THE ROLE OF FOOD IN THE INTERNATIONAL AFFAIRS OF THE UNITED STATES

Joseph D. Coffey

From the early 1600s, when tobacco exports literally saved the struggling Jamestown settlement, to the January 4, 1980, embargo of grain to the Soviet Union, food and agriculture have played varied roles in international affairs of the U.S., that is, in the political, military, economic, and cultural exchanges that affect the power of the U.S. relative to other sovereign nations. Food donations have been used as a humanitarian gesture to avert starvation. Food export embargoes have been used as weapons against foreign adversaries and domestic scarcities. Food pledges have been used to promote international food aid conventions. Food import quotas have been reallocated to reward friendly nations and penalize unfriendly ones. U.S. food shipments have been used to feed Allied soldiers and to barter for strategic materials. Food exports have been used to bolster the domestic economy and strengthen the dollar.

During the 1970s, four U.S. grain embargoes, rising real food prices, increased U.S. food exports, success of OPEC, massive U.S.-Soviet grain deals, severe food shortages in Africa and southeast Asia, and dwindling reserve stocks focused increased attention upon U.S. "food power." This paper assesses the potential role and power of food in the international affairs of the U.S. during the 1980s. It is argued that the role and power of food in future international affairs of the U.S. will be dependent upon the position and influence of the U.S. in international relations and food affairs; and the extent of scarcity or abundance of food in world markets.

U.S. POSITION IN INTERNATIONAL RELATIONS AND FOOD AFFAIRS

Changing Character of International Relations

T. K. Warley, a distinguished Canadian agricultural economist, has identified five key aspects of the changing character of international relations. First, economic policy has replaced strategic balance, territorial integrity, and ideological competition as the core of foreign policy. Second, there is today more pluralism in world political and economic affairs. The influence of the U.S. and the Soviet Union, the two nuclear super powers, has subsided; and the influence of the Third World, Japan, and OPEC has risen. Third, not only the degree of U.S. influence, but the desire of the U.S. to influence international economic affairs has apparently diminished, especially since the Vietnam conflict. Fourth, international economic problems have grown in scale, complexity, and interrelatedness. It is becoming increasingly difficult to identify discrete problems and solutions that an individual nation can resolve. Fifth, there is a growing wariness of the increased national vulnerability and costs of increased international interdependence.

The decline in U.S. prestige and military superiority was an issue during the 1980 presidential campaign. Whether the U.S. has the desire or the capability to regain lost influence is uncertain. The euphoric and patriotic response to the return of the hostages from Iran and the public support of increased military expenditures may signal an increase in the desire of this country to reassert itself in world affairs. Possibly there will come the realization that the last three decades of unprecedented world economic expansion have coincided with unprecedented world trade (Lewis). Nevertheless, it will not be too surprising if the prominence of the U.S. in international affairs further recedes. The center of world power has shifted. The predominance of Europe declined as a result of colonial revolutions and the ascendency of formerly backward nations such as Russia and China (Morgenthau).

Global Food Regime Challenged

Hopkins and Puchala (see especially pp. 18–25) argue that international food affairs are governed by a "global food regime," which they define as a set of rules, norms, or institutional expectations that guide decisions relating to international food transactions. Hopkins and Puchala maintain that the regime was U.S. centered and U.S. prescribed from the late 1940s to the early 1970s, and was guided by the following basic principles: (1) free trade in theory, with considerable deviation in practice; (2) stabilization of international grain markets by adjustments in the U.S. via production controls, gov-

Professor of Agricultural Economics, Virginia Tech, Blacksburg, Virginia.

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ernment stock accumulation, foreign donations, and market duopoly with Canada; (3) provision of food aid, but with as much attention to disposing of surpluses, creating markets, and cultivating allies as to alleviating global malnutrition; and (4) adherence to a philosophy of international "hands off" and national sovereignty in food production, consumption, and distribution matters.

Hopkins and Puchala contend that this set of norms was challenged and outmoded by the early 1970s. The New International Economic Order of the Third World countries, emboldened by the success of OPEC, began to challenge the concept of free trade and seek a deliberate manipulation of international terms of trade in their favor. The Soviet Union and China, largely absent from the international markets prior to the 1970s, became significant influences. Food aid was criticized for the disincentive effect it had on production in the recipient countries and for its political implications. The U.S. became less willing and able to stabilize the international grain markets as exports boomed and stocks dwindled. Steps were taken to establish an international food convention and improve the multilateral coordination of food assistance. Internationally sponsored agricultural research institutes were established to expand food production in the developing countries and to spread the "green revolution."

Role of Markets

It is possible to acknowledge the imperfections of and challenges to a trade-oriented world food regime and embrace the need for emergency food relief, yet advocate strengthening the international market mechanism. Despite the frequent and disruptive effects of government involvement, such as the 4 U.S. grain embargoes the past 8 years and the fickle grain purchases of the Soviet Union, world agricultural trade during the past 30 years has grown by 5.3 percent annually—almost double the 2.7 percent growth in world production (O'Brien). Despite policies to protect domestic agriculture, changes in grain prices are correlated among major grain exporters, and to a lesser extent among grain importers. Collins found that major grain exporting nations, such as Australia, Canada, Argentina, and Brazil, have elasticities of price transmission for wheat and corn fairly close to one. Importing countries, such as Japan, Egypt, India, and Nigeria, ranged from 0.3 to 0.8. Also, Thompson and Dahl have found that weekly corn prices in the U.S. and Rotterdam markets are highly correlated.

The problem of increasing world market instability during the 1970s was the result of reduced grain stocks and government policies—the most important policy was the Soviet Union's attempt to achieve internal price stability through trade controls and thereby force on the world markets even greater instability than otherwise would have been experienced (Johnson). Dale Hathaway, the former USDA Under Secretary for International Affairs, has implied that the U.S. needs to take a more active role in grain trade in order to cope with the Soviets. But I am apprehensive of increased direct U.S. government involvement in commercial grain trade.

If the meager results of the Tokyo Round of trade negotiations and the apathy relative to the 1974 World Food Conference recommendations are any indication, international agreements to foster agricultural trade and food security will be slow to materialize (Callear and Blandford). But the problems are not insurmountable; world unanimity is not required. As is indicated below, substantial grain deficits could be overcome by modest increases in productivity or grain prices. International grain price stability and food security could be achieved by modest world grain reserve stock levels of 15 to 80 million metric tons (Houck and Ryan, p. 31). The problems of grain pricing, contracting, and storage risks could be reduced by the use of the futures market (Seevers). Orbiting satellites could increase crop reporting accuracy and timeliness and, thereby, improve the economic efficiency of market price signals. In short, there are steps that can be taken now, without threatening national sovereignty or requiring total international agreement, which could enhance the contribution of food and agriculture in international affairs. Indeed, as Callear and Blandford have argued, it is very unlikely that international agricultural agreement will be possible unless and until trade liberalization is achieved.

FOOD POWER

Food as an Economic Weapon

The challenges to U.S. influence in international affairs, coupled with booming U.S. grain exports and the success of OPEC, stimulated discussion of food as a weapon or foreign policy tool. As Don Paarlberg notes (p. 1): "The thought has arisen that some of the lost U.S. international influence might be recaptured through the use of food."

But, food is very different from crude. First, only 10 percent of the world's food is consumed in countries other than where it is produced, whereas 50 percent of the oil is consumed in countries different from where it is produced (Nau). A stoppage of oil exports would drastically affect availability throughout the world. A curtailment of food exports would have a modest impact upon world food supplies. Second, it is essentially costless to "store" oil in the ground, whereas food is perishable and costly to hold off

the market to drive up prices. Third, food is a basic human need, and attempts to use it as a diplomatic weapon by withholding it in situations where starvation might result would be condemned by the world community. This does not mean that food power is negligible, but it does suggest that, politically, morally, and economically, food is a considerably weaker diplomatic weapon than oil.

Food Market Power via Cartels

One measure of the power or leverage of food in international affairs is the potential to increase export revenues by cartel action. Food leverage depends upon the derived demand elasticity of exports (E_x). If the derived demand for exports is inelastic, revenues may be increased by limiting exports. The derived demand depends upon the cartel's share of the world production (W), the elasticities of food supply (E_s^{ROW}), and demand (E_d^{ROW}) in the rest of the world (Van Duyne), that is,

$$E_x = E_d^{ROW}/W + (1\text{-}W)\ E_s^{ROW}/W.$$

If food supply or demand in the rest of the world is highly elastic, or if the cartel controls a small share of world production, limiting food exports will decrease the cartel's revenues and not greatly affect world markets and vice versa.

Suppose the U.S. wanted to increase grain export revenues by forming a cartel. If the grain supply and demand elasticities in the rest of the world each equal 0.2 in absolute value, the U.S. would need to control one-third of world grain production. To achieve that, this country would have to form a cartel with all the developed nations. If the supply and demand elasticities each equal 0.4, the cartel would need to control three-fifths of world production, which is roughly equal to all the grain produced outside centrally planned countries. Viewed from a different perspective, if the U.S. attains 20 percent of world grain production (W), the rest-of-world supply (E_s^{ROW}), and demand (E_d^{ROW}), elasticities would need to be .1 or smaller in order for the elasticity of derived demand to be inelastic. This is much lower than the 0.2 to 0.4 commonly used (U.S. Department of Agriculture 1971; Abbott; Abel; Peterson; Bredahl et al. Even if we assume a price transmission elasticity of 0.5, rest-of-world supply and demand elasticities less than 0.2 would be necessary. Thus, the U.S. is not likely to gain food power by forming a grain cartel.

The misconception of the potential for food power arises from the belief that a cartel's potential depends upon the share of world *exports*. It does not. It depends upon the share of *production*. A case in point is rice. The U.S. is the world's leading rice exporter, with 30 percent of the total, yet it produces only 2 percent of total world production: clearly, reducing rice exports would have little influence upon world prices. Since U.S. agricultural production has risen more slowly than world production during the past 30 years, this country's food power has been declining rather than increasing.

Food Power via Embargoes

In comparison with a cartel, an embargo is a more blatant attempt to wield food power. Obviously, trade must be occurring in order for shipments to be stopped. Assuming that there are no alternative sources of imports for the adversary and no alternative export outlets for the country imposing the embargo, the net social cost (reduction of consumer and producer surplus) imposed upon each country depends upon the square of the share of the amount embargoed $(X/Q)^2$, the elasticities of supply (E_s) and demand (E_d), and the equilibrium value (PQ) that would prevail without the embargo,[1] that is,

$$\text{Net Social Cost} = .5(X/Q)^2\ PQ/(E_d + E_s).$$

The social cost imposed upon the adversary will be higher (1) the larger the relative amount embargoed, (2) the lower the absolute value of the supply and demand elasticities, and (3) the higher the equilibrium value.

In the case of the recent Soviet grain embargo, I have made some rough calculations using the above formula, which suggest that the net social cost imposed upon the U.S. was $145 million compared to $470 million imposed upon the Soviets, assuming the U.S. and Soviet elasticities are equal.[2] The point is that an embargo not only inflicts social cost upon the adversary—it also penalizes the domestic economy as well; and it may in fact, depending upon the magnitudes and elasticities, impose greater social cost upon the domestic economy than upon the adversary. Furthermore, the responsiveness of the international grain market or the transshipment black market appear to render any food embargo ineffective unless accompanied by a military blockade.

[1] The net social cost corresponds to the area of the triangle formed, its apex being the with-embargo equilibrium price; its base being the horizontal distance between the domestic supply and demand curve at the without-embargo equilibrium price. The formula is an approximation to this area, assuming constant elasticities.

[2] These values are based upon 0.2 supply (E_s) and demand (E_d) elasticities for both U.S. and USSR; 17 million metric tons embargoed (X); without-embargo quantities (Q) of 300 million metric tons in the U.S. and 197 million metric tons in the USSR; and without the embargo price of $120 per metric ton in the U.S. and $160 per metric ton in the USSR. The grain supply and demand elasticities of wheat, rice, and coarse grains, weighted respectively by production and consumption as reported by U.S. Department of Agriculture (1971, pp. 35, 36, and 43, 44), are, for the U.S., 0.276 and 0.37; and for the USSR, 0.2 and 0.3.

WORLD GRAIN DEMAND, SUPPLY AND TRADE PROSPECTS[3]

Grain Demand

U.S. food power is most directly linked to the major grains—wheat, corn, and rice—because the U.S. is the world's leading grain exporter; grains are its most important agricultural export; and grains are important sources of energy in world diets. Accordingly, the demand, supply, and trade discussion will focus on grains.

Future demand growth for grain (D*) (herein an asterisk (*) signifies annual growth) depends upon population growth (N*), the income elasticity (E_y), the price elasticity of demand (E_d), real per capita income growth (Y*), and real grain price growth (P*), that is,

$$D^* = N^* + E_yY^* + E_dP^*.$$

We will now briefly examine each of these factors. Since international relations, as well as current and prospective levels of population, income, and prices differ greatly among countries, countries have been combined into familiar groups of developed, less developed, and centrally planned. The developed or industrial regions include western Europe, Japan, Oceania, and North America. They contain 15 percent of world population and 60 percent of world gross national product (GNP). The centrally planned countries include principally the USSR, China, and eastern Europe. They contain 30 percent of world population and 20 percent of world GNP. The developing countries include the remainder and contain 55 percent of world population and 20 percent of world GNP.

In 1978, the United Nations reassessed and lowered its 1973 world population growth projection for the 1980–90 period from 1.93 percent per annum to 1.80 percent per annum. The United Nation's experts concluded that "the period of the most rapid growth of the world population has already passed. . . . [T]he annual growth rate of the world population today is 1.8 percent which is below the highest level of about 2 percent estimated for 1960–65. The rate is expected to continue its decline, . . . reaching 1.5 percent at the end of the century" (p. 3).

World income growth is much more difficult to forecast than population growth. Nobel economist W. Arthur Lewis notes that "the period since the second world war, down to 1973, has been one of unprecedented growth for the world economy as a whole, as well as for developed and developing countries separately" (p. 1). But this boom waned. Lewis offers six reasons why the 1950–73 prosperity may be special and not repeatable (p. 14): (1) the backlog of innovations developed during the second world war has been exhausted; (2) major innovations are not likely; (3) surplus agricultural labor in developed countries has already been absorbed in industry; (4) minerals and oil are becoming more scarce; (5) consumer preferences in developed countries have shifted to services and away from manufactures, thereby dampening industrial demand; and (6) high taxes have diminished work and investment incentives and, consequently, growth. Lewis reminds us "that the world economy has had long periods of prosperity (like 1850–1873) and long periods of relative stagnation (say 1913–1950), so that there is nothing strange in the idea that the next two or three decades may turn out to be difficult" (p. 15).

The World Bank, in agreement with Lewis, observes "that world economic growth will be sluggish during the next few years, as oil-importing countries . . . adapt to higher energy costs" (p. 1). The World Bank projects a 1980–90 per capita GNP growth of developed countries in the range of 2.5 to 3.1 percent, of developing countries from 2.1 to 2.9 percent, and centrally planned countries at 3.3 percent. These figures imply a world GNP per capita growth in the range of 2.5 to 3.1 percent during the 1980s, which is slower than growth during the 1970s, which in turn was slower than the growth during the 1960s.

The world income elasticity for grain would appear to lie in the range of .2 to .4 (Abel; U.S. Department of Agriculture 1978). For the U.S. and other industrial countries, it is close to zero. As per capita income grows in the rest of the world, the income elasticity of demand for food will likely decline. Thus, the impact of income growth upon food demand will probably lessen in the future.

Price trends are more difficult to forecast than either population or income. The inelasticity of both grain supply and demand means that small changes in production will cause large changes in prices. Frequently, projections are based upon the assumption of quantity adjustments, but not price adjustments (e.g., see Abel). Although understandable in view of the limitations of international price data and price elasticity estimates, the omission of price adjustments results in exaggerated imbalances between projected demand and supply.

The index of prices received by U.S. farmers for food grains deflated by the consumer price index (CPI) declined by 2.9 percent annually in the 1950s, and by 4.5 percent annually during the 1960s, but increased by 6.7 percent annually during 1970–1977. During the past 30 years, real grain prices in the world market fell 1 percent annually (O'Brien, p. 7). Unit values of exports of major grains during the 1960–72 period de-

[3]This section draws heavily upon a recent paper by Coffey and Capps. For an explanation of the supply and demand projection equations, see Coffey.

clined relative to industrial products. But during the longer period of 1960–77, which includes the commodity price boom of 1973–74, unit values of grain exports increased relative to industrial products (Jabara). These price data suggest that real agricultural prices for grain declined during the 1960s but rose during the 1970s.

An added impetus to grain demand may be the conversion of grains to ethanol. Targets set by the Carter Administration called for the 1990 gasohol use to comprise 10 percent of U.S. gasoline consumption. O'Brien has estimated that an upper limit of 14 to 25 million metric tons of corn equivalent may be used annually for ethanol production by 1985. Abel places the upper limit of grain use in ethanol at 20 million metric tons by 1990. At these upper limits, total U.S. grain demand would increase about 5 to 10 percent. But these upper limits may be unrealistically high, unless the economic feasibility of grain conversion to ethanol improves. A recent study by Schruben and Landkamer indicates that gasohol subsidies in excess of $10 per net bushel of corn marketed through gasohol would be required to make gasohol production profitable. Thus, it does not appear that use of grain to produce gasohol will be a major factor influencing U.S. grain demand during this decade.

There is the possibility that grain demand may be reduced by the development of nonconventional substitute sources from the ocean, synthetic foods derived from oil, etc. I am in agreement with Wortman and Cummins and do not anticipate a significant impact of such nonconventional food sources as during the 1980s. However, because of new feed additives and growth stimulants, which improve feed conversion by 10 to 15 percent, the grain demand for livestock feed could be reduced in the U.S. by 10 to 15 million metric tons by 1990.

Taken together, these factors suggest a slower growth in world demand for grains during the 1980s than during the 1960s and 1970s. Population and income growth will likely be slower. If real prices rise, demand growth will be further dampened. My estimate is that, with constant prices, world grain consumption will grow by 2 to 3 percent per annum, with 2.6 percent being the most likely (Table 1). This compares to a 2.4 percent growth during the 1970s. The growth rate will be a slow 0.5 percent in the U.S. and 1.2 percent in developed countries, a fast 4.2 percent in developing countries, and a moderate 2.4 percent in centrally planned countries.

Grain Supply

Future growth in world grain supply (S*) depends on the shift in the supply function due to technological improvement or productivity growth (T*), the elasticity of supply (E_s), and the growth in real grain prices (P*), that is,

$$S^* = T^* + E_s P^*.$$

Productivity improvements have been the major source of agricultural expansion during the past three decades. The 1.9 percent annual rise in U.S. farm output, coupled with a .1 percent annual decline in farm inputs, implies an annual

TABLE 1. Past and Projected World Grain Production, Consumption, and Trade

	Production			Consumption			Gap Between Consumption & Production			Equilibrium[c] Trade		
		Projected[a]			Projected[b]			Projected			Projected 1990	
Country Group	Actual 1930	Annual Growth	1990	Actual 1980	Annual Growth	1990	Actual 1980	Annual Growth	1990	Production	Consumption	Trade
	mmt[e]	%	mmt	mmt	%	mmt	mmt	%	mmt	mmt	mmt	mmt
Developed												
U.S.	262[d]	2.5[d]	335	176	0.5	185	-113	3.0	-150	355	181	-174
Non-U.S.	243	1.5	282	242	1.2	274	-1	23.1	-8	300	266	-34
Developing	400	1.5	464	451	4.2	683	56	14.6	219	490	650	160
Centrally Planned	528	1.5	613	576	2.4	732	58	7.5	119	648	696	48
World Total	1,433	1.7	1,694	1,445	2.6	1,874	0	--	180	1,793	1,793	0

[a] Based upon a 1.5 percent productivity growth and constant real prices from Coffey and Capps (p. 14).
[b] Based upon a high growth of demand with constant real prices from Coffey and Capps (p. 11).
[c] Assumes a price elasticity of supply and demand of 0.3, a world-wide annual real price increase of 1.5 percent, and a supply-demand growth of 2.15 percent. Numbers have been adjusted so that total consumption equals total production.
[d] The 1980 drought cut U.S. grain production by 35 million metric tons. The high U.S. growth rate is due to the recovery from the drought.
[e] The letters mmt mean million metric tons.

productivity growth of 2 percent (Ruttan, p. 18). World agricultural productivity rose annually 2.2 percent from 1950 to 1980 (O'Brien, p. 19). The rate was 2.1 percent in developed countries, 2 percent in developing countries, and 2.8 percent in centrally planned countries.

The National Academy of Sciences concluded, "Recent trends in U.S. productivity relative to several crop and livestock products are sufficient to cause us to view the situation as we would clouds on a far horizon. Perhaps the clouds will grow into a storm; perhaps not" (p. 189). Vernon Ruttan, after reviewing the U.S. data, recently stated, "It is difficult to avoid a conclusion that the lag in research funding during the 1965–80 period will be followed by further decline in total productivity growth during the 1980–2000 period. . . . [E]ven a substantial effort . . . will have great difficulty pushing the rate of productivity growth much above 1.5% per year" (p. 36).

From 1972 to 1980, world agricultural productivity growth rates dropped by about 0.5 percentage points. There is concern that the world productivity growth rate will decline further. Most of the productive farmland has already been brought under cultivation. Additions to future production will have to come primarily from expanded yields arising from increased fertilizer and pesticides, improved varieties, or irrigation. However, the costs of these inputs are sensitive to rising energy prices. Thus, rising energy prices may dampen future productivity growth.

The significance of rising energy prices can be illustrated by using the framework of Debertin and Pagoulatos, which relates aggregate U.S. crop supply response to real energy prices. During the 1960s, U.S. crop production increased by 7.5 percent, while real gasoline prices decreased by 14 percent. Given a cross elasticity between crop supply and energy price of −.25, almost half of the crop production expansion during the 1960s in the U.S. could be attributed to the decline in real energy prices.[4] On the other hand, from 1970–79, the 44-percent increase in crop output and the 60-percent increase in real energy prices imply that the real energy price increase reduced the expansion of crop output by one-fourth.[5]

There are some encouraging signs of future productivity growth. Earl Swanson found little, if any, support for the hypotheses that U.S. agricultural productivity growth has slowed in the 1970s. T. W. Schultz has observed "that population quality matters and that a goodly number of low-income countries have a strong positive record in improving this quality. These achievements imply favorable economic prospects, provided they are not dissipated by political instability." The World Bank also has found some encouraging evidence of the favorable impacts of improvements in human capital upon economic progress. Thus, human capital improvements may become a significant contributor to productivity growth and partially offset the adverse effects of land, energy, and research funding scarcity. Current headlines suggest that major productivity increases may be forthcoming from genetic engineering.

Grain supply elasticity estimates span a wide range. Peterson estimated the long-run aggregate agricultural supply elasticity for developing countries in the range of 1.25 to 1.66, which he observes is 8 to 10 times greater than the widely accepted .15 level. (Grain supply should be even more elastic than aggregate agricultural supply.) The U.S. Department of Agriculture (1971, 1978) suggests a .3- to .5-range for grain supply elasticity. Given a supply of .4, rising real grain prices of 3 to 4 percent would result in a production increase equivalent to one-half of the historical production growth rate.

I have projected 1990 grain production at the conservative 1.5-percent growth rate, with an upward adjustment of 35 million metric tons to offset the 1980 U.S. drought (Table 1). These conservative projections of production, when coupled with the optimistic levels of consumption, imply a doubling of imports by the centrally planned countries and a quadrupling of imports by the developing countries by 1990. We will now examine import projections in more detail.

Grain Trade and Interdependency

Grain trade growth depends upon production and consumption growth and the extent to which governments permit imports and exports to cushion the domestic market. Gary Seevers estimates that about one-third of international grain trade is priced in open markets, and two-thirds is priced in public and private tenders and/or negotiated trades with centrally planned countries (p. 162). Governments are directly involved in 90 percent of world grain trade as buyers and/or sellers. Of course, the fact that a majority of grain sales involves governmental negotiations does not mean that market forces are inoperative. No one would accuse the Soviets of ignoring prices in their grain purchase decisions.

Grain trade growth is also influenced by international economic interdependencies, which in turn affect economic growth. Dornbusch indicates that, due to trade interdependencies, a 1-percent simultaneous increase in autonomous spending in all the OECD countries will increase GNP in the U.S. by 1.8 percent (pp. 51, 52). In the reverse direction, a 1.5-percent expansion of the U.S. will spill over, resulting in an income

[4]The crop supply growth function is $Q^* = E_s P^* + E_e P_e^*$, where Q^* is the growth in crop output, E_s is the elasticity of crop supply, P^* is index of crop prices, E_e is the cross elasticity of supply with respect to energy prices, and P_e^* is the growth in energy prices. $E_e P_e^* = (-.25)(14) = 3.5$ percent, or almost half of the 7.5-percent increase.

[5]In this case, $E_e P_e^* = (-.25)(60) = 15$ percent, or one-fourth of 44 percent plus 15 percent.

rise in Germany by 0.2 percent, in Japan by 0.3 percent, and Canada by 0.7 percent. W. Arthur Lewis points out that the remarkable economic growth of the developing countries during the past two decades has to a significant degree been possible because of the expanded demand for their raw material exports arising from the growth of the developed countries. Lewis stresses that contrary to much of the rhetoric, future growth in the industrial world will not be at the expense of Third World growth; rather, it will be necessary to their growth.

John Mellor emphasizes the relatively stable relationship between growth in the demand for and the supply of food in the early stages of development: "The possibility of a 'gap' between supply and demand increases with progress of the economic transformation and development and since the price elasticity of demand is also decreasing, the possibility of major price increases or the necessity for food imports appears somewhat greater for the medium-income countries than for the very low-income countries" (p. 78, 79). Mellor's insight casts the trends of increased grain imports of the developing countries and rising world grain prices in a different light. It may be attributed, at least partially, to economic success rather than to agricultural failure.

In view of these interdependencies between the East and the West, between the North and the South, between agriculture and the rest of the economy, and between world prices and domestic prices, we would expect more convergence of grain production and consumption growth rates and the growth rates of exports and imports than the 180 million metric ton gap projected, assuming slow production and optimistic consumption growth. In fact, an annual real price increase of 1.6 percent would be sufficient to equalize the projected world grain supply and demand growth at 2.15 percent, provided world markets were closely linked, that is, if the elasticity of price transmission is close to 1.

I interpret the world production, consumption and trade projections in Table 1 as follows:

1. Under conservative productivity and optimistic consumption assumptions, 1990 combined grain deficits of the developing and centrally planned countries would be 338 million metric tons, compared to 114 million metric tons in 1980. Still, the U.S. could fill this deficit if exports grow in the 1980s at the 11-percent rate they grew during the 1970s.
2. With more favorable productivity increases and/or a modest 1-to-2-percent real grain price increase, world grain production in 1990 would be an estimated 1,793 million metric tons. World exports would be 208 million metric tons, or 11.6 percent of world production.
3. U.S. grain exports will grow five or more times faster than the domestic consumption and the dependence upon international grain markets will rise. If U.S. grain exports do not expand by at least 3 percent annually, surplus grain-producing capacity may emerge in the U.S.
4. The U.S. share of world grain exports may rise, but the U.S. share of world grain production will stabilize or decline. The U.S. will not likely have sufficient leverage to exercise food power.
5. Finally, world grain markets might not boom as much during the 1980s as during the 1970s because of slower population and per capita income growth.

IMPLICATIONS AND CONCLUSIONS

Events of the past decade have suggested to some an expanded role of food power in the international diplomatic, military, and economic affairs of the U.S. It has been especially tempting for those of us associated with U.S. agriculture to climb aboard this bandwagon and proclaim a larger role for agriculture. I will summarize the factors that point to both for and against a larger role.

The following factors point to a growing U.S. influence in food and diplomatic affairs and/or tightening world food markets, and hence to an expanded role of food in international affairs of the U.S.:

1. Rising food trade and growing interdependencies between East and West, North and South.
2. Apparent willingness of the U.S. to use embargoes for both foreign and domestic reasons.
3. Proliferation of world food organizations, conferences, and conventions.
4. Concern about slower world food production growth due to scarcity of new land suitable for agricultural production and reduced agricultural productivity growth.
5. Increasing absolute numbers of malnourished people and deepening grain deficits in the developing countries.
6. The emergence of the Soviet Union and China as major agricultural importers and hence as potential targets for food power.
7. The continuing energy crisis, which raises production costs and creates a new demand of grain for use in gasohol.
8. Increased bilateralism, segmentation, and, hence, instability of grain trade.
9. Success of OPEC oil cartel, thus encouraging the creation of food cartels.

The following factors point to a waning influence of the U.S. in international relations and a shrinking share of agriculture, and, thus, a reduced role of food in international affairs of the U.S.:

1. Slowed world food demand growth due to

reduced population and income growth prospects in the 1980s.

2. The increasing wave of protectionism to reduce domestic reliance on food imports.

3. The depletion of foreign exchange earnings in oil-importing countries, which may necessitate further cutbacks in food imports.

4. Growing disenchantment with food aid programs, both from the perspectives of the donor and the recipient.

5. Diplomatic sensitivity to use of food as a weapon or tool.

6. Shrinking share of world agriculture as a percent of GNP, population, trade, and consumer expenditures.

7. Declining international influence and, hence, the ability of the U.S. to bring about liberal trade terms for agricultural products.

8. The possibility of breakthroughs in agricultural technology or the improvements arising from increased human capital that would accelerate food supply growth.

9. The apparent minor adverse impact on the Soviets of the recent grain embargo, despite the favorable circumstances of reduced world supplies, record Soviet import intentions, and two successive poor Soviet harvests.

On balance, I am inclined to the view of a lessened rather than an expanded role for food, largely because of the limited leverage of food, the continued decline in the share of agriculture in the world economy, and the tarnished record of previous uses of food diplomacy. I hope that a lessened role is the case, because it will be possible to the extent that agricultural and general economic progress occurs, international tensions diminish, and international cooperation expands.

My conclusion is paradoxical: *U.S. agriculture will have a diminished role in international affairs, but international affairs will have an increased impact on U.S. agriculture.* U.S. domestic food demand will grow very slowly in the 1980s. Hence, a vigorous U.S. agriculture will be dependent upon exporting a larger share of production. This means assuring food importing nations that they can depend upon our food exports and signaling food exporting nations that we intend to compete for world markets. The use of food as an economic weapon in international affairs jeopardizes U.S. credibility as a dependable supplier and as a vigorous competitor. It prompts the USSR, Japan, and other importers to contract with alternative suppliers. It prompts Argentina, Brazil, and other food exporters to expand production and compete with the U.S. for the Soviet, Japanese, and other markets. Do you expect the Soviet Union ever again to become so dependent upon U.S. grain? Do you expect Argentina to forfeit its new grain agreement with the Soviet Union? I do not.

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