, chickpeas, pigeon peas, farming systems	1972	India	Semi-arid tropics
<i>Under Development</i>				
ILRAD	Blood diseases of cattle	1974	Kenya	Mainly semi-arid tropics
ILCA	Cattle production	1974	Africa	Humid to dry tropics

*CGIAR-sponsored. The Asian Vegetable Research and Development Center (AVRDC) in Taiwan is an associated international institution but is not CGIAR supported. The Lebanon-based Arid Lands Agricultural Development Program (ALAD) developed by the Ford Foundation is limited closely to wheat, sorghum, food legume and farming-system programs of the centers. ALAD is international in character. The possibility of developing a CGIAR-sponsored international center in the Middle East is under discussion. Such a center, if developed, would subsume major functions now performed by ALAD.

first-quality analysis which could be drawn upon by all concerned but would be especially helpful to those who need it most – governments of low-income countries requiring food imports. This exploration may result in the creation of an international food policy institute.

“Third, the Foundation is concerned with the process of rural development. Inputs from socio-economic analyses, planning, resource evaluation, management and technology are being used (e.g., area development in India, multiple cropping in Thailand, smallholder projects in Latin America, “Masagana 99” in the Philippines, and package programs in West Africa and the Middle East). To some extent, these efforts are a subset in the policy-analysis area. Our work suggests that delineation of regions (by agroclimatic, socio-economic criteria) as diagnostic and developmental units is usually desirable. Recommendations can be

tailored to situation-specific risks, institutions and cultures which characterize the regions. Performance, as well as reasons for nonperformance, can be measured.

“These findings can, in turn, be cycled back into problem-solving socio-economic, biological, and production research undertakings. We have learned that chances for success are materially enhanced if we have a significant technological or institutional change. The specialized needs of the smallholder are being highlighted in several of the undertakings. There is danger that unrealistic expectations can flow from rhetoric about improving the welfare of individuals and groups whose resource endowments are meager. For untold thousands of the rural poor, our studies suggest that a better tomorrow rests not in agriculture but in nonagricultural pursuits. Recognition of this principle requires that regional development efforts focus fully as

much on nonagricultural as on the agricultural generators of growth."

**C. W. COOK, Chairman
General Foods Corporation**

"It was my privilege to serve on the National Advisory Commission on Food and Fiber in 1965-66 and to participate in the White House Conference on Food, Nutrition and Health held at Williamsburg, Virginia in 1969. As a result of those exposures, and study of much of the material and data that have been available in my post as Chairman of General Foods Corporation, I have arrived at some conclusions regarding the world food outlook and the impact this is apt to have on the United States in the years ahead.

"These conclusions are not widely supported nor are they popular. Nevertheless, I feel a deep obligation to make them known, especially since I am retiring on June 30, 1974 from active management of General Foods.

"I am convinced of the following:

"A. World need for food will outpace world supply within the next several years, if not sooner.

"- We should not be misled by occasional bumper crops.

"B. Increasing export demand - both demand backed by hard currency and demand backed by soft currency, or no currency at all - will result in greatly increased pressure on U.S. supplies.

"C. These export demands, given unrestricted access to U.S. markets, will result in unacceptably high prices which U.S. consumers would have to face.

"- We experienced a sample of this in 1973 and early 1974.

"D. In my judgment, inflation is the greatest threat the United States faces in the years ahead.

"Food is by far the most sensitive item in the budgets of at least 50 percent (my estimate) of our families.

"E. The threat of starvation and extreme malnutrition in Africa, Asia and some areas of Latin America poses a massive issue to the developed countries, especially those which have the capacity to produce food for export.

"In my opinion, American will be reluctant to support a continuing major program of food aid, regardless of the need, if their own food costs are imposing real strains on family resources.

"- Is it not possible that the failure of the U.S. public to react more charitably to Central Africa's current plight results, in part, from concerns about our own food budget problems?

"F. It is possible - even probable - that the time will come when U.S. allocation of its food resources will determine who faces starvation in the world.

"'Managing' our food supply, specifically the amounts the U.S. exports and where it goes, would then become imperative.

"G. Proper nutrition for the lowest 20 to 25 percent (my estimate) in the U.S. income scale has become virtually

impossible as a consequence of food price trends over the past two years.

"If the U.S. consumer has to compete with export demands of an increasingly crowded and hungry world, providing adequate nutrition to millions of lower-income Americans could become an impossible dream."

**ALEXANDER HEARD, Chancellor
Vanderbilt University**

"The range of activities within the University that pertain to food and population matters is extensive, so extensive that I hesitate to undertake an inventory. The activities range from research in reproductive physiology (and a lot of other things that affect health, hence population) to work in demography and graduate training in economic development, plus all the programs of education and training in which a complex university engages that have implications for the food supply-population equation."

**R. HEATH LARRY, Vice Chairman - Board of Directors
United States Steel Corporation**

"U. S. Steel already has a large fertilizer plant in operation in India. This facility was made possible through the cooperation of the Agency for International Development, the International Finance Corporation, a group of international banks, and local investors.

"We are quite close to a final decision for another plant to be built in Pakistan - to be based on presently unused natural gas deposits - which also will be the result of substantial international cooperative efforts under the leadership of the private sector. Interestingly, this project involves the 'exercise of influence on governments' mentioned by Dr. Ross as the third action option.

"We are investigating similar projects in other less-developed areas. For instance, studies are underway for the possibility of fertilizer production in Central Africa and the Caribbean area.

"I am citing these activities to record that U.S. Steel is already engaged in a major way in helping to alleviate existing food shortages in underdeveloped countries. We are, of course, doing this within the framework - and the consequent limitations - of a private-sector company.

"Additionally, as a major shareholder of ADELA, U.S. Steel is indirectly participating in the sponsorship of organizations such as the Latin American Agribusiness Development Corporation, S.A. (specific proposals of which we have also reviewed on a case-by-case basis). Importantly also, the United States Steel Foundation, Inc. is a substantial contributor to Planned Parenthood, Inc., to assist in its international activities."

**E. W. LITTLEFIELD, Chairman of the Board
Utah International Incorporated**

"Except for the type of indirect example of Marcona used in the staff paper, we really are quite remote from the

food production or distribution problem. As a miner we do not now produce any of the minerals used for fertilizers. The trade organizations to which we belong – and where we have some measure of real influence, like the American Mining Congress – are so busy defending themselves against attacks on the mining industry that they are not in a position to become concerned or effective in the food problem. The other organizations of which I am a member – like The Conference Board, the CED, The Business Council, etc. – number among their members others who can be much more informed and influential on food matters.”

**W. F. ROCKWELL, JR., Chairman of the Board
Rockwell International**

“Private-sector participation can play an important role in helping to forestall an impending crisis.

“Rockwell International is a diverse corporation (operating in 30 countries) with products in the aerospace, electronics, automotive, industrial, utility and consumer areas. We are particularly strong in areas of advanced technology, research, development and systems engineering. . . . Although we have no businesses directly related to food production, we have some activities which bear on the several action options discussed in Dr. Ross’ paper:

• “We manufacture products used in the production of food, including agricultural aircraft and components (e.g., axles and transmissions) used in agricultural machinery. These products are utilized by developing nations to increase their agricultural productivity.

• “We aid in developing increased purchasing power and employment throughout the world by investments in subsidiaries, affiliates and manufacturing facilities. An example here is the recent construction of an electronics manufacturing facility in Malaysia. We have similar activities in several developing parts of the world, including South America, Asia and Africa. Our internal operations provide jobs for over 20,000 men and women outside the United States.

• “We are producing products, such as our Ambassador Loom, specifically tailored to the needs of the developing nations of the world. These products help to develop local economic strength.

• “We are using our advanced technological capabilities to conduct research and development in areas directly related to food production. This includes the development of abundant energy sources (breeder reactor, solar power, coal utilization, etc.), desalinization of water and utilization of space observation techniques (such as will be available with the Space Shuttle) to assess agriculture.”

**IRVING S. SHAPIRO, Chairman of the Board
E. I. duPont de Nemours & Company**

“We support the view that success in averting the world food crisis will be highly dependent upon a number of factors, including finding ways to increase efficiency and yields of food production. Increased agricultural yields can

be accomplished in such ways as better utilization of water, reduction of losses from drought and pestilence, elimination of competition for nutrients and water by more effective weed control, improved planting and harvesting techniques, and development of plant species with greater resistance to natural antagonists. We believe that business and industry are best qualified to make important contributions to solution of the world’s food problem in these ways. Our company has a number of products and research programs aimed at major problems limiting efficiency of food production. For example:

“1. Herbicides are effective in increasing plant yields, lowering labor costs, improving crop quality, and raising efficiency of utilization of water.

“2. Fungicides have been developed to reduce or eliminate attack on grains, fruits and vegetables by fungi which, if unchecked, would substantially lower yield and quality.

“3. Insecticides greatly reduce loss and damage to crops by pests.

“4. We are conducting major research programs to develop new approaches to control of insects, fungi, and weeds, and, especially, to find chemicals that are effective against these plant antagonists but are nontoxic, or of extremely low toxicity, for humans. Programs are also directed toward chemicals that will help to control plant growth and the processes of vegetation and flowering and thus increase yield and quality of agricultural products.

“5. The Company’s . . . porous plastic irrigation tubing is now being test-marketed for use in conserving irrigation water and in improving yields through more efficient utilization of water by plants. This product may help to expand the world’s arable land resources by making possible reclamation of arid areas.

“6. A large proportion of people in the underdeveloped countries are suffering not only from undernutrition or insufficient calorie intake but also from malnutrition caused by a diet deficient in protein. Animals are today a major source of protein for human consumption but production of animal protein involves a long, costly and highly inefficient process. E. I. duPont and Ranks Hovis McDougall, Ltd. of England have joined forces to develop a new high-quality protein directly from carbohydrates thus bypassing the costly animal feeding step. If successful, the development should help to alleviate one of the world’s most critical food problems.”

**LESLIE H. WARNER, Chairman of the Board
General Telephone & Electronics Corporation**

“Since General Telephone & Electronics Corporation is engaged only in the provision of communications services and the manufacture of electrical and electronic equipment, we are not directly involved in any food-related activities. However, as a multinational company, we have manufacturing plants and sales and engineering organizations scattered around the world, many of which are contributing significantly to the purchasing power of people in the poor and populous regions of the world through job creation.

“While most of our manufacturing plants outside the United States are located, understandably, in the more highly developed countries, we have in recent years followed a policy of establishing plants in the less-developed countries to the fullest extent possible. As a

result, we now have manufacturing plants in Brazil, Colombia, Costa Rica, Hong Kong, India, Jamaica, Mexico, The Philippines, Taiwan, and Trinidad, all of which have created new jobs in these countries and contributed to their economic development.”

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