TOWARDS A NEW FOOD POLICY: A DISSENTING PERSPECITVE

An Essay by

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INTRODUCTION

In his first news conference the new Secretary of Agriculture, John Block, argued that food is a great bargain and an "inflation fighter" for the U.S. consumer. The Secretary noted the typical reactions of foreign visitors to the U.S. who cannot believe the low food prices here. This widely held belief, especially among those in the agricultural establishment, that food is "cheap" provides an important justification for the neglect of consumer interests in the formulation of food and agricultural policy. To the extent that there is a food price problem, it is really a problem of poverty and not of direct concern to most consumers who are not poor. The Food Stamp Program can deal with poverty. Consequently, food policy need not be concerned with food prices.

However, while it is true that in comparison to other industrial nations, U.S. food prices are generally lower and the U.S. consumer may spend a smaller proportion of his/her income on food than European counterparts, it does not follow that food prices have little effect on inflation in the U.S.. What is important for consumers is not international comparisons, but rather, comparisons with their own immediate experience. The important reality is that for all consumers, rich and poor, food prices have been rising more rapidly over the past eight years than almost all nonfood items, in sharp contrast with the experience of the 1950's and 60's. In fact, food prices have become a major contributor to the inflation

problem that has dominated the economic landscape of the past decade. Any effort to deal with the overall inflation problem must confront the food price problem.

It is the contention of this paper that consumers and virtually all other interests who have a stake in the reduction in the inflation rate do have a large stake in the reformulation of agricultural policy that is about to take place in the debates over the 1981 food and agricultural legislation. The thrust of the nation's food policy over the past 15 years has been to encourage the export of agricultural commodities as a means of supporting farm incomes, reducing the government costs of farm policy, and of helping to offset the increasing trade deficit from oil imports. This "export" oriented policy has been "successful" in promoting the rapid expansion of the demand for grain and oil seed crops, but the price of this "success" has been substantially higher food prices and consequently higher levels of domestic inflation, the costs of which far outweight the benefits of the policies. Moreover, even the farmer, who has been the presumed beneficiary of this new foreign demand, has not substantially improved his well-being during this period. The main points of this argument are summarized as follows:

1/ Over the past eight years, food prices have made substantial contributions to the nation's inflation problem, and indirectly, to the equally serious problem of declining economic growth. This new role contrasts sharply with the role food played during the 1950's and 60's, when slow-rising prices served to dampen inflation and to stimulate economic growth. A comprensive food policy aimed at stabilizing food prices could provide the nation with substantial relief from inflation and could also improve overall economc growth.

2/ The dramatic shift in the behavior of food prices after 1972 can be attributed to the agricultural sector of the food system and not to the performance of food processors or retailers. Specifically, after almost thirty years of relative commodity price stability, the agricultural economy has witnessed the re-emergence of the "commodity cycle", in which commodity prices are subject to violent fluctuations. It is this price cycle that lies at the heart of the new food price behavior and is responsible for the new relationship between food prices and inflation.

3/ The re-emergence of the commodity cycle is intimately related to the increased degree of integration of U.S. agriculture in world markets, to the decision of the government to cease holding large grain reserves, and to the unwillingness of the government to place controls on farm exports so as to insure domestic price stability. As long as agricultural policies favor continued export expansion and "free" agricultural trade with partners who protect their own food systems from the effects of world market price fluctuations, food price inflation will persist. The only feasible alternative would be for the U.S. to adopt new price stabilization policies, including programs aimed at maintaining publicly-held and managed grain reserves and restrictions on exports.

4/ In addition to price instablity associated with the commodity cycle, the U.S. also faces a potential long-run problem of sustaining its agricultural productivity. There are many indications that productivity in agriculture will not continue to increase as it has in the past. The export-expansion strategy, discussed above, is premised on the belief that the U.S. farmer is capable of meeting almost any demand for his products. However, the world-wide demand for grains is growing more rapidly than world supply, with the consequence that more and more pressure will be

focused on the U.S. to meet deficits. Should the necessary supplies not be forthcoming, world grain prices will rise rapidly, forcing inflationary pressures throughout the world.

The only sustainable long-term solution is for the U.S. to invest heavily in agricultural research and development. New technologies must be designed to minimize the dependence on fossil fuels. Agricultural development must be pursued throughout the world, particularly in the Third World, where the payoff for such investment will be greatest. Such development could be justified solely on the grounds that without this kind of assistance, many nations will increasingly less able to feed their growing populations, with the consequence that the world's political stability will be threatened. However, an even more direct justification for such an international aid policy is to prevent the inflation, and subsequent economic stagnation in the U.S. economy itself that would surely accompany the rapidly rising agricultural commodity prices resulting from rising world grain deficits.

FOOD PRICES AND INFLATION: THE END OF THE ERA OF "CHEAP FOOD"

Throughout the post-war era, food prices have played a vital, if poorly understood role in our economic development. As indicated by the ratio of food and nonfood prices shown in Fig. 1, the relative price of food declined beginning in the early 1950's for more than two decades. From 1953 to 1972, food prices rose at annal rate of about 1.7 percent while nonfood items rose at 2.5 percent. Food is a necessity. As income increases, proportionately less is spent on food. Therefore the decline in real food costs over this long period increased the consumer's general purchasing power, most of which was spent on nonfood goods and services, stimulating the growth of the industrial economy.

Stable and slowly declining real food prices also served other beneficial functions. First, stable prices create a favorable environment for investment in farm technology. The 1950's and 60's witnessed a massive infusion of capital in agriculture, embodied in the form of new machinery and in new biological and chemical inputs. This technological transformation helped to produce a rapid increase in the productive capacity, even though fewer and fewer individuals were directly involved in agriculture. Many of the twenty million individuals who left agriculture between 1950 and 1970 became part of the industrial labor force, allowing still more rapid growth of the nonfarm economy. At the same time, the greater productive capacity helped to create the basis for continued food price stability by encouraging the rapid expansion of supply.

Second, declining real food prices also served to dampen overall inflation,and to discourage the development of inflationary expectations, which play a major role in perpetuating inflation, once under way. Thus

stable food prices helped to prevent development of all the side-effects associated with inflation that have become all too obvious over the past decade. Such a noninflationary environment was conducive to overall economic growth, in large measure because the government was not forced to undertake growth restricting, anti-inflationary monetary and fiscal policies and instead was able to encourage investment and economic growth which helped to increase productivity and to allow for higher real incomes without increasing inflationary pressures.

Beginning in 1972, food prices began rising faster than the average of nonfood prices, as can be seen in Fig. 1. Between 1972 and 1980, food prices rose at 9.5 percent per year while nonfood prices rose at 8.7 percent. Curiously, this increase in the relative cost of food does not appear to have reversed the long-standing tendency of consumers to spend less of their income on food. As can be seen in Fig. 2, inspite of rising real food prices, the percentage of after-tax income spent on food continued to decline throughout the 1970's. Thus, it is possible for the Secretary of Agriculture to claim that food is a "bargain." Yet the continued decline in food expenditures is not indicative of the actual situtation faced by most consumers. Because this measure is so frequently used to justify leaving consumer interests out of the debate over food policy, it is important to understand why it provides a misleading interpretation of consumer welfare.

Food and the Consumer: What is the Appropriate Measure of Welfare?

To say that 19 percent of disposable income was spent on food in 1980 does not mean that the typical family spent only 19 percent of its after-tax income on food. All that this ratio tells us is that total

FIG. 1

RATIO FOOD AND NONFOOD PRICES
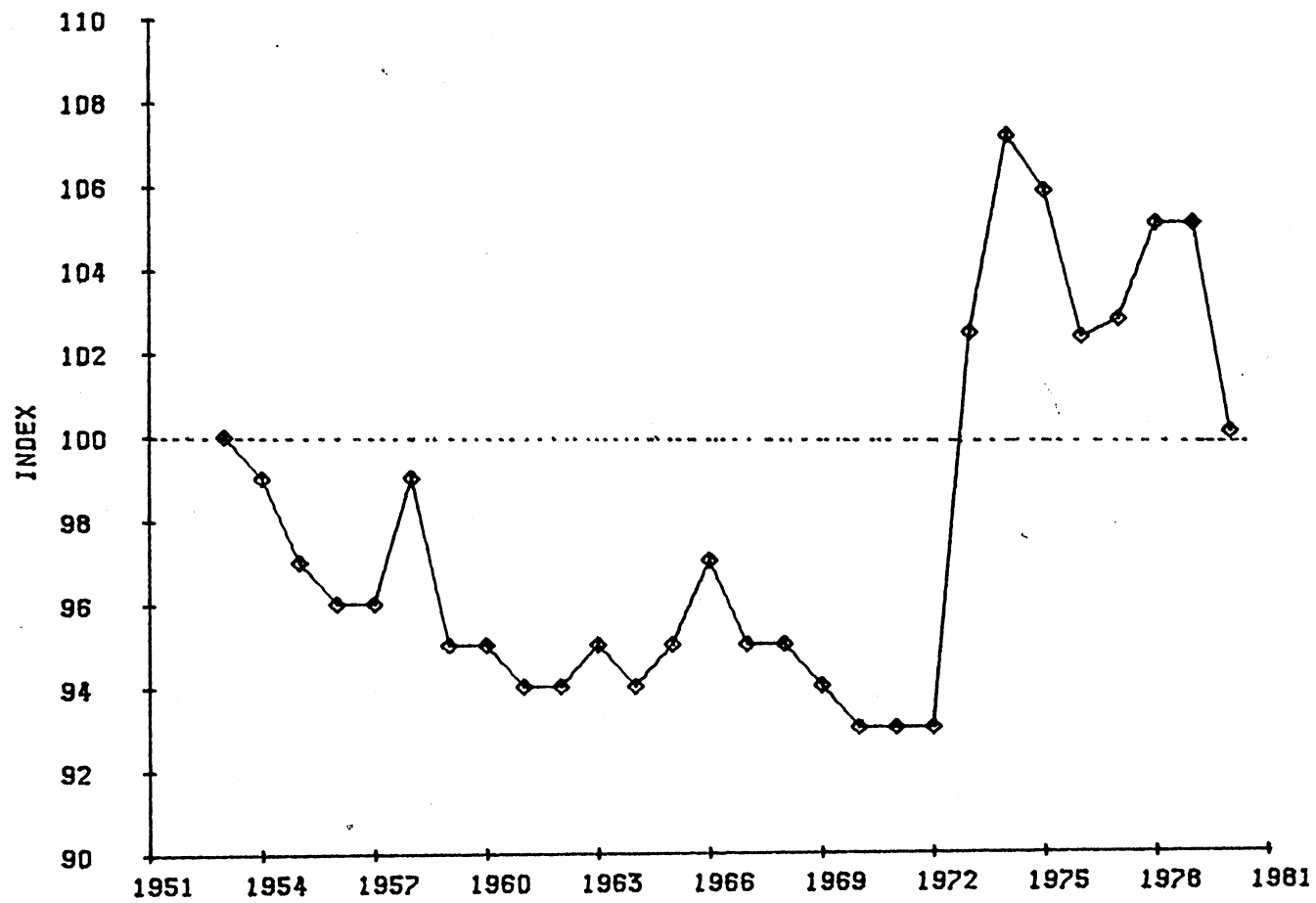
spending on food equalled 19 percent of total personal after-tax income for the entire U.S. economy. One frequent criticism is that this ratio describes an _average_ of all families and is not descriptive of the conditions of those with less than average incomes.

Poor families actually spend much more than the 19 percent average. To illustrate this point, we have calculated the percentage of after-tax income that would have been spent on food by families and unrelated individuals of various income classes in 1978 according to one of three basic food plans drawn up by the USDA; see Table 1. We do not have actual food expenditures of families according to income class (and family size), but it is likely that low income families follow the low-cost plan while higher income families follow the moderate of liberal plans. It is evident from this table that the poorest 1.5 million families, with less than $3000 in annual income (whichcomprises money income from all sources, including transfer payments such as welfare and social security, but not food stamps) must have found other ways of providing for food, since the low cost food plan requires two and half times as much income as these families have to spend. It is also evident that all but the wealthiest families spent substantially more than 19 percent of after-tax income on food.

One of the reasons the percentages on Table 1 are considerably higher than the percentages of after-tax income spent on food shown in Fig. 2 is the latter figures are based on an average for all consumers; this average is raised by the very high incomes of a relatively small number of families. This effect can be eliminated by finding the percentage of food expenditure of families with _median_ rather than average incomes. The median income is the dividing line above and below which half of all families are found. For example, in 1978 the median family income was about

TABLE 1

FOOD EXPENDITURES AS A PERCENT OF AFTER-TAX INCOME,[a]
BY INCOME CLASS AND BY USDA FOOD PLAN, 1978

Income Class Families	Percent of all families or [b] individuals	USDA Food Plans		
		Low Cost	Moderate	Liberal
		percent of income spent for food[c]		
Under $3,000	3.5	252.9	308.6	364.2
$3,000-4,999	5.8	64.6	78.8	93.0
$5,000-6,999	7.3	45.5	55.4	65.3
$7,000-9,999	10.8	33.8	41.3	48.7
$10,000-11,999	7.2	30.2	41.0	43.8
$12,000-14,999	11.4	24.7	29.7	35.6
$15,000-24,999	31.8	19.7	23.2	28.6
$25,000 over	22.4	13.1	14.9	20.1
Unrelated Individuals				
under $3,000	20.3	49.1	63.6	75.1
$3,000-4,999	21.3	22.1	28.6	33.8
$5,000-6,999	13.7	15.4	19.9	23.5
$7,000-9,999	15.2	11.7	15.2	17.9
$10,000-14,999	16.2	8.5	11.0	12.9
$15,000 over	13.3	5.2	6.8	7.9

a/ includes all forms of money income, including welfare.
b/ there were approximately 57 million families and 23 million unrelated
   individuals.
c/ food expenditures have been adjusted for differences in mean family size
   between income classes.
Source:
 U.S. Dept. of Commerce, Statistical Abstract of the United States,
 Tables 442, 443, 444, 745, and 749. Washington, D.C., 1980.

 USDA, Agricultural Statistics, Table 766, Washington, 1980

$17,500 while average family income was about $20,400; therefore concentration of income in wealthier families increases the average over the median by more than $3,000. Adjusting for this difference between average and median income implies that the typical or median family spent at least 22 percent of its income on food. Such a higher figure is supported by the evidence in Table 1, where we can see that families in the $15,000 to $25,000 class, which contains the median income, spent up to 28.6 percent of their income on food in 1978, supposing they purchase the liberal food plan.

Having established that the typical family spends more on food than is generally recognized, we still must answer the question of why the averagepercent of spending on food from after-tax income has continued to decline throughout the 1970's, while the real cost of food has risen against most other items the consumer purchases.The hypothesis developed here is that the typical family has been forced to spend more of its income for food; contrary to what is apparently shown by this conventional spending ratio.

Justification for this hypothesis is provided by the second ratio shown in Fig. 2 which compares food prices with average weekly earnings; as can be seen, this ratio declined more steeply throughout the 1950's and 1960's than did the conventional spending ratio, but then it abruptly reversed itself in 1972 and has been rising steadily ever since. What caused this reversal was the failure of average weekly earnings to rise as rapidly as food price increases during the 1970's. This reversal means that if a family depended on a single wage earner receiving pay raises typical of the overall workforce, it would have been forced to spend more and more of its income on food during the 1970s, so by 1980 it would have

FIG. 2

FOOD EXPENDITURES AS A PERCENT OF PERSONAL DISPOSABLE INCOME;
RATIO OF FOOD PRICE AND AVERAGE WEEKLY EARNINGS
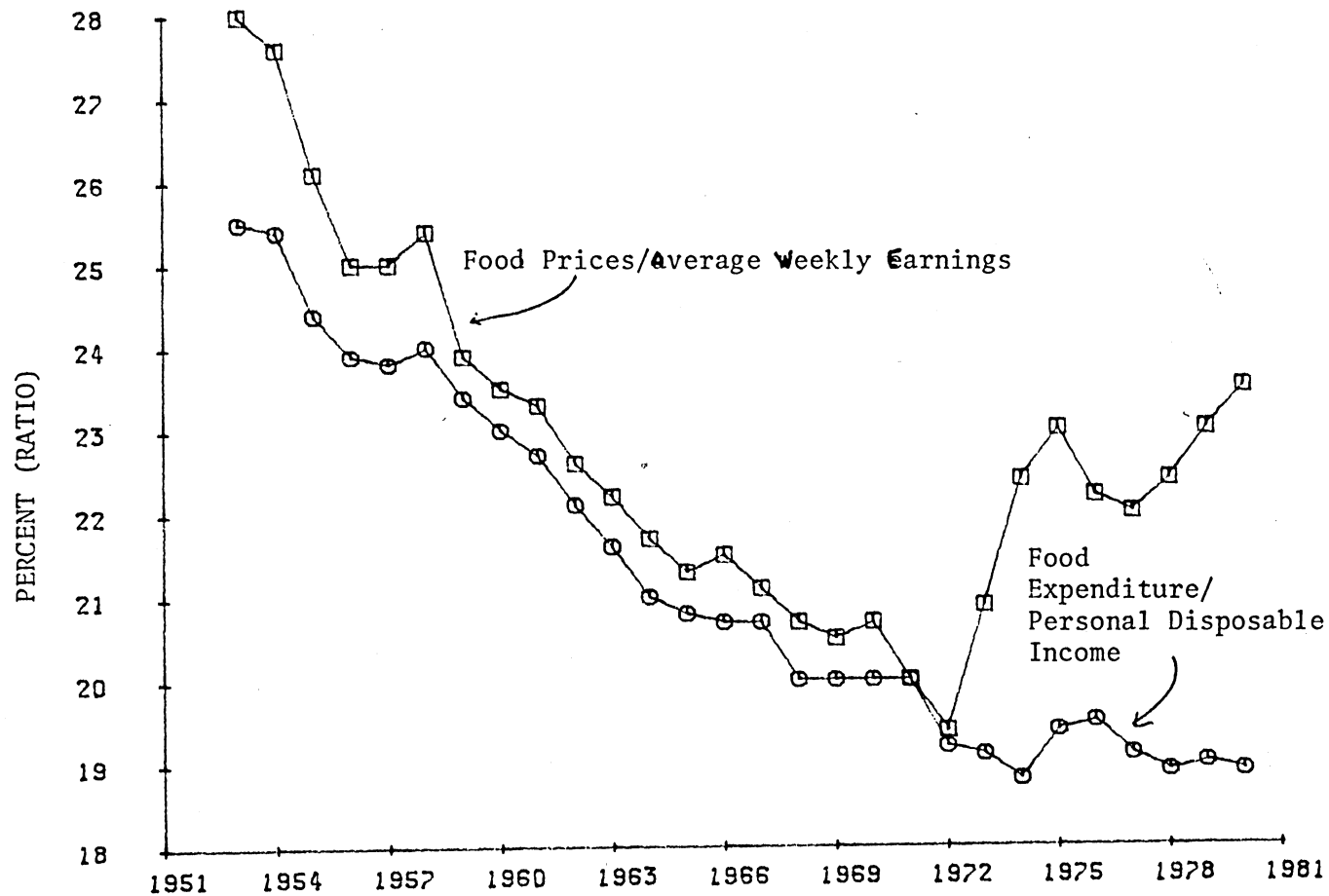
spent as much of its income for food as it did in 1960.

In light of the rise in the food price/earnings ratio after 1972, why does the proportion of disposable income spent on food continue to decline after 1972? The answer to this question requires a clear understanding of what is really being measured by the conventional spending ratio. First, in contrast to the ratio of food prices to average weekly earnings, the conventional spending ratio is influenced by several factors other than food prices and income. Its numerator, total food spending, is influenced by population growth and by changes in the quantity and composition of food expenditures, as well as the costs of individual food items. A price index of food is based on a typical "basket" of commodities purchased by consumers; the mix does not change over time. No allowance is made for possible adjustments in purchasing patterns that consumers might make in response to higher prices.

Between 1953 and 1972, the real value of food consumed, per capita, increased by 1.2 percent per year; this means that consumers were gradually increasing their consumption of higher-priced foods, especially higher grades of meat. After 1972, because of rapidly increasing relative food prices, per capita consumption ceased growing altogether; if anything, there has been a gradual substitution of cheaper forms of protein in the typical consumer market basket. In this way, consumers have partially offset the impact of rising prices on their food budgets. Population growth also slowed during the past eight years to 0.8 percent per year from 1.4 percent during the earlier period. Therefore, even though prices grew more rapidly after 1972, the numerator of the spending ratio began growing more slowly because of offsetting effects from new food expenditure patterns and from slower population growth. When the numerator grows more slowly, the

ratio cannot increase unless the denominator grows even more slowly.

The denominator, after-tax spendable income, also grew more slowly after 1972; at 2.8 percent per year after deducting inflation, in contrast to the 3.9 percent of the 1953-72 period. Yet even at this slower rate, real per capita spendable income rose faster than per capita spending on food, and hence the ratio continued to decline.

After-tax income is not the same as average weekly earnings. It might be supposed that if non-wage and salary sources of income grew more rapidly after 1972, we could account for the divergence of the two ratios of Fig. 2. However, wages and salaries account for about 80 percent of the income of most families (the ratio has not changed over the past decade), and the total of wages and salary income has grown about at the same rate as income from interest, dividends, rent and faster than income from self-employment. Therefore, the difference in the ratios cannot be explained in this way.

Nevertheless, the source of income growth after 1972 was very different from the earlier period. Fig. 3 shows that after deducting inflation, average real weekly earnings per worker rose rapidly until 1972 and then sharply fell. Fig. 3 also indicates that the ratio of total employment to total population has dramatically increased during the past decade, after remaining relatively constant between 1953 and 1972. These two trends mean that before 1972, per capita income rose because of increasing real earnings, per worker. After 1972, per capita income increased only because the number of workers, relative to the total population, increased faster than the decrease in hourly earnings, per worker.

It is this drastic shift in the source of economic growth over the past eight years that accounts for the different performances of the two

FIG. 3

AVERAGE REAL WEEKLY EARNINGS;
RATIO OF EMPLOYED TO TOTAL POPULATION

Average real weekly earnings

Ratio of total labor force with employment to total population
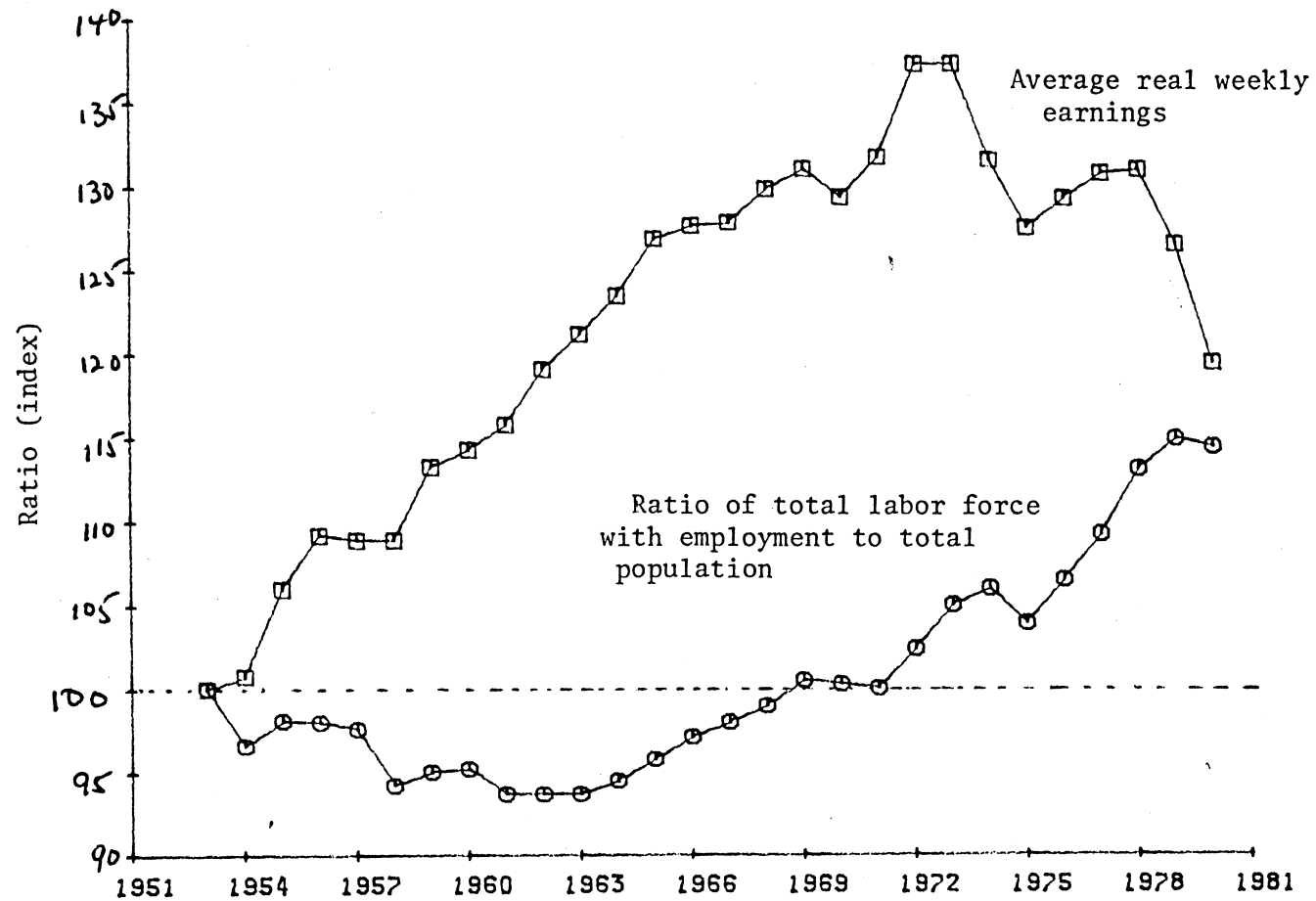
ratios after 1972. Families appear to be better off than they really are because they have cut back on food consumption and because they are working sufficiently more hours to offset the loss of hourly purchasing power in their wages. The reality is that the individual worker must work ever harder to afford the same level of food consumption. This reality is disguised by the conventional spending measure; it is starkly visible in the comparison of food prices and average weekly earnings.

Of course, not all families or households have been able to increase work effort; retired couples, single-parent families, those without marketable skills have all lost ground to rising food prices, while young, well-educated professional couples without children have considerably improved their position relative to the past. The use of the after-tax spending ratio therefore masks both the relatively greater resources that must now be expended to buy food and the growing inequality between families regarding access to food and all other goods and services.

Food Prices and Inflation: A Numerical Example

Part of the significance of the changing role of food prices after 1972 can be seen in the following example. Suppose that food price increases in 1973-1974, which averaged 14.4 percent per year, had been restricted to the 6.9 percent growth rate of all nonfood items during this period. The Consumer Price Index would have been reduced from 8.4 to 6.9 percent (food makes up about 18 percent of all items in the CPI). Such a reduction in the rate of growth of inflation may appear modest, but had food prices been so contained, consumers would have saved a total of over $25 billion during the two year period.

Food Prices and Inflationary Expectations: Second Round Effects

The full impact of rising food prices on the rate of inflation is greater than the figure just calculated. Through their effect on wages, food prices also have an influence on the cost structure of nonfood goods and services and hence contribute to inflation in all parts of the economy. The impact of this second-round effect on inflation depends on how accurately consumers perceive food price increases and incorporate them into their wage demands.

A strong case can be made that even though food constitutes only 18 to 30 percent of all consumer expenditures, and many nonfood items have risen in price at least as fast as food (as Table 2 indicates), food prices help to shape inflationary expectations in excess of their weight in the CPI. The reasoning behind this statement is as follows: food is a necessity that everyone purchases on a repetitive basis. In contrast, the average consumer will be less aware of the price increase of new cars, for example, because he/she rarely visits a show-room. Moreover, the impact of rising new car prices can be avoided; the consumer has other options to the new car, including keeping his/her old car or purchasing a second-hand car. With food, some shifting between products can occur to avoid all of the effects of rising prices, but when prices of most items rise, there is no escaping higher weekly food bills. As we pointed out above, under the higher prices of the past eight years, the deflated value of food purchases, per person, has remained roughly constant. Thus, consumers have not been able to avoid paying most of the higher food prices.

In short, food price increases generate inflationary expectations. Given their awareness of food price increases, it is reasonable to assume

TABLE 2

SELECTED ITEMS IN THE CONSUMER PRICE INDEX, 1967 TO 1980

Items	Relative Weight in Overall Index	Price Index 1980 Value (1967 = 100)
Overall CPI	100.0	258.4
All Items, less food	82.3	255.5
Food	17.7	266.4
Food at home	12.2	263.9
Food away from home	5.5	277.7
All Commodities	59.1	243.5
All Commodities, less food	40.4	232.5
All Services	40.9	284.7
Medical Care Services	4.0	297.6
Rent	5.3	199.6
Selected Items		
Fuel and utilities	6.5 [a]	289.9
Energy	10.3	370.4
Homeownership	24.9	334.2
Apparel and upkeep	5.1	183.9
Transportation	18.6	261.1

a/ These weights total more than 100 percent because the items are also included in the general categories of commodities and services.

Source:
U.S. Department of Labor, Bureau of Labor Statistics, CPI Detailed Report, Feb. 1981, Washington, D.C.

that workerswill press for sufficiently higher wages to offset the loss of purchasing power. To the degree they are successful in obtaining higher wages, production costs throughout the economy will rise, eventually forcing general price increases. In particular, higher wages also influence the costs of processing and distributing food, so after the initial surge in food prices, there will be a second-round effect. Obviously, wage demands are also related to nonfood price increases, so as prices rise from the second round effect, there will be further pressure on wages and still more inflation; pressure on wages and prices should continue until consumers and capitalists have re-established their former purchasing power or until halted by government policy. Inflationary spirals generally do force restrictive monetary and fiscal policies that control inflation by increasing unemployment and reducing economic growth.

Inflation and Income Distribution: Who Really Pays Higher Food Prices?

The dynamic process we have sketched is based on a struggle by all members of the economy to keep from losing purchasing power. Thus, initially in 1972/73, when foreign demand drove up the price of food, the benefactors of this price rise were crop farmers and owners of farm commodity inventories; the losers were consumers and possibly food processors. As the loss of purchasing power was translated into higher wages, capitalists also were threatened with lost profit and they responded by raising profit margins and costs to cover higher wages. The initial price rise thus sets off a series of reactions that may take many months to work out.

Certainly there is no guarantee that all workers and owners of capital will be successful in their efforts to escape paying some of the

TABLE 3

CHANGE IN REAL MEAN EARNINGS OF EMPLOYED WORKERS: 1969 TO 1976

Industry and Occupation	Percent Change in Real Mean Earnings: 1969 to 1976	
	Male	Female
All workers, all activities	-4.9	-4.2
Professional, Technical, Administrative and Mangerial		
All Industries	-8.8	-6.6
Manufacturing	-6.0	-5.1
Construction	-7.7	n.a.
Transportation, Communication, and Public Utilities	-0.3	n.a.
Public Administration	-4.9	-5.4
Craft and Operative Workers		
All Industries	-3.9	n.a.
Manufacturing	-1.8	"
Construction	-13.8	"
Transportation, Communication, and Public Utilities	0.4	"
Public Administration	6.0	"
Clerical Workers		
All Industries	-3.5	-1.4
Manufacturing	n.a	2.5
Transportation, Communication, and Public Utilities	"	21.9
Public Administration	6.0	3.7
Retail Sales	n.a.	-7.3
Farmers and Farm Managers	-15.4	n.a.

Source:
U.S. Department of Commerce, Social and Ecoomic Characteristics of the Metropolitan and Nonmetropolitan Population; 1977 and 1970, Special Studies P-23, No. 75. Washington, 1978.

TABLE 4

SELECTED INCOME CHARACTERISTICS OF FAMILIES BY
REGION, RACE AND SEX: 1969 AND 1976

Family Characteristics	Percent Change in:	
	Real Median Family Income: 1969-1976	Proportion of Families with income of $25,000 in 1976 dollars
All Races, All Families		
United States	1.4	8.4
North and West	-1.6	4.0
South	9.2	24.7
Center City	-4.2	-5.2
Suburb	-0.3	9.3
Rural	7.5	25.8
White Families, All U.S.		
Male head	1.7	11.1
Female head	-4.4	-20.1
Black Families, All U.S.		
Male head	17.7	39.6
Female head	-0.3	-37.2
Spanish Families, All U.S.		
Male head	-2.4	-2.1
Female head	-5.2	-55.2

Source:
U.S. Department of Commerce, Social and Economic Characteristics of the
Metropolitan and Nonmetropolitan Population; 1970 and 1977, Special Studies
P-23, NO. 75, Washington, 1978.

costs of the income redistribution, for after all, commodity producers received a large increase (even if temporary) in their real incomes, and given the total income available to the society is fixed, someone else must therefore have less. Some of this redistribution came from foreign buyers, but much of it was born by U.S. residents. There is a lag between the initial increase in prices and its recognition and translation into higher wages and profits. During this lag, there is little doubt that crop farmers and other benefactors enjoyed a real increase in purchasing power at the expense of the everyone else in the economy.

Individuals most able to defend their interests were those in strong unions, both in the public and private sectors, or those fortunte enough to have their incomes adjusted automatically with changes in cost of living indexes. Workers outside of the strong unions, especially those employed by highly competitive businesses, would not be able to keep pace with inflation. We noted above that weekly earnings began falling rapidly after 1972; Table 3 indicates that the burden of falling real earnings was not evenly distributed over the workforce. This uneven distribution of earnings was translated into still greater inequality in terms of family income changes, as can be seen from Table 4. In sharp contrast with earlier periods, the benefits of rising real income were denied to large segments of the society, whilea few more fortunategroups continued to receive such benefits.The unequal distrbution of the costs of adjusting to slower economic growth did not go unnoticed by those left behind; indeed, this situtation fueled the distributional struggles that manifest themselves in rising wage demands and inflation.

Businesses most able to protect their profits were those with the ability to employ mark-up pricing formulaes. Enterprises capable of such

pricing are found in oligopolistic or publicly-regulated sectors of manufacturing, utilities, transportation, and finance where a few firms control most production. Firms whose business is primarily with the the government on a "cost plus" basis can also pass on cost increases. In contrast, smaller businesses in highly competitive sectors are forced to absorb rising costs of production, as described above.

At least some of the burden of adjusting to income redistribution is shifted to the public sector, as more individuals end up on the unemployment roles or on welfare because some inflation-squeezed firms in the competitive sector are forced out of business, reducing job opportunities for workers with the least power to survive in the job market. Moreover, since major government expenditures are closely linked to inflation (e.g. social security, medicare) costs of government are forced up with rising food prices and related increases in wages and profits as they are reflected in other prices paid by government.

If governments chooses to raise taxes to meet costs, then the burden of adjustment is shifted back to taxpayers, with the probable effect of encouraging taxpayer revolts. Proposition 13, for example, which ultimately reduced the level and quality of public services in California, is one such example. If government chooses to finance rising costs through deficit-spending, then a new round of inflation is set off.

Conceivably, the inflationary spiral could continue indefinitely, especially if the initial beneficiaries, e.g. the farmers and inventory owners, were able to react to the rising inflation by again increasing commodity prices to protect their initial gains. However, this reaction is unlikely for reasons to be explored below. For now, it is sufficient to point out that in the U.S. the outbreak of inflationary spirals very quickly

leads to anti-inflation monetary and fiscal policies that impose an entirely new set of burdens. We shall discuss these below.

A Numerical Example of the Second-round Effects of Food Inflation

The precise impact of rising food prices on overall domestic inflation has not been determined. However, we can illustrate the probable magnitude of the full impact of an initial surge in food prices using the above numerical example. If food prices had been controlled at the 6.9 percent inflation of nonfood items, then consumers would have realized a 1.5 percent increase in overall purchasing power as a result of a 7.5 percent reduction in food prices. Assuming that wage demands are closely related to changes in purchasing power, it follows that wages would not have risen as fast. Indeed, if food prices play a major role in forming expectations for future price increases, then restricting food inflation should effect wage demands by more than the 1.5 percent reduction in overall purchasing power, since the reduction in food prices is 7.5 percent.

To be conservative, we assume that wage settlements would have been reduced by 1.5 percent over the following two-year period (allowing some lag before wage demands are effectively translated into higher wages). Since wages and salaries account for about 75 percent of national income, such a reduction implies a cost savings throughout the economy of about 1.1 percent. Therefore, the second-round impact on overall inflation would have been a reduction of another 1.1 percent from the CPI. Thus instead of rising at 8.4 percent during the two year period, the CPI would have increased at no more than 5.8 percent. This implies that food prices increased the inflation rate by about 45 percent during the 1973-1975 period. This estimate is probably an understatement of the true impact,

since lower inflation rates would also have reduced incentives to raise profit margins to keep up with inflation.

The Costs of Controlling Inflation

Inflation creates problems for many sectors of the economy. People on fixed incomes are made poorer, government costs rise, debtors gain relative to lenders, some enterprises cannot increase prices as fast as costs and are driven out of business, investors experience increased uncertainty and are unwilling to make long-term commitments or participate in speculative activities, neither of which encourage long-term productivity growth. Inflation also tends to weaken the dollar relative to curriencies that do not inflate as quickly, thus reducing the economic power of the U.S. internationally. Thus, when faced with inflation, governments are forced to initiate restrictive monetary and fiscal measures that operate to reduce the overall level of demand for goods and services which, in turn, causes increased unemployment and lower output. These conditions reduce the power of labor to increase wages and of capital to raise profits and thus inflation is slowed.

Economic stagnation and unemployment are very expensive methods of slowing inflation. Econometric evidence suggests that in order to control inflation through unemployment, for every one percentage point of reduction in the rate of inflation, the rate of unemployment must increase by from one half to a full percentage point. For every one half percentage point of increased unemployment, real output drops by about 1.5 percent.

To place these costs into the perspective of the above numerical example, we calculate the cost of removing the 2.6 percentage points from

the CPI that we attributed to food-price inflation during 1973 and 1974, using anti-inflationary monetary and fiscal policies. On the basis of the above reltionships, reducing inflation by 2.6 percentage points would require an increase in unemployment of between 1.3 and 2.6 percentage points and a corresponding decrease in real output equal to between 4 and 7 percent from what it otherwise would have been. In terms of 1973/74 values of income and employment, these figures imply an increase in unemployment of between one and two million workers and lost output valued between $40 and $70 billion over the two year period. The equivalent to this loss in output in 1980 dollars would be almost twice as large. Moreover, the higher unemployment and lower output imply smaller government tax revenues and increased public costs associated with supporting unemployed workers.

In reality, the Nixon/Ford Administrations were forced to engineer a deep and costly recession beginning late in 1974 and lasting through 1975 to eliminate the unacceptably high inflation rates that had developed. Although food prices were but one of the major sources of inflation during this time (energy being the other large contributor), a substantial share of the costs of this recession must be attributed to food price increases.

The experience of 1973/74 was not the only episode of food-induced inflation that we could have analyzed. A similar pattern developed in 1978 and 1979, when food prices again became a leading source of double-digit inflation. As in the earlier period, the initial surge led to second-round effects and eventually to recession in 1980.

Toward a More Cost-Effective "Sectoral" Policy

An agricultural policy that limited the prices of farm commodities in 1973/74 to roughly the rate of inflation of nonfood items would have

achieved the same degree of inflation control as those policies that cost between $40 and $70 billion in lost output. Such price policies would have sharply limited the windfall benefits received by farmers and commodity owners at the expense of consumers, both domestic and foreign. As we shall argue below, the benefits conferred by this windfall did not permanently help farmers and mainly served to drive up land values. Moreover, if for some reason such a transfer of wealth to farmers were deemed desirable, there are many other ways this could have been achieved without stimulating inflation and its subsequent costs, which were substantially larger than the $20 billion windfall received by farmers, landowners, and commodity speculators.

To achieve control over food prices, a deliberate policy directed at maintaining stable farm prices would have to be employed. As discussed below, such a policy in agriculture would require a combination of export restrictions and public grain reserves. Economists and producer groups have long argued the benefits of "free trade" in agricultural products and challenge the desirability of such policies. However, the argument that the U.S. obtains substantial benefits from agricultural trade is rarely examined with reference to the effects of this trade on domestic inflation and economic stagnation. As we have seen in this section, when these substantial costs are added into the equation, the benefits of a completely unrestrained agricultural trade are found to be illusory.

AGRICULTURE AND FOOD PRICE INFLATION

Having established the importance of the changing role of food prices in the "stagflationary" economy of the past eight years, we now trace the cause of the new role of food prices to the farm sector of the food system. To provide some background, we first examine the various components of the food system and then describe in greater detail, the emergence of the commodity cycle that underlies food price increases.

A Portrait of the Food System

Retail food prices can be broken down into two major components: one consists of the prices of raw commodities, the other of prices associated with the processing and marketing of these commodities. In 1979, consumers paid about $312 billion for food. Of this, about $245 billion (79 percent), consisted of food originating in the domestic farm economy. The remaining $67 billions either originated in foreign food imports or contained no farm-originated commodities at all.

Of the $245 billion spent for domestic farm-originated food, the farmer received $78 billion (32 percent). Of the $67 billion spent on food originating outside of the domestic farm economy, about $17 billion went to foreign suppliers. Therefore, roughly $217 billion of the $312 billion (69 percent) spent on food went to firms that transported, processed, or retailed food commodities.

U.S. farmers also received about $34 billion from the sale of farm commodities overseas which accounted for about 30 percent of all farm receipts in 1979. Almost all of these export earnings derived from the sale of crops rather than livestock. Grains and soybean products accounted for

66 66 percent of all farm exports in 1979. The importance of exports is particularly evident to wheat farmers who export over 70 percent of their crop; likewise, 45 percent of soybean, 55 percent of cotton, and 35 percent of the corn production is exported. In contrast, only 5 percent of livestock sales originated from exports; indeed, much of the dairy and livestock sector is protected by trade barriers from foreign competition.

The farmer shares his receipts with many other enterprises. In 1979, 54 percent of total farm receipts went to pay for chemicals, fertilizer, seed, feed, livestock, machinery repairs, and fuel. Another 33 percent was spent on rent, hired labor, interest, depreciation of capital, and taxes. This left about 13 percent of receipts for the farm operator; it amounted to about $17 billion. This means that about 4 percent of total expenditures for domestic farm-originated food went to the farm operator, 17 percent went to farm input suppliers, and 11 percent went to landlords, hired workers, financial institutions, machinery dealers, and the government.

The costs of marketing and processing food in 1979 can be broken down as follows: wholesalers and transportation firms received about 18 percent of the retail food dollar, processing and packing firms about 21 percent, retail food stores another 20 percent, and eating places and vending machines about 9 percent (over 25 percent of food consumption occurs away from the home). About 44 percent of processing, transportation, marketing costs consisted of payments to labor, 12 percent for packing materials, 7 percent for truck and train transportation, 6 percent for profits, and 31 percent for inputs such as energy, advertizing, depreciation, interest, rent, and business taxes.

FIG. 4

RATIO FOOD AND NONFOOD COSTS
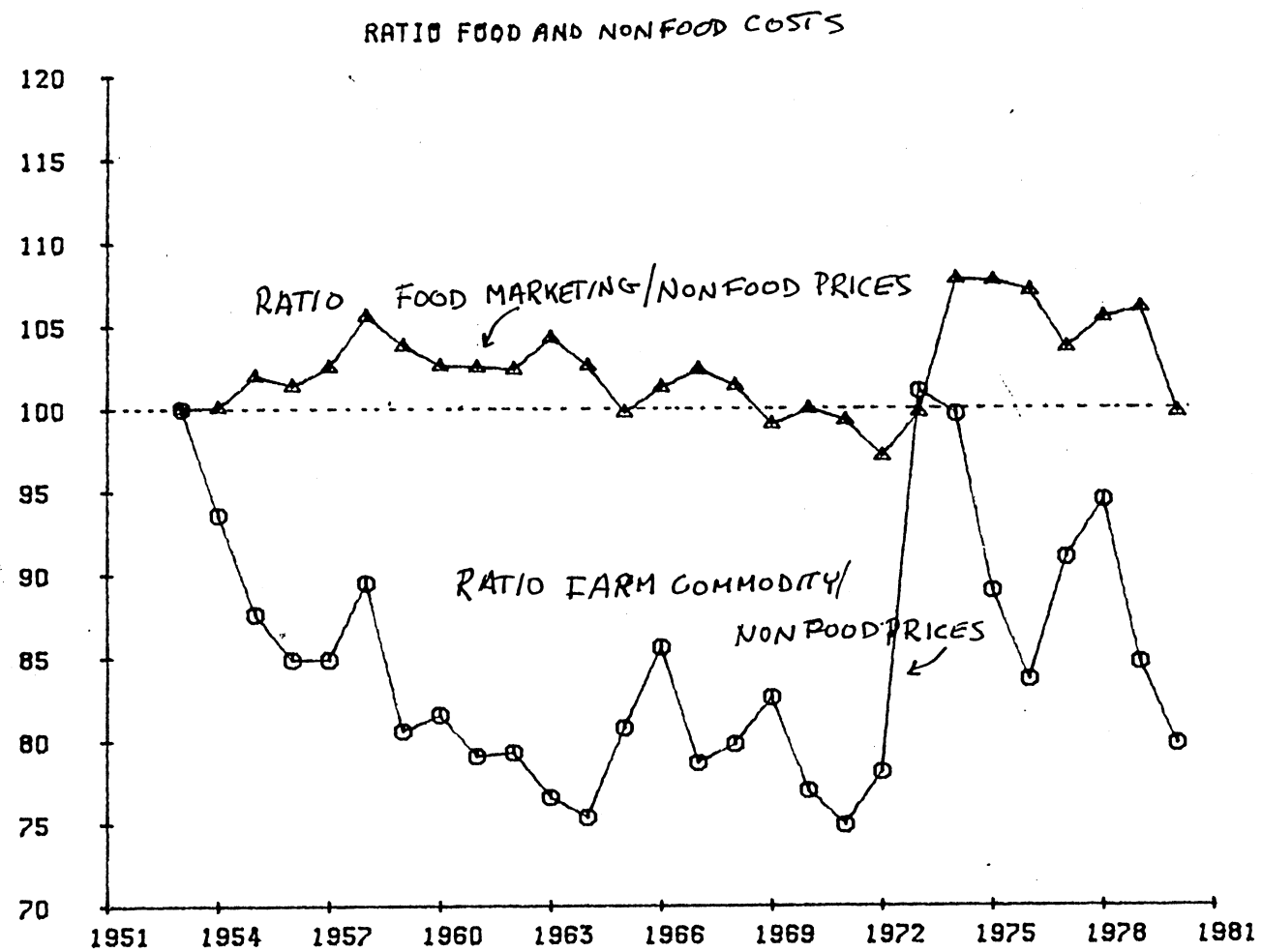
Food Price Trends and the Importance of Farm Commodity Prices:

Because farm commodity prices constitute only about one third of the retail food price, much of the recent analysis of food inflation has been on the processing and marketing sectors of the food system. To be certain, the costs of processing and retailing, etc. are rising, reflecting mainly the higher wages, energy, transportation, interest costs, along with increased profit margins that all have risen with the general increase in prices. But these price increases cannot explain why food prices suddenly began rising faster than overall inflation after 1972.

If we compare price increases in this sector of the food system with price increases of nonfood items, we find that between 1953 and 1972, processing and distribution costs rose at an average annual rate of 2.6 percent per year, while nonfood prices rose at about 2.5 percent per year. Between 1972 and 1980, processing and distribution costs rose at the average of about 8.9 percent, again only slightly faster than the 8.7 percent rate of growth in nonfood prices. Fig. 4 illustrates the changes in this ratio over the entire time period. In short, there was no sudden shift in the behavior of processing and marketing prices that would account for the sudden shift in retail food prices.

Before going on to consider commodity prices, we should deal with an argument proposed mainly by farm interests that the reason food costs have risen in the past decade is the changing buying preferences of consumers who have increased their purchases of highly processed and packaged convenience foods relative to cheaper, less processed foods that require more time to prepare. Without denying the validity of this claimed switch in consumer buying practices or the fact that such convenience foods are more expensive because they embody more energy and costly packaging

materials, this argument still cannot explain why we see so dramatic a shift in the food price index.

Recall that a price index is based on a fixed market basket of goods, the composition of which does not change over time. If it did, the price index would be meaningless. Therefore, changes in product-mix do not explain the rapid rise in food prices as measured by a price index. This is not to say that total food expenditure (the numerator of the indicator discussed above) is unaffected by these changes, as we pointed out above. Moreover, if consumer buying patterns do shift substantially over time, the price index will become increasingly less accurate an indicator of actual price impacts. For example, a price index based on commodities typically bought during the 1950's would understate the true food price impacts today, if we accept the above argument.

The inescapable conclusion is that the dramatic change in the behavior of food price indexes during the last decade arises because of the performance of farm commodity prices; this can be seen by examining Fig. 4. During the 1953-72 period, farm commodity prices rose at about 1.1 percent per year, less than half the 2.5 percent increase in nonfood prices. However, between 1972 and 1980, commodity prices rose at 8.8 percent per year, fast than other the 8.7 percent average increase of nonfood items. However, many important aspects of the changing farm commodity situation are disguised by these averages. The most important new feature of the commodity markets during the past eight years has been the marked fluctuations in prices, in sharp contrast to the stability of the earlier period.

Profile of a Commodity Cycle

The pattern of rapidly rising and falling commodity prices is not
new; economists studied these patterns prior to the 1950's and called them
"commodity cycles." These patterns have re-emerged during the past ten
years, and have been observed in such commodities as wheat, corn, soybeans,
sugar, beef and coffee. Fig. 5 illustrates the both the long period of
relative price stability and the dramatic cycle that affected grain prices
between 1972 and 1976 as well as the beginnings of the next cycle that
began in 1978 and may still be in its upward phase. Two distinct cycles in
meat animal prices are evident.

Why Commodity Markets are Susceptible to Cycles

Commodity cycles develop because of one particular characteristic of
commodity production: farm commodities are subject to the requirements of
nature; they cannot be produced simply by starting up an assembly line.
Should there be a poor harvest supplies will be short relative to demand,
and prices will rise accordingly. Since the demand for food commodities is
inelastic, even relatively small shortages can cause large increases in
price. By contrast, if shortages should develop in a manufacturing
activity, there are usually substitute products available or there is
excess production capacity that can be quickly utilized to increase supply.
Hence, we rarely observe dramatic demand-induced price fluctuations in the
industrial economy.

Another difference between commodity production and production in the
manufacturing sector concerns the ability of producers to pass along
increases in production costs. Farm commodities are produced under
conditions approximating perfect competition; prices are set according to
the laws of supply and demand. If crops are short, prices will be high and

FIG. 5

Grain Prices

Meat Animal
Prices
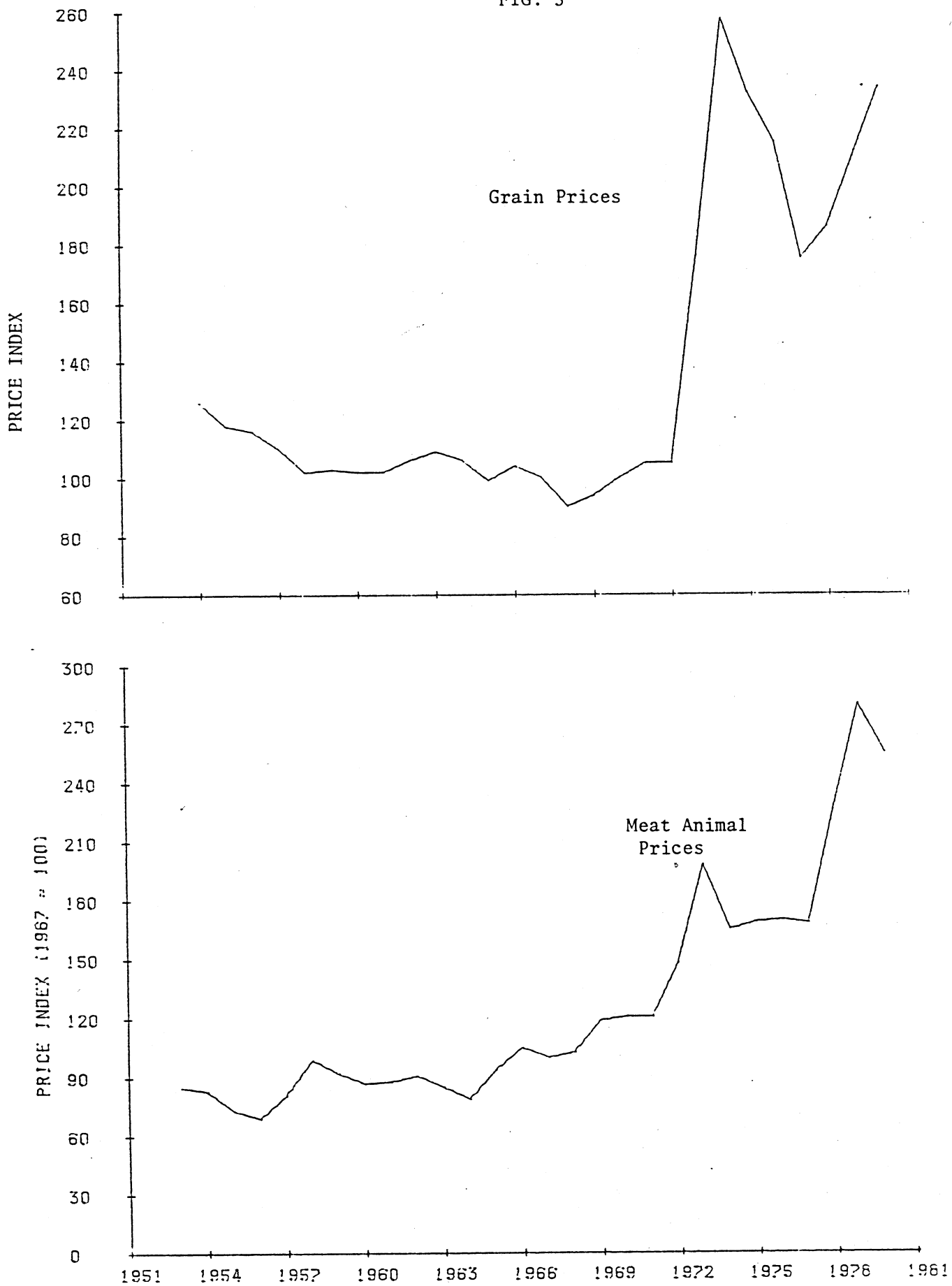
farm incomes will rise; if supplies are plentiful relative to demand, prices will be low as will be farm incomes. Should the costs of fertilizer, land, machinery, labor, and interest rise, there need be no necessary impact on the market price of commodities, as long as supplies are not reduced. The only way that these higher costs can be passed along to commodity buyers is for farmers to restrict output. Under competitive conditions, such supply restrictions occur slowly, as the less prosperous farmers are squeezed out of business.

To summarize, in the commodity markets, prices are determined by supply and demand, and the resulting prices need not have any relationship to costs of production in the short-run. Supplies are fixed in any period by the laws of nature and they cannot be increased until subsequent crops are produced in the following seasons. Therefore, adjustments to changing demand or supply conditions are all accomplished through the price mechanism. Over the long run, costs of production influence price as continuing losses (profits) discourage (encourage) new investment in capacity.

In contrast, should prices rise in the industrial sector, they will be passed along to consumers almost immediately through a process called "administrative" or "mark-up" pricing. Large firms price their products on the basis of costs, plus a profit margin. If costs rise, so does price after only a short lag. Large firms can practice such pricing because they do have sufficient control over market supplies so that they do not fear price-cutting competition. Since all of the firms within a market operate on similar pricing strategies and face similar costs, competition for markets takes on other forms than cutting prices.. If raising prices to reflect higher costs reduces demand, the large firms can restrict supply by

running at lower capacity utilization. Therefore, in the short-run product prices in the industrial economy are determined on the basis of cost, and adjustments to changing demand conditions are reflected in the quantity of the product supplied. Over the long-run, continuing losses (profits) will cause some firms to close (open) plants or to go out of business entirely.

The Grain Cycle of 1972/75

Given this background, we can now examine a typical commodity cycle. First, since the cycle is a short-run phenomona we do not need to explain it with reference to changes in long-run investment. What typically sets off a cycle is a "shock" such as a frost or a drought. The impetus for the 1972/75 grain price explosion was a combination of a sudden increase in world demand for U.S. grain and soybeans, brought about by devaluation of the dollar, detente and poor grain harvests outside the U.S., and a modest reduction in supply of U.S. grain because of poor harvests in 1974. Because grain supplies were fixed and could not be immediately increased, the surge in demand could only be met by reducing existing grain stocks (about which much more will be said below) and by a rapid increase in grain prices, which tripled between 1972 and 1974. It was during this phase of exploding prices that farmers and commodity speculators realized substantial windfall profits, for rises in grain prices bore little relation to changes in production costs, which had not risen nearly as rapidly as prices.

The declining phase of the commodity cycle begins once the shortage conditions are alleviated. High commodity prices stimulate producers to increase output. New land is brought into cultivation, or crops whose profitability has not kept pace with those in strong demand can displaced. High prices serve to choke off demand and, for reasons we have discussed

above, to create an environment conducive to recession which further discourages demand. The combination of rising commodity supplies and diminished demand eliminates the shortages that led to the price increases. Because of the inelastic demand, prices fall sharply, along with farm income. Windfall benefits are erased.

This phase of decline is very evident in the grain cycle, beginning in 1975. After the initial surge in demand, exports ceased growing rapidly after 1974. At the same time, grain supplies increased, largely because the government relaxed all acreage restrictions, thus allowing some 50 million acres to be brought back into production that had been diverted under price support programs.

Commodity Cycle Interactions

Price fluctuations in one crop may have impacts throughout the agricultural economy, even in activities that are not subject to the initial "shock" that started the process. For example, the increase in demand for grain crops causes increased acreage to be devoted to their production, reducing the production and increasing the prices of other crops. Therefore, even though demand many not increase for other crops, their prices may also rise as indirect consequence of the initial grain cycle.

Perhaps the most important interaction, however, is between grain and cattle markets. The grain price explosion of 1972-74 set off a major cycle in cattle production and prices. High grain prices destroyed the profitability of cattle feeding, causing investors to sell off their herds which cost more to feed than they would return in the market. This action further lowered cattle prices and depressed profits in the industry. Beef

prices eventually began rising when supplies had fallen sufficiently. However, with herds at very low levels, supplies were not sufficient to meet demand, so cattle prices began rapidly rising, a process that was exaggerated by the fact that in order to increase supplies, herds had to be rebuilt, which meant withholding breeding cattle from the marketplace. The upward phase of this cycle began in 1978 and continued in 1979, when rising grain prices again again choked off profits and sent the industry into another downward spiral; see Fig. 5.

In sum, the grain cycle indirectly helped to worsen food price inflation by increasing uncertainty and reducing overall investment in cattle feeding, thus raising average consumer beef prices. The grain cycle also served to destabilize beef prices, causing prices to fluctuate sharply. As we shall next see, it is this pattern of sharp fluctuations that most contributes to food price, and indirectly, to overall inflation.

Commodity Cycles and Food Price Inflation

The relationship of the boom phase of the commodity cycle and inflation is relatively clear. Rapidly rising commodity prices are quickly translated into higher consumer prices by processors and retailers who price according to mark-up formulaes.

In actual experience, there are limits to how fast these adjustments may be made. During the initial period of the price boom, processors and retailers may not make sufficient allowance in their pricing for the rapid escalation of their raw commodity costs. For example, in 1972 and 1973, the spread between retail commodity prices fell relative to the general rise in inflation, as can be seen in Fig. 6. In other words, the processing/retailing sectors of the food system may have been forced to

FIG. 6

COMPARISON OF:
ANNUAL PRICE CHANGES IN
FARM PRICES, FARM-RETAIL PRICE SPREAD, FOOD PRICES
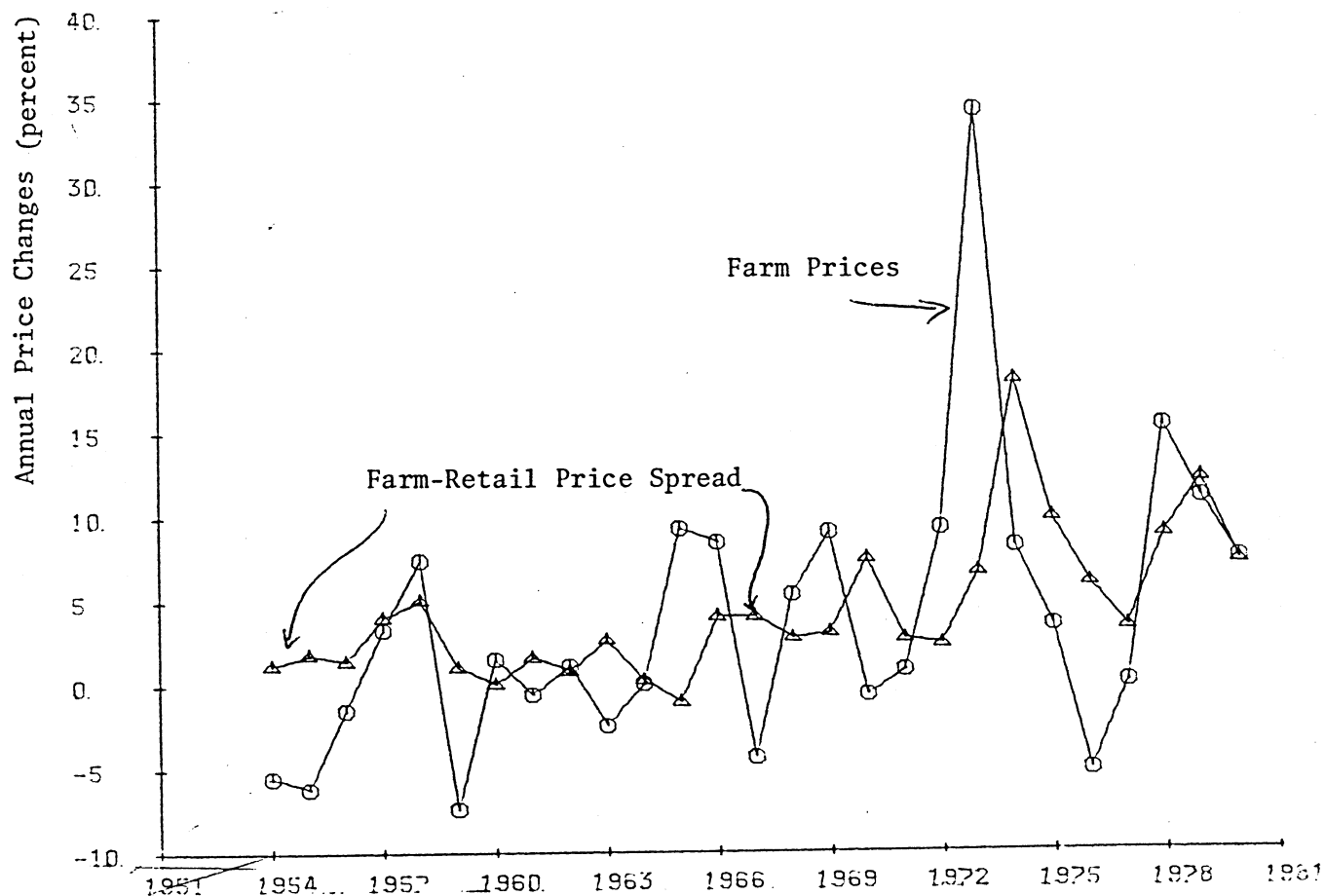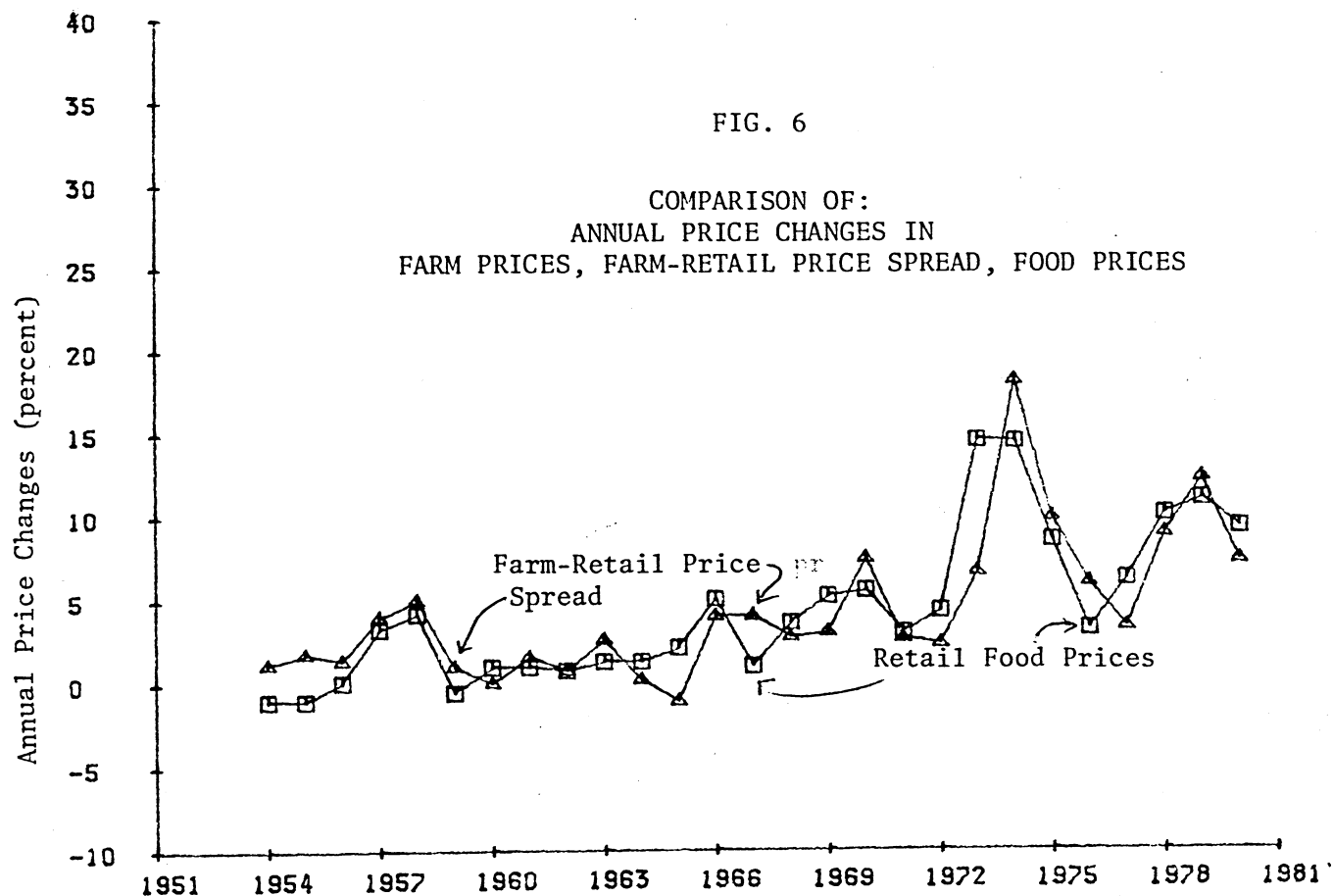
absorb some of the impact of rising commodity prices. However, in 1974 and 1975 the spread widened relative to inflation. This behavior would suggest that industrial firms more than compensated for any losses they have have incurred during the early part of the cycle. Similar patterns may be observed during other less severe periods of commodity instability (e.g. 1957-59; 1965-66; 1977-79). What this pattern implies is that the initial surge in commodity prices may exaggerated and extended by the pricing behavior of the rest of the food system.

In addition, commodity price increases may be exaggerated by the mark-up formulaes, by which profits are set according to a percentage of the final sales price. If a supermarket chain expects to earn two percent profit on its overall sales, and raises prices to reflect higher commodity costs, it will also raise the absolute profit margin so as to attain its two percent target. Thus, as this mark-up procedure takes place at each step of the production process, the initial commodity price is magnified each time it moves from production stage to the next.

The question arises as to the effects of the declining price phase of the cycle on food prices; does this phase contribute to a slowing of overall inflation? The answer appears to be "no." The reason is related to the second-round effect that we described above. Rising wages increase production costs throughout the economy as workers and capitalist alike attempt to recoup lost purchasing power from the initial price surge. By the time commodity prices begin to decline, these second-round effects are in operation, and keep inflation alive.

There are two particular aspects of these second-round effects that are particularly important. The first concerns the effect of inflation on the cost of energy, another major component of the inflationary picture. The

second regards the reactions within agriculture to commodity price declines.

Commmodity Cycles and Oil Imports:

The rapid rise in energy prices is directly related to OPEC pricing decisions. These decisions have a logic. The first major price increase occurred in 1973, after a thirty percent decline in the value of the dollar vis a vis the harder currencies of Western Europe and Japan. Traditionally, OPEC allowed the U.S. to pay for its oil imports with dollars and consequently the Arab states held billions of dollars in reserves. Devaluation directly reduced the value of the major OPEC asset; therefore these state had little choice but to raise oil prices to maintain the real value of their wealth. Inflation in the U.S. has been a major factor behind the devaluation of the dollar. Since food prices play a major role in this inflation, we can see that there is a direct relationship between the commodity cycle and the increasing costs of imported oil. It should not be forgotten that the food price explosion preceeded the first oil price increase by almost a year.

It goes without saying that the continuing increase in energy costs during the past decade have exaggerated the distributional struggle that was begun with the increasing commodity prices. The energy price increases forced U.S. consumers to give up additional purchasing power to oil suppliers. Just as was the case with food, workers and capitalists responded to higher energy costs by raising wages and profits to defend their real purchasing power; the consequence was continued inflation. Had the U.S. been able to maintain a more stable domestic price level in the first place, by, for example, containing food prices, the pressures on OPEC to raise prices would have been lessened with a corresponding reduction in

the magnitude of the adjustments that had to be made because of the export of billions of dollars out of the U.S. economy.

An important implication of this discussion of energy is it tends to turn on its head the usual justification for policies favoring expansion of agricultural exports. According to this conventional argument, farm commodity exports are necessary to offset the costs of higher imported oil. The argument advanced here is that food prices initially helped to weaken the dollar by stimulating inflation; therefore, rising oil prices and rising food prices in the U.S. are strongly related. We will further develop the argument below that food price increases are largely the result of past export policies and the unwillingness of the U.S. to protect domestic consumers from the fluctuations of foreign markets. If this argument is true, then our current agricultural policies help to create the very environment that helps to drive up energy prices. A policy emphasizing a smaller role for food exports would reduce domestic food price increases, benefitting domestic consumers directly, but even more important, such a policy would also serve to stabilize the dollar and thereby reduce the threat of rising oil prices. In sum, dampening commodity price cycles should help to reduce the stimulus to inflation on several fronts.

Commodity Cycles and Farm Welfare

The commodity cycle has a very ambigious effect on agriculture. Initially, farmers receive a large windfall as commodity prices rise faster than production costs. As is evident in Fig. 7, overall farm income doubled between 1972 and 1974, and for grain farmers, conditions were better than for the entire farm economy. But during the down-phase of the cycle, farmers were again caught in a cost/price squeeze as the effects of the

FIG. 7

FARM INCOME
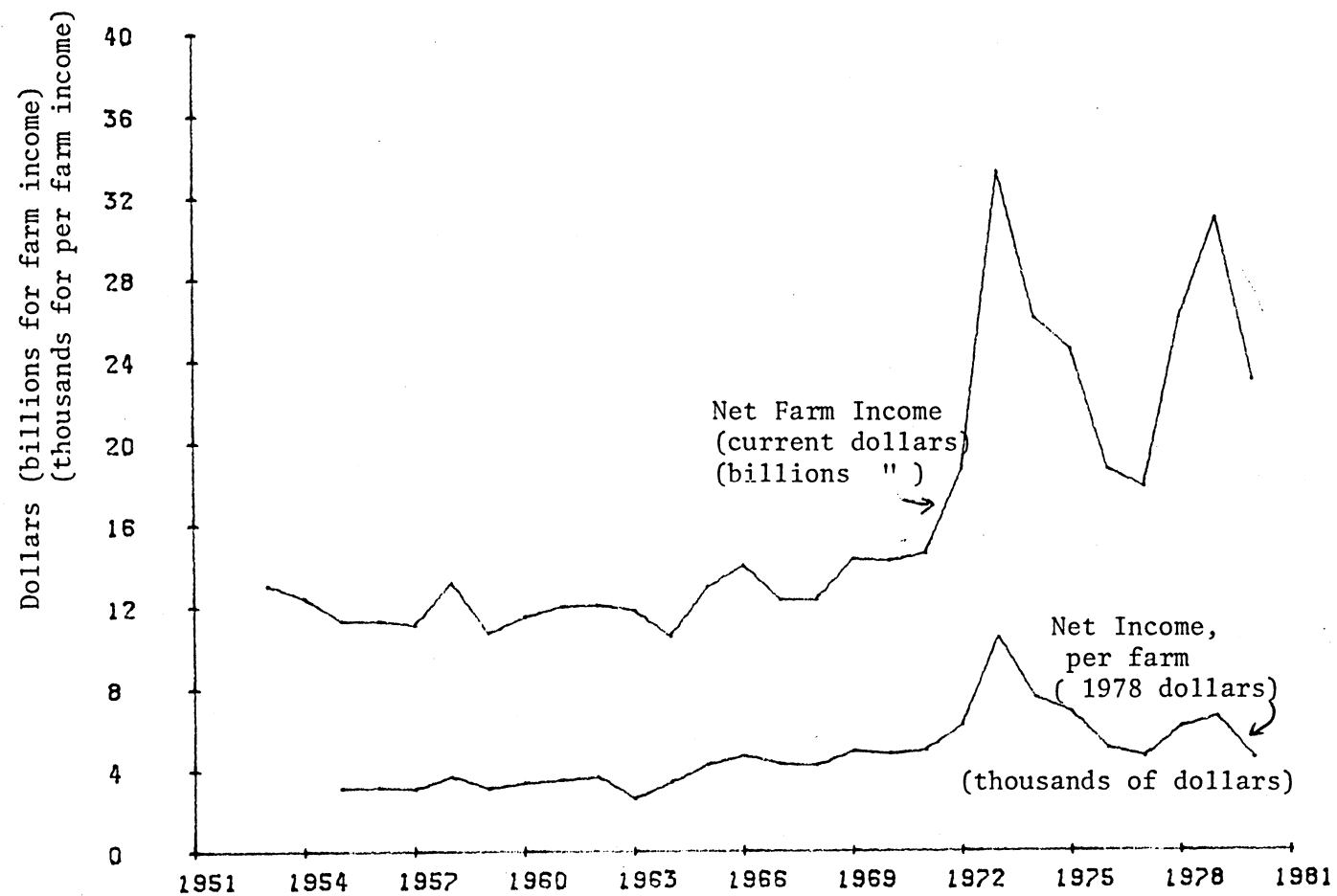
first round of inflation bounce back at them in the form of much higher costs of fertilizer, chemicals, machinery and labor. By 1976, real farm income, per farm, was as low as it had been in the least properous years of the late 1960's.

Perhaps even more important, farmers were faced with much larger debt, and higher interest rates. The debt was directly related to the windfall benefits of the first phase of the cycle, which many farmers had used to buy additional land. Since there is a relatively fixed supply of farmland, the effect of many farmers bidding for land was simply to drive up its price. This effect was reinforced by nonfarm investors who were attracted to farmland by its spectacular growth. It was one of the few assets that increased in value relative to inflation; see Fig. 8. Land values also rose relative to farm income and those who purchased land at the new high prices were hard-pressed to meet debt requirements when commodity prices failed to increase. Thus, as incomes fell, many producers could not earn enough to cover their debts and pay themselves for their labor and management.

As we have pointed out, because farmers produce under conditions of competition they cannot pass on higher input costs. Therefore, during the price decline part of the cycle, farmers were unable to protect their new-found wealth from the efforts of the rest of the economy to regain lost purchasing power. However, farmers did have a trump card; they had political power to affect the prices and incomes they received. Two "tractorcades" in the winters of 1977 and 78 led to the enactment of the 1977 Food and Agriculture Act that reinstated high income supports and acreage controls for grain and cotton crops, and to an emergency bill in 1978 that further increased the income support levels.

FIG. 8

LAND PRICES AND NET RETURN TO CROPLAND
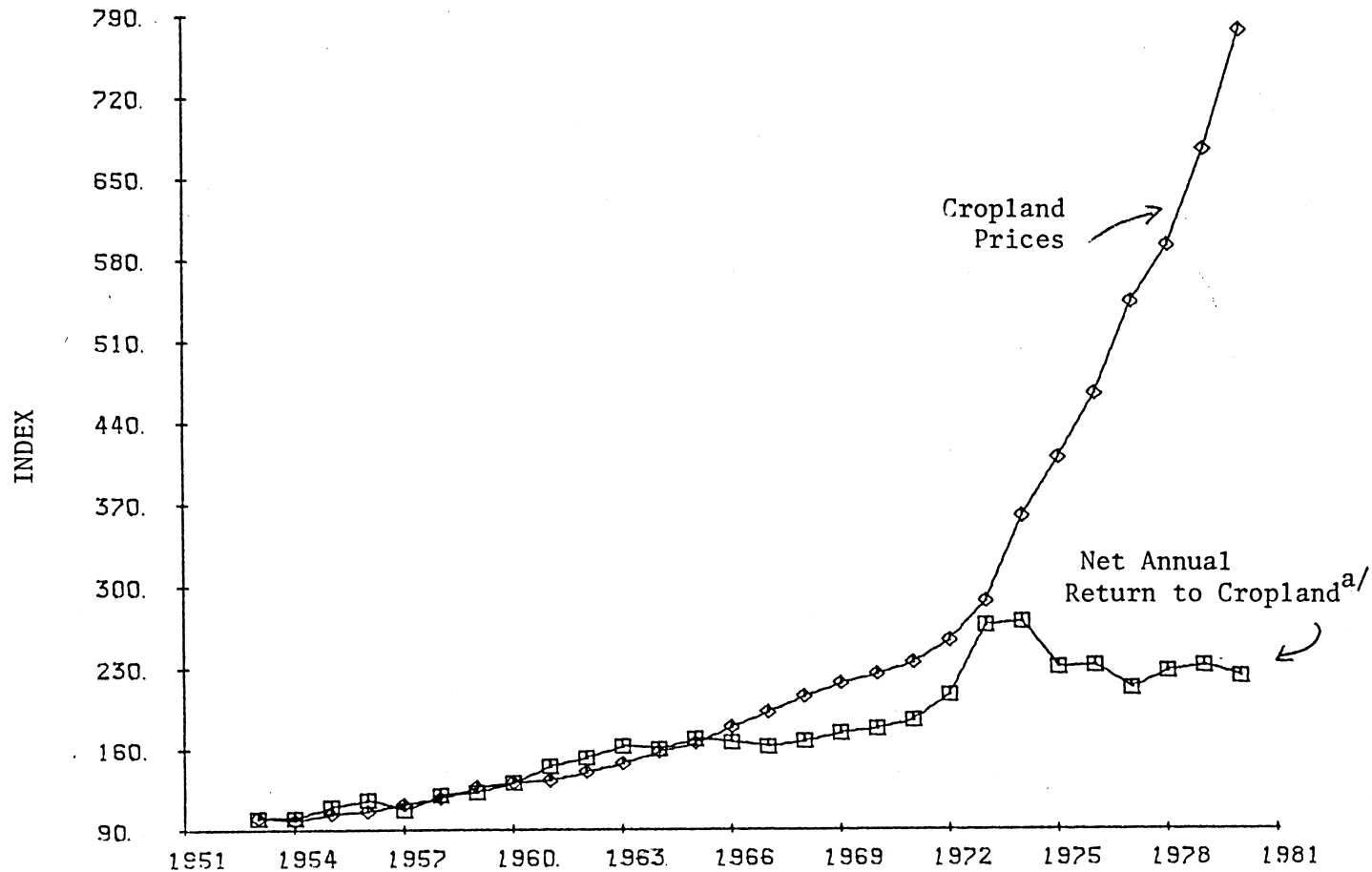
a/ Net annual return to cropland is derived by adjusting gross receipts of sale of crops
   with index of prices paid for production items and cropland productivity and then
   dividing by total cropland index.

The new support programs set subsidy levels sufficiently high to allow farmers to pay off new mortgage debt as well as meet higher input costs. Thus governmnent prevented the completion of the full cycle. Landowners were allowed to reap huge gains, for the primary effect of these policies was to protect the rapid rate of growth in real estate values, which would otherwise have been severely limited by the unrestrained effects of the commodity cycle. During the past eight years, more than $500 billion has been added to the value of farm real estate.

Landowners are obviously made much better off by such policies. Farmers are much wealthier than they otherwise would have been, but they still earn relatively low incomes in farming and unless they are willing to sell out, the new-found wealth cannot be easily realized. Thus, rising land values have not prevented the continuing exodus of farmers who are being squeezed by rising costs; the high land values provide considerable incentives to sell and have probably encouraged this decline of the farm population. Such high values also make it almost impossible for young farmers to gain entry into farming, except has hired managers. Increasingly, the land will be owned by absentee owners who can afford to buy and sell land for the capital gains. Ultimately, high land values will eliminate the family-type farm.

The implication of this discussion of the reactions to declining incomes in the farm economy is to emphasize the fact that while farmers lack the direct market power of large corporations, they do possess important political power that serves a similar purpose of preventing the full completion of the commodity cycle. That is, even though commodity prices did fall after 1975, they were prevented from returning to pre-cycle levels by government intervention. However, it must also be recognized that

as long as workers and nonfarm businesses continue to possess the power to pass on higher commodity prices, no amount of government intervention can long sustain farm incomes. All such intervention can do is encourage yet still further rounds of food price increases and more inflation.

The other most important consequence of goverment intervention in 1977 was to protect the huge capital gains that had accrued to landowners. Had such intervention not occurred, inevitable and perhaps very traumatic adjustments in the land market would have taken place. Ultimately, these temporary adjustment costs would have been beneficial, since they would have discouraged speculation in the land markets that continues to this day. Such adjustments are much more difficult to make with the passage of time, for as the land changes hands, the new higher cost land is a liability to some individual, and to instigate conditions that would reduce its value would threaten the viability of the entire farm economy and financial institutions supporting it. Therefore, because of government intervention, land prices have been permanently increased and will become part of the cost of producing food. Higher food prices will be necessary simply to pay for the added rent to land.

The Commodity Cycle and The Ratchet Effect

This analysis of the role of government intervention provides the last piece of supporting evidence to explain why commodity cycles lead to ever higher prices. If there were no market power in the labor markets or in the industrial sector of the economy and if there were no special interest connection between farmers and the government, the commodity cycle would not be the same threat, since prices would rise and fall. But under the current institutional arrangements, prices cannot fall, so with each

new episode of the commodity cycle, prices ratchet upward.

The driving force behind this ratchet effect is the reactions of everyone, especially those with market power (unions, large corporations, groups with special political leverage), to fend off the detrimental effects of an initial loss of purchasing power from some external shock. The analysis developed here applies not only to the impact of commodity price changes, but also to the energy price shocks and to devaluation of the dollar. All of these events have reduced the real income of major groups in the U.S. and have triggered subsequent struggles.

Commodity Cycle Inflation and Public Policy

There are three principle ways this process could be halted. The first would be to prevent any reactions to such shocks and force everyone to accept a lower standard of living. One way this might happen is if the special political and economic power that allows some groups to shift the burden of adjustment were eliminated. This would require total deregulation of capital and labor and the elimination of all special interest relationships with the government. It would also imply using anti-trust laws to force large-scale enterprise into a purely competitive mode. Such a plan would have no chance of success; it would be opposed by virtually every powerful group in the country.

Strict price and wage controls might offer another avenue to preventing the development of inflationary spirals resulting from external shocks. However, experience with these kinds of regulations shows that they are difficult, if not impossible, to administer fairly and effectively. If they are not instituted equitably, especially between capital and labor, the pressures for inflation do not diminish. Moreover, price and wage

controls, if imposed over a long period, inevitably imply inefficient uses of resources, since relative price changestend to be surpressed and prices no longer function to provide appropriate incentives for efficient production or consumption.

The second way that we can deal with these inflationary situations is to follow the same course as during the past decade. That is, deal with the symptoms of the problem by engineering periodic recessions to dampen inflationary forces originating from such shocks. This process is extremely costly, as we argued above. Such policies do not solve the problem, since they only serve to weaken the productivity of the economy and thereby further weaken the relative strength of the U.S. in the world economy. This means continuing devaluation of the dollar and further increases in energy prices, both of which force still further struggles in the domestic economy.

Last, we could deal with the problem by minimizing the impact of these external shocks through policies aimed at producing greater domestic price stability in the commodity markets. This last approach would appear to be the most desirable, given the political difficulties of eliminating the distributional struggles that are generated by instability. The methods why which this last alternative might be realized are the topic of the next section.

AGRICULTURAL POLICY AND FOOD PRICE STABILITY

The purpose of this section is to review the reasons why, after almost two decades of stability, the commodity cycle emerged during the post-1972 period. We shall argue that the cycle is directly related to the redesign of agricultural policy so as to facilitate an export-expansion strategy. This orientation toward exports is also the keystone of the Reagan Administration's food and agricultural policy.

The Sources of Price Stability: 1953-1972

Three important factors account for the long period of price stability and subsequent emergence of commodity price cycles. First, the 1950's and 60s were a time of very rapid adoption of new agricultural technologies. Labor-saving mechanical devices allowed fewer and fewer farmers to produce more and more food while new biological innovations increased the productivity of the land as well. This technology increased the supply of agricultural commodities faster than demand for them grew, creating an environment favorable to the accumulation of large surplus stocks.

Second, the adjustment to this technological revolution in agriculture was far from smooth, and to lessen its adverse impacts as well as to stimulate its adoption, government price support policies were initiated under the Eisenhower administration. Until the mid-1960s, farmers were not obliged to restrict output, and prices were maintained by government purchases of unwanted surpluses. These surpluses accumulated into huge stocks; by 1961 the U.S. government held about 50 lbs. of wheat and corn for each man, woman, and child on earth; see Fig. 9. These large

stocks were available to meet any short-fall in U.S. production without necessitating an increase in prices.

Third, U.S. agriculture was largely isolated from the rest of the world. Very little unsubsidized commercial trade in agricultural exports took place; more than 60 percent of agricultural exports in 1960 were subsidized by one of several government programs, the most important of which were PL 480, the Food for Peace Program and credit-subsidized sales from the Commodity Credit Corporation. Government price supports kept domestic prices of grain and cotton above world price levels, discouraging commercial exports. This isolation from world markets shielded consumers from the unpredictable price effects of shifts in world demand and supply conditions.

The resulting commodity price stability not only prevented price cycles and their attendant problems, but perhaps equally important, it created an investment environment that encouraged the rapid adoption of new, cost-reducing technologies. In short, stable prices encouraged higher productivity, which, in turn, helped to insure the additional food supplies necessary to the maintenance of future price stability. Productivity also allowed government to reduce, very gradually, price support levels without impairing the economic prosperity of progressive farmers (though declining prices certainly "squeezed" many small producers out of agriculture).

Setting the Stage for Export Expansion

By the mid-1960's, new forces had begun to reshape agricultural policy. While price stabilization had always been one of the goals of farm policy, the most important goal has been that of maintaining farm income at

a sufficient level to allow progressive commercial farmers to survive during the economic chaos wrought by the industrialization of agriculture.

By 1960, it had become increasingly clear that the government could meet the income maintenance goal without continuing to accumulate huge stocks, which had become expensive to maintain and a major political liability. Consequently, several reforms were introduced during the 1960's to reduce the costs of government involvement in agriculture. First, rather than supporting prices by accumulating food stocks, surplus production was controlled by restricting the farmers' use of land. By the early 1970's, 60 million acres 20, percent of all cropland, were diverted from grain and cotton production. Government-owned grain reserves dramatically decreased from the peak of 2.5 billion bushels in 1960 to 350 million in 1966; see Fig. 9. Privately-held stocks increased to compensate for this decline, but overall grain reserves sharply declined.

The second important reform divorced farm income policy from farm commodity price policy. After 1965, farm incomes were maintained by direct payments from the treasury to the individual producers. This allowed the government to reduce market prices of grain and cotton to world levels without destroying farm income. The original purpose of this reform was to eliminate the double-tax implied by the high public cost of purchasing surplus commodities and the effect of these high prices on domestic food prices. Moreover, by the late 1960's, a substantial body of opinion held that U.S. agriculture had a comparative advantage in world grain markets and, if domestic prices were reduced to world price levels, commercial exports would increase, thereby allowing the government to phase out price supports and acreage controls. This was the logic of export-expansion.

This strategy was given added impetus by two other developments. The

FIG. 9

STOCKS; PUBLIC AND PRIVATE
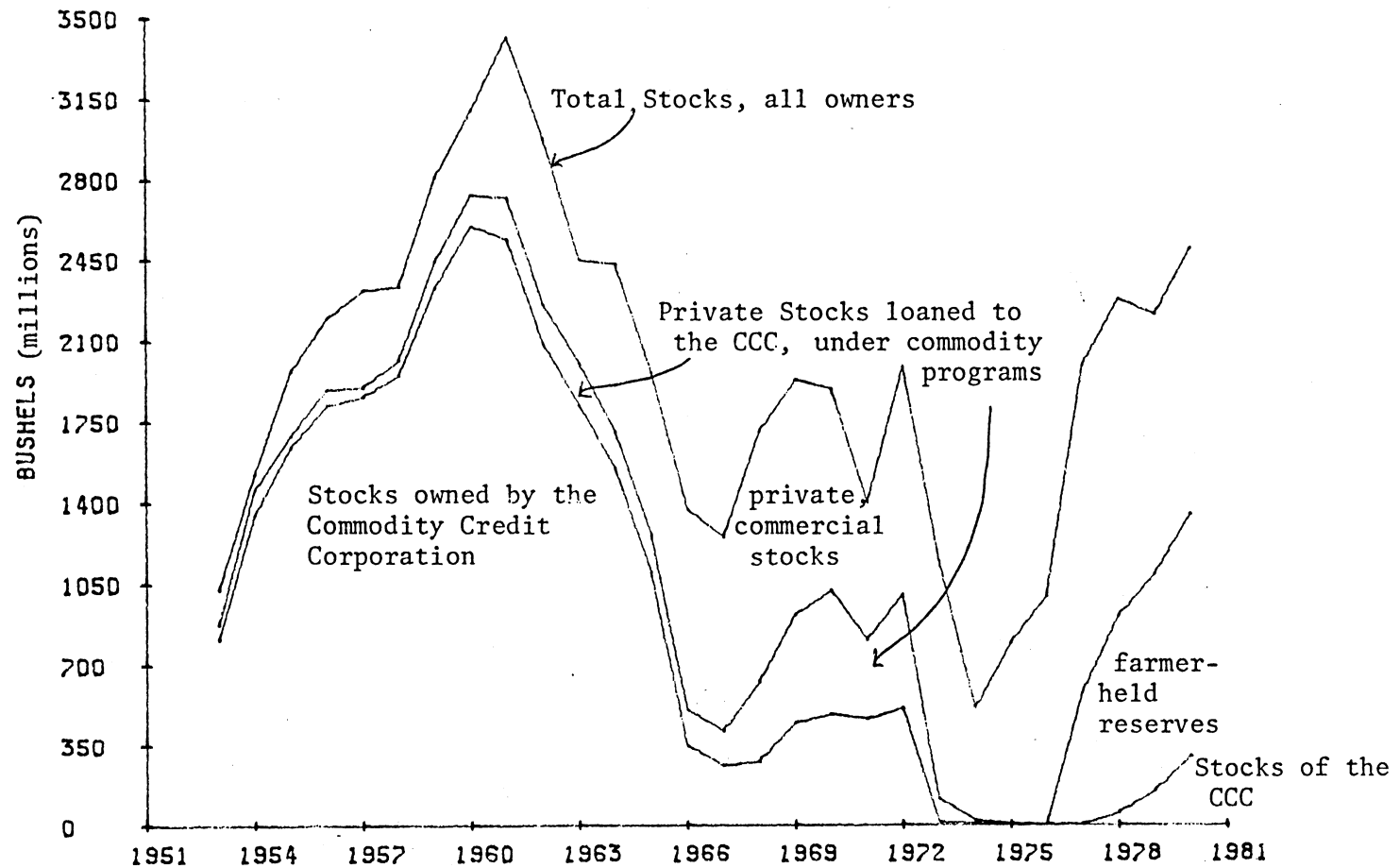
move to direct income supports made the benefits of the public subsidy to farmers much more visible. The visibility proved a liability, since it became clear to the public that the benefits of the agricultural programs were highly skewed toward a few already-prosperous large farms. By the late 1960's, farm programs had lost much of their political appeal and there were partially successful legislative efforts to limit the size of thesubsidy a farmer could receive. Only the fact that the Food Stamp program, of considerable interest to urban members of Congress, was part of the same legislation as farm income programs allowed agricultural interests to bargain for continued political support. Nevertheless, it was clear that agriculture would have to find some other way of supporting itself in the future.

The second impetus to the development of a new agricultural policy was the growing U.S. trade deficit and the signs that the dollar was overvalued. Prominent economists argued that once domestic commodity prices were allowed to fall to world market levels, commercial exports would accelerate, and the trade deficit would shrink, allowing the dollar to strengthen. Such predictions proved premature, for the export strategy failed to increase the volume of exports during the late 1960's, while agricultural interests continued to press the government for higher subsidies.

It was not until 1971, when the Nixon Administration devalued the dollar, that the first signs of the success export-strategy were visible. Nixon turned to devaluation for a "quick-fix" to two-years' of recession; he hoped that a cheaper dollar would stimulate foreign demand for U.S. goods, thus increasing demand and employment. Agricultural exports were to play a key role in this recovery through their beneficial impact on the U.S. trade

account and the stability of the dollar. As part of this same strategy, Nixon also pursued a policy of detente with both the Soviet Union and China. One immediate consequence was new agricultural trade agreements, with much higher exports of grain to these nations.

To this combination of devaluation and detente a third factor of poor world harvests in 1973 and 1974 was added and U.S. farmers suddenly found themselves confronted by world clamoring for their grain. The quantity of grain exports doubled in two years, while the dollar value of all agricultural exports tripled; see Fig. 10. The remaining U.S. grain reserves were quickly drawn down to record low levels and unfortunately, in 1974 the U.S. suffered poor harvests, reinforcing earlier price increases.

The Crucial Relationship between Stocks and Price Explosions

With the increasing demand for grain and reduced stocks, prices of wheat, corn, and soybeans tripled between the end of 1972 and 1974. Yet, inspite of the increased demand and the slowing in the increase of supply, economists have been unable to explain this price explosion in terms of simple supply and demand. Certainly the underlying supply and demand conditions warranted a price rise, but of a smaller magnitude. The much greater than expected price increase appears to have been related to "panic" or "speculative" buying that erupted when stocks reached critically low levels. Fig. 11 illustrates the relationship between prices and stock levels in corn and wheat; as can be seen there exist threshold stock levels below which prices begin to rise steeply.

Processors increased purchases to assure themselves of reliable supplies, while others, believing that the world would face drastic food shortages, bought up stocks in anticipation of even higher prices to come.

FIG. 10

U.S. GRAIN EXPORTS

Fig. 11

STOCK/PRICE RELATIONSHIP: CORN

U.S. CORN STOCKS/AVERAGE U.S. DISAPPEARANCE

STOCK/PRICE RELATIONSHIP: WHEAT

U.S. WHEAT STOCKS/AVERAGE U.S. DISAPPEARANCE
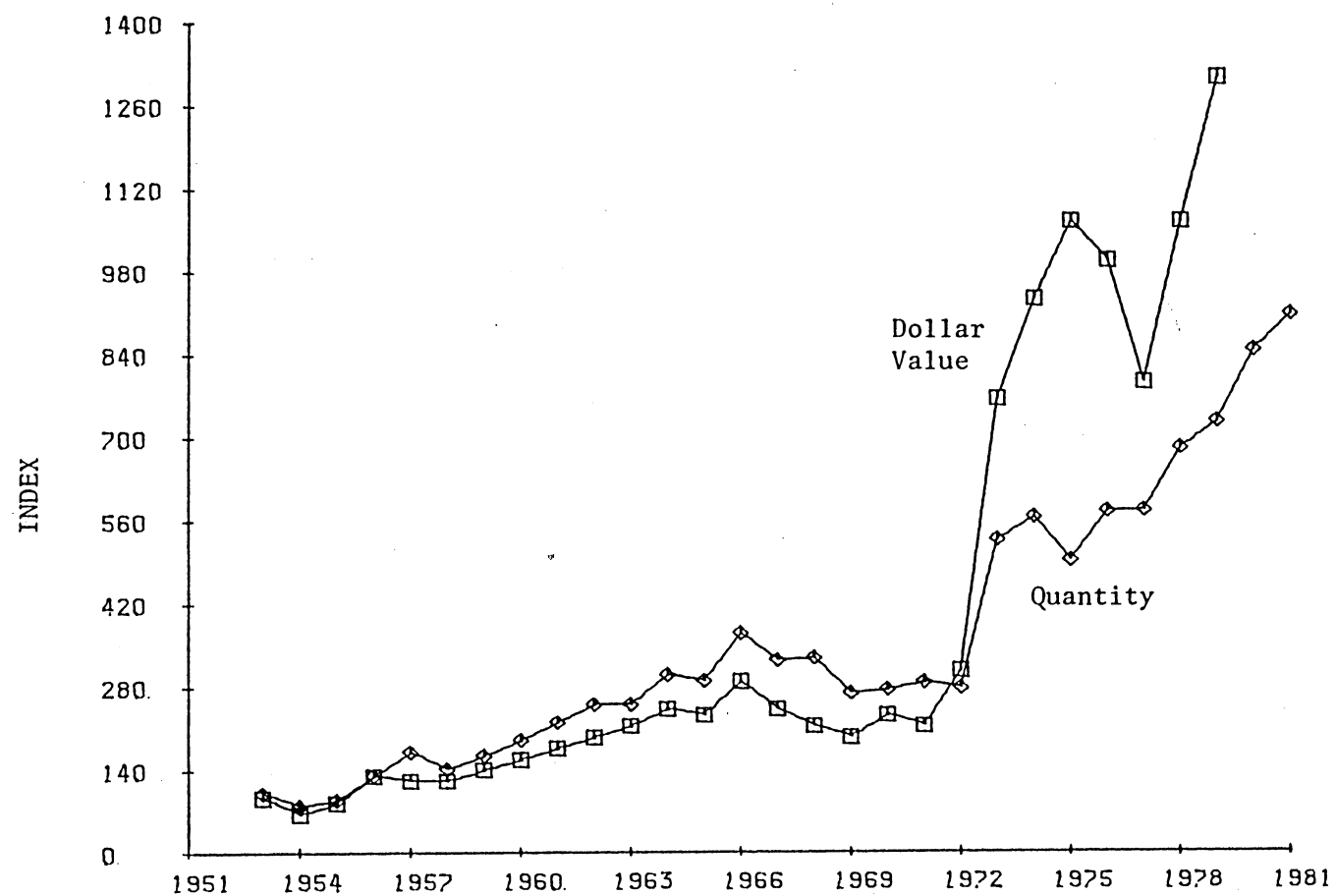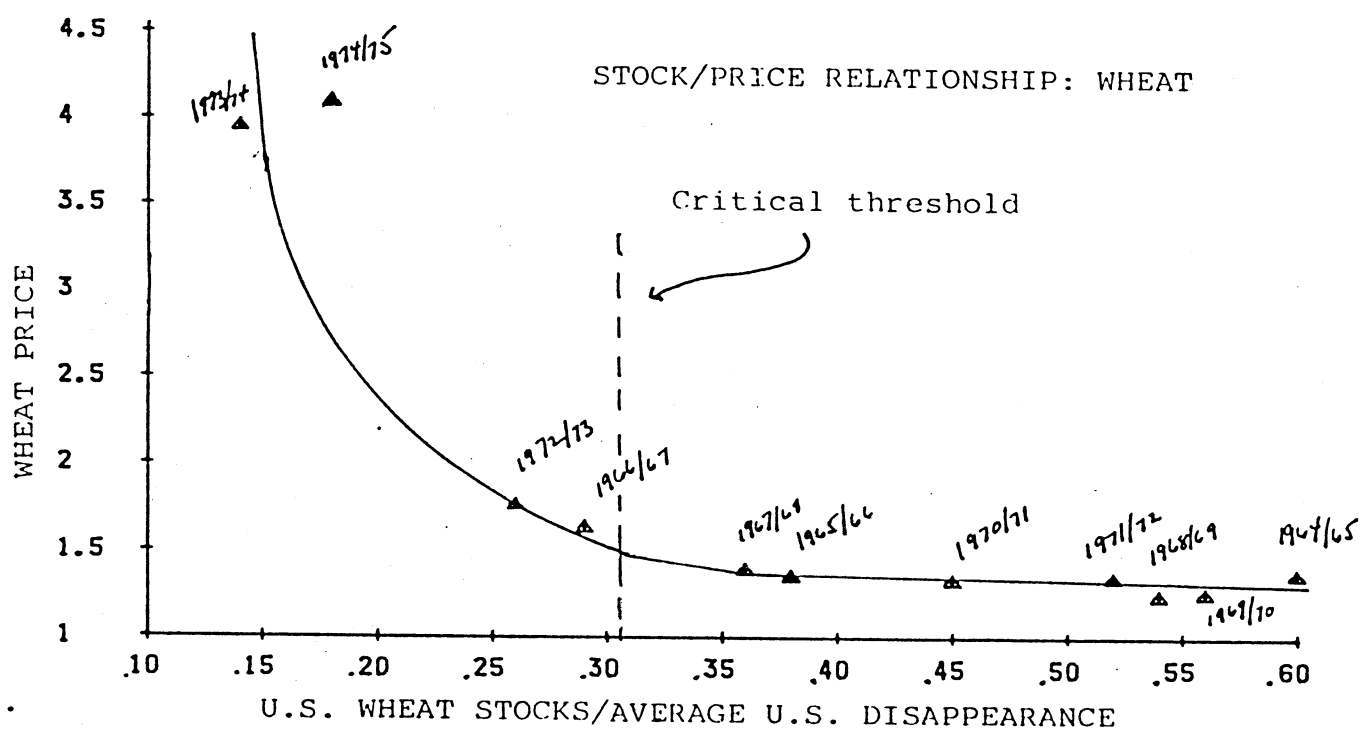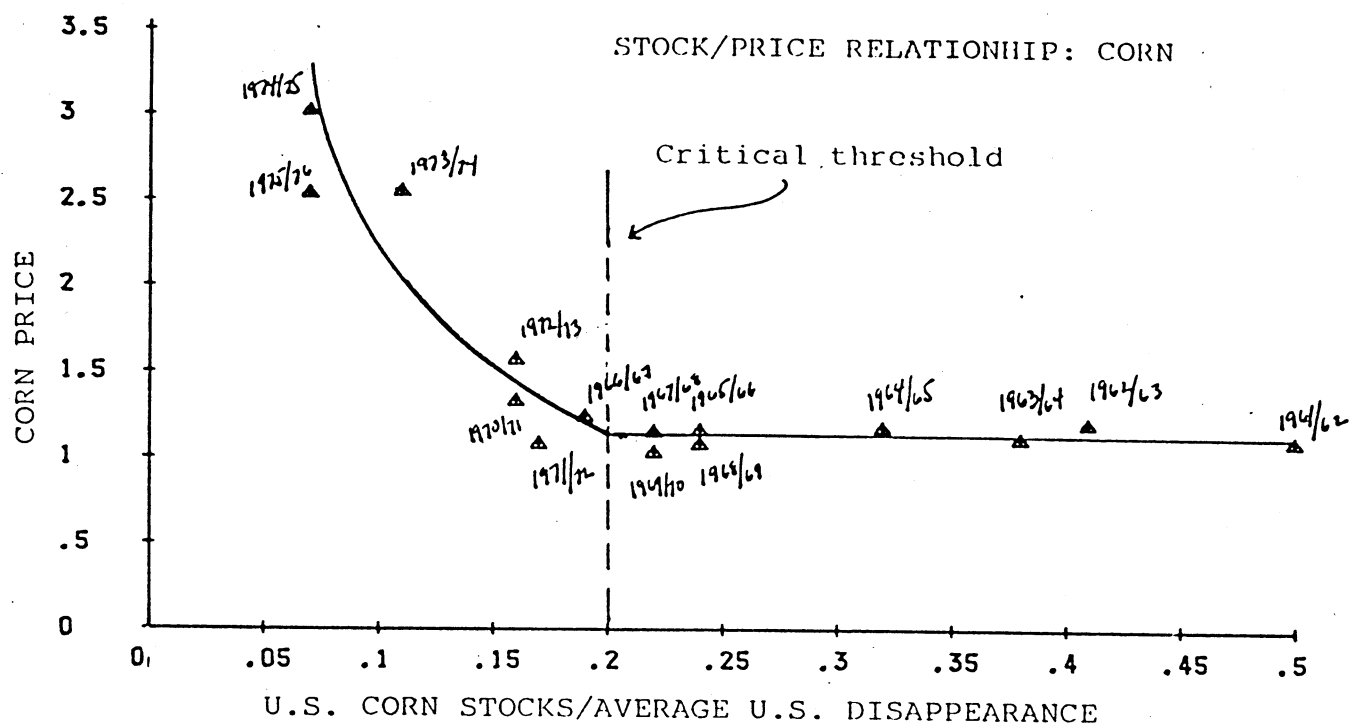
The initial impact of this behavior was to cause the upward price spiral. Fig. 12 provides a detailed look at this process in the wheat market. In contrast to the small week-to-week price variations in the first part of 1972, as the full implication of declining stocks hit the marketplace, prices became highly unstable. Thus, while the average wheat price for 1973 was less than $4/bushel, there were some weeks when the price was close to $7/bushel. Characteristic of such speculative episodes, the underlying reality of supply and demand eventually forced a revision of unrealistic expectations, and prices collapsed at least twice (with a second explosion in 1974) before settling down in 1976.

The pattern illustrated in Fig. 12 cannot be explained in terms of simple supply and demand; the dramatic price fluctuations clearly reveal the domination of speculativative buying. Very similar patterns have been observed in corn, soybeans, cattle, sugar, coffee, rubber, silver, gold, and many other commodities over the past decade. Interestingly, during the 1950's and 60's, such episodes were rare. At least in the case of agriculture, the reasons for this long period of price stability are easily explained by the existence of large surplus stocks.

Prices, Stocks and Exports After 1975

The collapse of grain prices was reinforced by the combined effects of increased U.S. grain output, resulting from intensification of production and the release of 60 million diverted acres, and by the leveling off of foreign demand, which discouraged further growth of exports between 1974 and 1977 (see Fig. 10). However, with the continued devaluation of the dollar in 1977 and 1978 and poor harvests in the Soviet Union, farm exports again began growing rapidly in 1978 this growth

FIG. 12

WEEKLY WHEAT PRICES
1972 to 1976
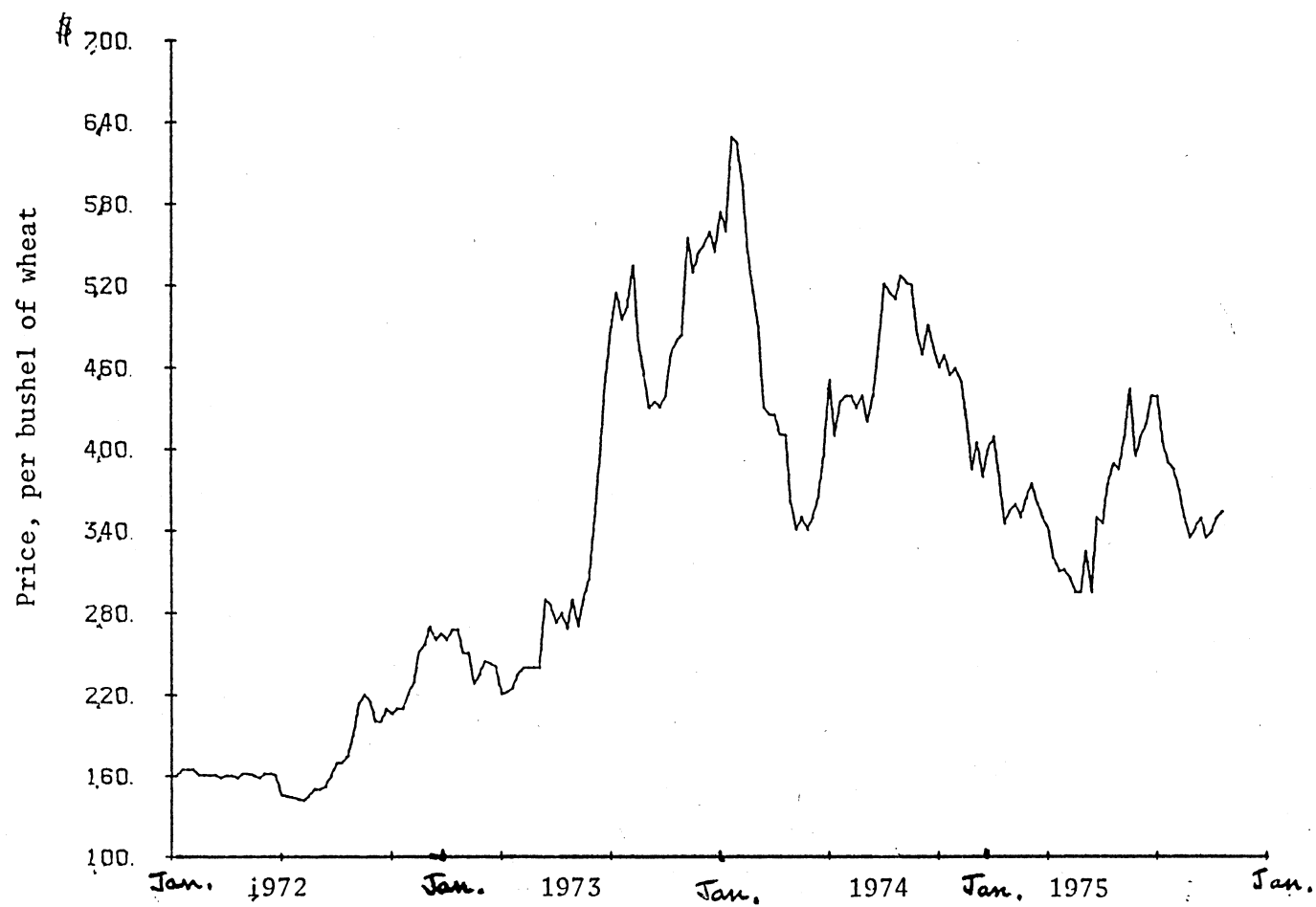
continues to the present day. Farm prices began rising, but did not "explode" as in 1973 because of exceptional grain harvests in the U.S. in 1978 and 1979 and because of relatively large grain stocks accumulated in 1975 through 1977.

In 1980, drought substantially reduced U.S. harvests and to meet rapidly growing export demand, U.S. suppliers drew down grain stocks. By the beginning of 1981, the ratio of expected exports to available grain stocks is approaching the same very high level of the last period of exploding prices. A mediocre harvest in the U.S. or poor harvests elsewhere that increase export demand will again bring us to the critical grain reserve thresholds and the very real possibility of another speculative outbreak in the grain markets.

Post-1975 Policy: Export Expansion

We have already discussed the retreat to income supports and acreage controls after the return of low farm incomes in 1976. However, the new legislation was more than a restoration of the programs of the 1960's. Two features are of particular importance: the continuing emphasis on export-expansion and the creation of a new grain reserve system held by farmers.

The export orientation is incorporated into the very structure of the income support system of "target" and "loan" prices. Under this system, the government establishes a loan price at which it will agree to purchase a farmer's crops, should there be insufficient market demand. The loan rate is so named because the farmer can receive a subsidized government loan at the beginning of the crop year equal to a portion of his expected crop, valued at the loan rate. The target price establishes the minimum price the

farmer will receive for his crop; it is above the loan rate. Should the farmer sell his crop for less than the target price, he would be eligible to receive the difference between the target price and his actual market price in direct payment from the government.

The advantage of this two-price system is that it allows the government to maintain artificially low prices for agricultural commodities so as to encourage exports. Setting a target price higher than the competitive market price induces farmers to increase production, which has the desired impact of keeping market prices low and exports competitive. The loan rate serves to set a floor for market prices, since the government stands ready to purchase the crop or to pay farmers to hold the crops off the market. With this control, the government has the ability to set export prices according to available demand. It should be clear that by manipulating these two prices, the government can effectively subsidize exports and thereby encourage market development. Of course, such subsidies only payoff if they create long-term market expansion for U.S. products and thereby increase foreign dependence to such a degree that the subsidies are no longer needed.

It should be added that export expansion has been fostered by other policies as well. Agricultural trade promotion is carried on through a series of overseas missions, set up expressly for this purpose. Some commercial exports are sold through special programs that allow a long pay-back period, with subsidized credit. The Food for Peace Program continues to offer highly subsidized food; one aspect of this program is trade promotion. New kinds of food are introduced into the diets of recepients who then form new preferences that lead them to purchase the same products from commercial outlets. Also, food aid programs tend to

discourage production of competiting crops in recepient nations because food aid depresses local prices and production incentives. Markets for U.S. crops are thus protected and expanded.

Farmer-held Grain Reserves

The other new element of agricultural policy after 1977 is the farmer-held reserve program. The price explosion of the early 1970's sensitized policy makers to the need for some degree of stability. However, large food reserves held by the government were widely disliked by farmers and grain corporations because of their tendency to eliminate profits during periods of shortage. To accomodate this opposition, a compromise was reached. Farmers would hold the reserves and the government would give farmers a loan equal to to the value of their contribution and would further subsidize the storage costs at a sufficiently high level to encourage adequately large reserves. In order to ensure that the reserves would be used to stabilize markets, the storage subsidies would be withdrawn when prices reached certain levels and the loans would be recalled to give incentives to place the reserves in the marketplace so as to restrain further upward price movement.

A grain reserve was accumulated after 1977, and by mid-1979 the equivalent of 20 percent of annual wheat production and 10 percent of feed grain production was held under this program; see Fig. 9. Yet there are several reasons to suspect that this program cannot achieve the goal of stabilizing prices within the prescribed price band.

First, the reserves are too small. Given the increased integration of the U.S. in the world market and the fact that more than 50 percent of grain is exported, it will not take a very large reduction in production or

an expansion of demand to exhaust these reserves after which prices will be susceptible to all of the influences discussed above. Fig. 13 shows that whereas during the 1960, total grain stocks (public and private) were in excess of 70 percent of total U.S. annual disappearance (i.e. human consumption, animal feed, exports, and seed), today these stocks represent less than 30 percent of production. Given the fact that reserves in other nations are also lower, the margin available to support the world grain markets through a couple of poor years are very slim. The declining ability of the U.S. to meet such a world crisis is also evident in Fig. 13; U.S. grain exports over the past seven years have exceeded stocks by more than a ratio of 2/1, in sharp contrast with the early 1960's, when the U.S. held two bushels of grain for every bushel exported. In other words, it would take only reduction in world production to bring about a return of the 1973/74 price explosion, since the additional demand would be focused on the U.S. which does not possess the reserves to satisfy it without bringing down stocks to the critical levels where explosions take place.

For there to be adequate stocks, farm-held reserves would have to be expanded substantially over present levels. These larger reserves would be expensive to maintain and effectively increase the cost of food during periods of relative abundance, when such reserves would be accumulated. Most of the stabilization benefits of such reserves would accrue to foreign nations who would receive lower prices during periods of shortage and not have to pay the costs of holding the reserves.

The second problem with the farmer-held reserve concept is the assumption that the economic incentives intended to force reserves into the marketplace would be effective in periods of acute shortage. There is no obligation that farmers sell their reserves; if the government calls in the

FIG. 13

GRAIN STOCKS AS A PERCENT
OF ANNUAL U.S. DISAPPEARANCE

GRAIN EXPORTS AS A PERCENT
OF U.S. GRAIN STOCKS
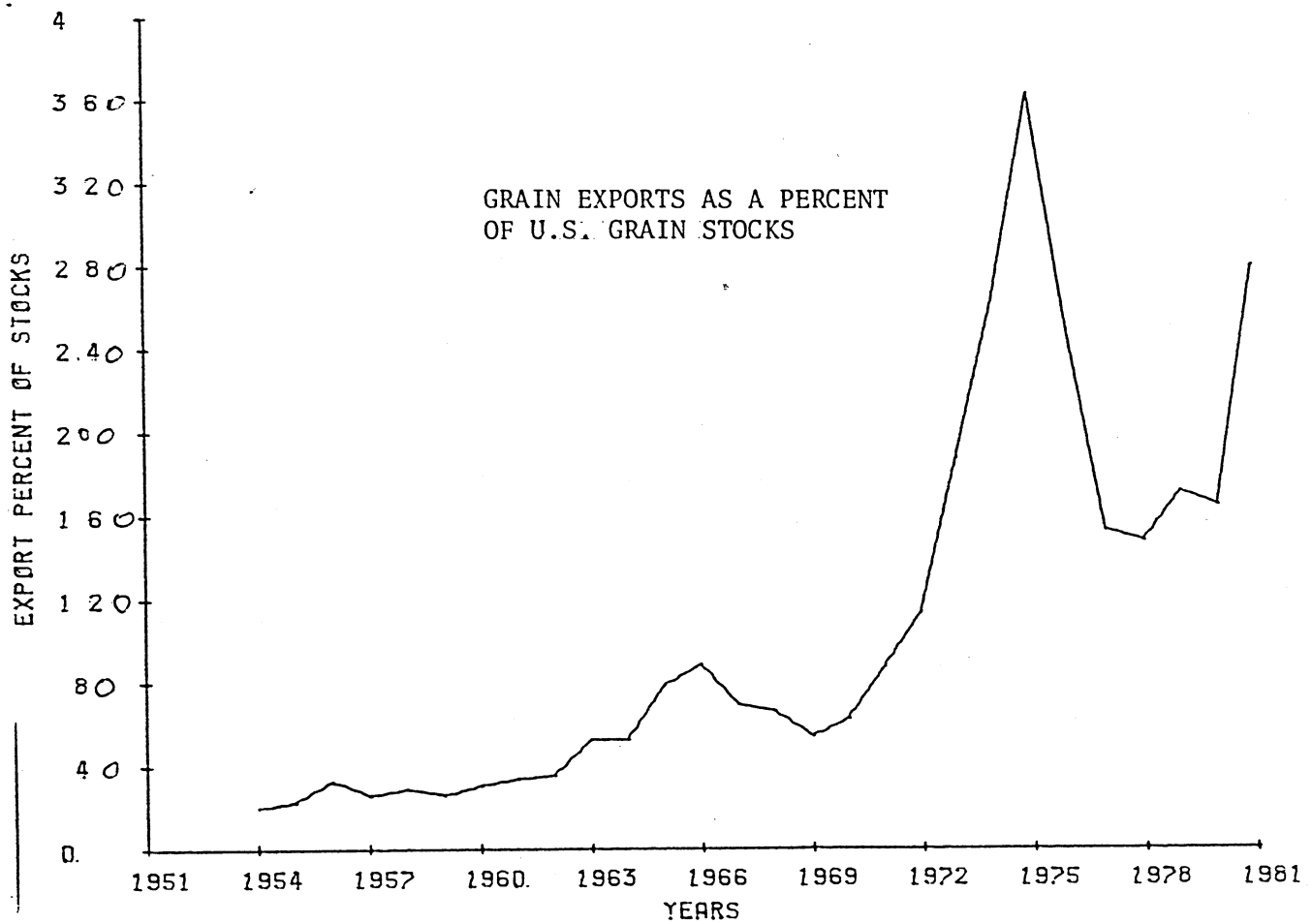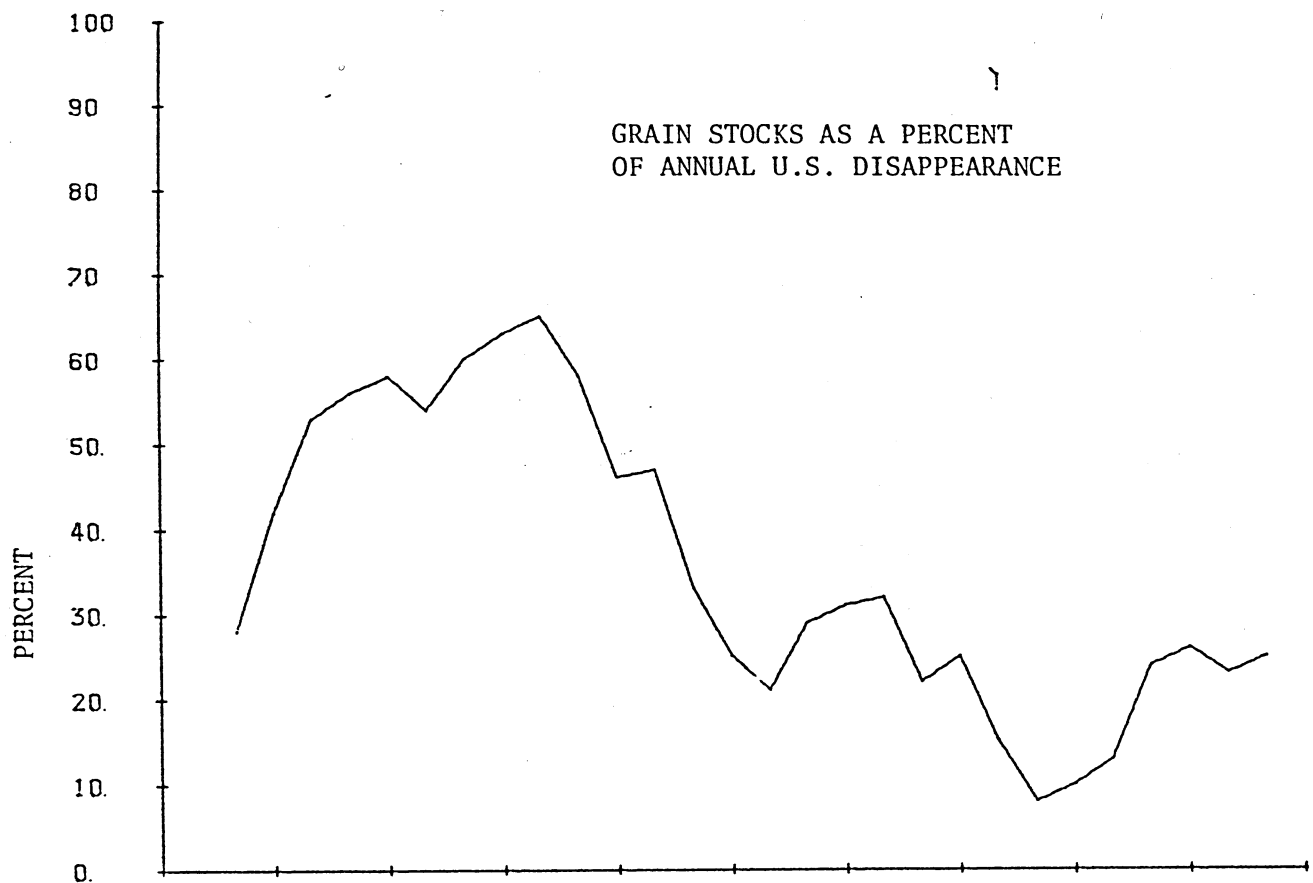
loans, farmers can refinance these loans and cover the holding costs themselves. If they anticipate much higher prices in the future, it would be economically rational to hold the stocks off the market. If most reserve-owners anticipate higher prices, and behave accordingly, their collective action will insure that prices rise rapidly, thus helping to destablize markets and encourage further speculation. The government would be at a loss to stop this.

The current reserve system rewards farmers who want to speculate by subsidizing the ownership and holding costs and by placing a floor under the prices. The reserve system also benefits farmers during periods of surplus by diverting crops from the marketplace, keeping prices higher than they would otherwise be. The participating farmer accepts very little risk since other government policies prevent prices from falling below the loan rate, and so with his storage costs paid by the government, the farmer has no downside risk in holding his crop off the market. If there should be a repeat of the 1973 price increase, the reserves will become very valuable; this wealth will be captured by the private sector, even though the costs are born by the public sector. The public gets little in return for its subsidy.

Proponents of the system argue that it "worked" in the summer of 1979, when rising grain prices led farmers to release 30 to 40 percent of corn and wheat reserves. However, this episode does not constitute a very significant test, for 1979 was a year of record harvests in both the U.S. and the rest of the world, including the Soviet Union. Total reserves, including those outside of the farmer-held system were also at relatively high levels. Moreover, the Soviet grain embargo in the fall of 1979 added a dampening effect on grain markets (even though the real impact of this

embargo on grain exports was probably small).

In other words, farmers realized that the grain price run-up was not a prelude to another explosion and they unloaded their reserves to capture the substantial capital gains they had earned. What might have been their reaction had the world faced the prospects of a poor harvest can only be the subject of speculation, but in all likelihood they would not have as readily released their holdings.

Finally, we are still faced with the problem of what would happen to the reserves once placed in the markets, supposing that the government could find an effective mechanism for forcing their sale at crucial periods. There would be no guarantee of price relief because farmers would sell to other private traders and speculators who would, in turn, hold the stocks off the market if they anticipated higher returns in the future. Only a publicly-held reserve could avoid this problem.

Price stability creates large benefits for the society, but most of these benefits cannot be captured by the private holders of reserves. Indeed, speculators who hold a portion of reserves have an interest in unstable prices. For these reasons, the private sector does not have adequate incentives to hold large enough reserves to produce price stability. Therefore, there must be public participation in this process. The current form of this public participation does not eliminate many of the problems associated with private markets. The only adequate solution is for the government to be the owner and manager of these reserves, as it was during the 1950's and 60's.

Summary

The analysis of this section leads to two important conclusions.

First, the integration of U.S. agriculture into the world economy over the past decade has greatly increased the risk of large, unpredictable fluctuations in demand that are translated into equally large and uncontrollable price fluctuations. Domestic demand for food grows steadily; foreign demand grows unsteadily because it is related to unstable world agricultural production and to other factors such as international politics, as illustrated by the Soviet grain embargo and current discussions over the use of food as a weapon. In the pre-1970 era, the main threat to price instability was weather-related changes in domestic production, since foreign trade was a very small fraction of total demand.

The second conclusion concerns the role of grain stocks. Prior to 1970, the availability of huge grain stocks served to smooth out year to year variations in domestic production and were even large enough to stabilize world grain markets during the mini-crisis in world grain production in 1965 and 1966. However, the world grain market has become much larger as has the U.S. share of this market. The U.S. no longer holds adequate stocks to stablize prices in the event of two or three poor harvests in the U.S. or major shortfalls elsewhere. This is evident in the much higher ratio of exports to   stocks over the past eight years shown in Fig. 10.

We have seen that government policy has contributed to these developments, through deliberate efforts to reduce grain stocks during the 1960's and then through a variety of efforts to expand U.S. farm exports during the 1970's. The consequence has been a great increase in domestic price instability and all of its related costs. The wisdom of continuing to emphasize public policies export expansion, even to the extent of subsidizing farm commodities during periods of low farm income, must be

challenged in light of the adverse effects of resulting instability on the domestic economy.

Finally, the public policies intended to moderate commodity price instability through a new grain reserve system have been too limited and poorly conceived. While it would probably not be cost-effective to attempt to hold large enough reserves to stabilize the entire world grain market, a more effective publicly-held and administered reserve policy could be developed, if combined with other policies to be discussed in the next section.

TOWARDS A PRICE-STABILIZING FOOD POLICY

The agricultural exports of the 1970's have been looked upon with great favor by both farmers and policy-makers alike. Farmers believe that exploiting foreign markets is the only way they can insure rising incomes without poitically risky public subsidies. Policy-makers view the export earnings as vital to the maintenance of the U.S. trade balance in the face of rising oil imports and the related weakening of the dollar. Others see agricultural export expansion as important to the U.S. strategic position in the world, as growing dependence on our food supplies leads to increased U.S. world influence. It has been the contention of this paper that these arguments are based on faulty analysis. We briefly summarize the opposing case.

The Case Against Export Expansion

To summarize our opposing case, we have argued that:

1/ the export policies have come at the cost of domestic inflation, and the related costs of controlling inflation to recession. The costs of lost output and increased unemployment outweigh the benefits of greater exports. To these costs should also be added a share of the costs associated with the growing fiscal problems of both federal and state governments.

2/ While expanding foreign markets are certainly helpful to stimulating demand and hence the price of farm commodities, the benefits to the farm economy of this export strategy are not what they appear. Because of the competitive nature of commodity production, it is virtually

impossible, over the long run, for there to be a permanent redistribution of income in favor of agricultural commodity producers. What can be expected is brief periods of relative prosperity, followed by the inevitable return of low incomes.

3/ Government policies cannot insure lasting prosperity, except through direct transfers of income to farmers. Any strategy that relies on boosting farm income by improving demand for farm commodities must soon fail as the higher prices are quickly translated into rising costs throughout the economy that re-establish the former less favorable income relationships in agriculture.

4/ Unstable prices discourage investment in new technology, since the instability increases uncertainty and risk. Over the long-run, less investment in productivity-increasing technology reduces the supply of commodities and further raises prices.

5/ The one "benefit" that has been conferred on agriculture as a result of these policies is much higher land values; indeed, a major impetus for continuing current policies undoubtably comes from landowners who have a large stake in continued farmland appreciation. However, for many would-be farmers, higher land values constitute impossible barriers to entry while to older farmers, the increasing value of their assets make it almost impossible for them to transfer their farm to the next generation.

Such high land values certainly do not benefit the rest of society, since they imply an increasing portion of the retail food dollar must be allocated a nonproductive use. This situation is similar to one Ricardo portrayed over one hundred years ago. In his analysis, rising land values eventually drove up the cost of food to such a level that capitalists could not earn a profit and pay the high wages necessary to keep workers alive.

At that point economic growth came to a halt.

6/ Last, we have argued that the grain for oil tradeoff is illusory. Domestic inflation is a major source of oil price inceases. Controlling inflation would be more effectively accomplished through control over commodity prices than recessionary policies. Therefore, some kind of control over commodity price increases would, in the long run, provide much more effective control over energy import costs and the current policies of unrestrained export growth.

What are the Alternatives?

If the agricultural policies of the last decade have contributed to many of the nation's economic ills, then what policies might have worked better? We briefly discuss and evaluate four proposals to alleviate commodity price instability.

Trade Liberalization:

Advocates of the export policies, recognizing the problem of price instability, have argued that the real cause of instability is not U.S. trade policy, but rather, the protectionist food policies of our trading partners which force the U.S. to shoulder the entire burden of international food market instability. That is, most of the non-food exporting nations of the world attempt to insolate their consumers from fluctuations in world commodity prices through a system of taxes and subsidies. When such nations experience poor harvests, they supplement supplies with imports to sufficient levels to keep domestic food prices from rising; if necessary, they purchase high cost food on international markets and effectively subsidize food consumption for their own consumers.

The impact of such behavior is to increase the demand for food during periods of shortage and thereby to increase the magnitude of price fluctuations in international markets.

If all nations acted like the U.S. and allowed changing international prices to influence domestic food prices, then production shortfalls would result in higher food prices for all consumers throughout the world. Higher prices would reduce demand and hence moderate the impact on international markets, allowing for greater world price stability. Therefore, according to this view, the solution to the instability problem lies in liberalizing agricultural trade, removing trade barriers, and generally promoting a free world trade.

The logic of this argument cannot be refuted. However, the political reality is such that food price stability is so crucial to most nations that they cannot allow food prices to fluctuate according to world market conditions; to do so would threaten domestic upheaval. The example of Poland's continuing problems with food prices and availability underlines this conclusion. In short, the likelihood that the rest of the world will turn to free trade is remote and so, therefore, it is unlikely that unrestricted agricultural trade in the future will lead to any less price instability in U.S. than we have experienced over the past decade. Indeed, instability should increase as we approach the limits of the world's food production capacity and more and more of the unsatisfied demand is focused on the U.S.

World Market Rationalization; International Buffer Stocks:

An alternative suggested by many members of the United Nations would be to establish international grain reserves whose purpose would be price

stabilization. The thrust of such policy would be to extend the kinds of policies praticed during the 1950's and 60's in the U.S. to the world marketplace. The argument is that since no nation has a sufficient incentive to hold stocks to stablize world markets, the costs must be collectively shared and the stocks accumulated and administered by an international body.

Such reserve proposals should be distinguished from reserves maintained for emergency famine relief which would be small in size and used to aid poor nations that face immediate problems from drought. International reserves would seek to stablize prices by accumulating stocks during periods of relative abundance and releasing stocks during periods of shortage and high prices. Stock size would depend on the degree of stability desired. Their most important function would be to prevent episodes such as occurred in grain prices during 1973 and 1974 when many nations were forced to give up valuable foreign exchange to feed themselves. From the point of view of world economic development, periodic income transfers from the world's poor to commodity producers in developed nations is undesirable.

In addition to the distributive consequences of price stability, international reserve stocks would have at least two other virtues. First, stable prices should encourage productivity by providing an environment more conducive to investment. Second, stock policies could be tailored to guarantee export earnings of poor nations so as to stimulate additional agricultural development in these nations. Both of these features would contribute to increasing food supplies, which, in turn, would help to keep commodity prices down over the long-run.

Unfortunately, international reserve proposals have been strongly opposed by the major exporters of grain, including the U.S., since

producers in these nations fear that their abilities to exploit foreign markets will be restricted, not without some justification. Meanwhile, consumers have neglected the issue, leaving this aspect of policy to producers. Thus the U.S. has generally played an antagonistic role in international debates over buffer stocks, even though such proposals would ultimately be of considerable benefit to a majority of its citizens.

Buffer stock proposals would also require a new world order to implement them that does not now exist. They would have to be financed, at substantial cost, and some agency would have to be empowered to buy and sell reserves. To be effective, most of the large producers of the regulated commodity would have to participate. Wheat markets could not be stabilized without the U.S., etc. Therefore, even were the U.S. willing to consider participating in such schemes, important political issues would have to be resolved without benefit of an over-arching international political order. Given the potential strategic importance of large commodity reserves and the difficulties of establishing ground rules, it would appear very unlikely that international reserve schemes have a chance of success.

Unilateral Stabilization:

Another option would be for the U.S. to unilaterally stablize world grain markets, as it inadvertantly did during the 1950s and 1960s. This would require greatly expanding the system of "farmer-held" reserves, which was described above. Aside from the shortcomings of this system outlined aleady, the major problem with this proposal is the large cost that would be necessary to have sufficient reserves to stablize world prices. Moreover, the benefits of stabilization would accrue to the entire world

community, making such a proposal unacceptable to the overburden U.S.
taxpayer.

Managed Exports for Domestic Price Stability:

A final alternative, and probably the most politically feasible,
would be for the U.S. to maintain domestic price stability by adopting an
export management program that would protect consumers from major
international supply shocks. Under such a proposal, when domestic prices
threaten to rise above some upper threshold level, exports would be
restricted to a level sufficient to maintain domestic prices within an
acceptable price range. This proposal would have the effect of restricting
exports only during periods of shortage, such as occurred during 1972-74.
It should be combined with a domestic grain reserve policy that functioned
to even out year-to-year production fluctuations so as to allow the U.S. to
enter into long-term bilateral trade agreements without hindering its
domestic price objectives. Such reserves should be held by the government;
the farmer-held reserve system rewards farmers for being speculators but
provides no assurance tha reserves will be used to stablize prices when
they are needed.

The implementation of this proposal would not require that the U.S.
give up its present dominant position in world agricultural trade. However,
it would mean that farmers and grain exporting corporations would have to
forego periodic windfalls arising for world shortages. The proposal would
also imply more extreme price fluctuations in the world economy, but since
most other nations control their domestic prices through trade barriers, it
is not clear how these fluctuations would affect consumers outside the U.S.
To the benefit of U.S. suppliers, pressure would be placed on our trade

partners to enter into stable long-term trade agreements with the U.S. since there are few other nations in the world from whom they can obtain these supplies. Rather than go without grain during periods of shortage, these buyers would have incentives to commit themselves to taking more than they might otherwise buy during periods of surplus. Thus they would have to share the burden of adjustment.

The U.S. would cease to be the only open market of last resort during periods of shortage. Much the the impetus behind the instability of the international marketplace is not the stable, long-term buyer, but rather, the sudden temporary demands of buyers whose more favored sources have failed. In an important sense, the U.S. could have many of the advantages of trade, without also accepting the instability that has traditionally accompanied trade. If instability can be smoothed out, then we can begin to get control over the commodity cycle.

This is not to say that all problems could be easily eliminated by this approach. If the U.S. were not to play supplier of last resort, then where would nations without long-term agreements obtain food during periods of crisis? The answer is that some other kind of a reserve system should be set up to meet such emergencies. If the U.S. made clear its new policy, there would be strong incentives not now present in the world economy to see that such supplies would be available.

Another problem concerns the magnitude of the long-term agreements that the U.S. could underwrite. The size of exports would be related to the degree of stability desired in the domestic market. If a high degree of stability were desired, then the domestic reserve requirements would be larger and the variance in the amount of surplus over and above domestic needs would be greater. The greater this variance, the smaller the total

exports we could supply on a guaranteed basis. From the above analysis, the key requirement from the perspective of domestic price stability is the elimination of the very large fluctuations in price. This does not mean that all instability should be eliminated. Therefore the U.S. could afford to share some of the burden of instability with its important trade partners.

Finally, there is an important issue that has not been discussed in this paper that relates to the future of U.S. exports and that is the level of exports that is consistent with long-term productivity. This problem is sufficient important to warrent separate treatment, and we will return to it in the last section.

There can be no doubt that such a modest proposal would opposed by farmers and grain exporting firms, but consumers and indeed, everyone who has a stake in reducing inflation, would substantially benefit from a restricted export program. Over the long-run, farmers would also benefit. The only real losers are the various middlemen who make their money speculating on grain prices, and absentee landowners whose capital gains in farmland would rise more slowly.

AGRICULTURAL POLICY AND LONG-TERM PRODUCTIVITY

The overriding importance of food price stability in any effective anti-inflation policy has been the subject of the analysis to this point. The inflation problem, as outlined above, is essentially one of temporary imbalances between supply and demand generating price shocks that destabilize the entire economy. However, the problem of agricultural price instability may also be related to increasing relative food scarcity that arises from a chronic, not temporary, imbalance in food production and consumption. If the world demand rises faster than world supply, farm commodity prices must rise relative to other prices. Most of the projections for the next twenty years suggest that both farm commodity and retail food prices will continue to rise in real terms as a result of growing world demand for grain, as more and more meat is consumed in the USSR, the Eastern European nations, Japan and the Middle East, and as world population pressure generates additional demand in the Third World, particularly China.

While agricultural interests generally look upon such projections with considerable anticipation for the good times ahead, the other side of the picture is that continued real increases in commodity prices portend a continuing struggle over the distribution of income and related inflation and stagnation. For reasons outlined above, it will be all but impossible for there to be a permanent shift in the terms of trade in favor of agriculture without corresponding reactions throughout the domestic economy that will lead to continued inflation.

There are only two ways this can be prevented. The government can continue to control inflation through recession, with consequent

stagnation. Alternatively, the government can reduce the sources of the problem by controlling prices of farm commodities. We have discussed what this means from the perspective of managing exports; but there is also the potential for increasing the supply of commodities to prevent higher prices. The questions are, what is this potential and in what ways can it be tapped?

In the past, we produced "too much" and continually contrived means of limiting production or restricting food supplies from the marketplace. Indeed, President Reagan, in his recent interview with Walter Cronkite, contrasted the agricultural systems of the U.S. and the U.S.S.R. by declaring that 'our problem is not one of producing too little (which is, according to the President, the main problem of the U.S.S.R.); our problem is finding enough places to sell agricultural commodities that we do produce.' In stating this, the President expressed a popular view that the productive potential of the U.S. is virtually limitless. Those who support the continuation of export expansion echo the President in asserting that we do have the capacity to meet any foreign demand that might materialize, without also incurring unacceptably large domestic costs.

Inspite of these optimistic projections from some government officials and agricultural interests, there is growing evidence that the fabled productivity growth of U.S. agriculture has been slowing down and, in all likelihood, will grow at a slower rate in the future, thus forcing us to face important trade-offs between maintaining domestic price stability and responding to the demand for our agricultural exports.

The purpose of this section is to review some of the evidence regarding the possible limits on agricultural productivity, to examine the question of whether it will be possible to have a reasonable degree of

domestic price stability along with continued expansion of agricultural exports. Finally, we will discuss some of the possible public policies that might be adopted to deal with future food shortages and rising food prices.

Changing U.S. Agricultural Productivity and the New Importance of Land

The productive capacity of the agricultural system is determined by the amount and by the productivity of the land cultivated. Until World War II, most of the increase in U.S. food production came from increasing the cropland under cultivation. The widespread use of the tractor released some 90 million acres between 1930 and 1955 (one third of the entire cropland base), previously devoted to feeding draft animals, for human consumption (including consumption of grain-fed livestock) between 1930 and 1955. Synthetic fibre similarly released an additional 30 million acres that had been devoted to cotton after 1945. The Reclamation Act of 1902 permitted the irrigation of Western desert land; most of the 11 million acres that are today irrigated by Federal projects have been added to the cropland base since 1945.

Crop yields did not begin rising significantly until after World War II, when new, high-yield seeds (such as hybrid corn) came into widespread use along with mass-produced nitrogen fertilizer and chemical pesticides. From the late 1940's to the early 1970's, most of the increased food production came from increased land yields rather than an increase in the cropland base. Indeed, because of urban expansion and government policies, cultivated acreage generally declined over this period.

The past ten years have witnessed a dramatic departure from these post-War trends. Crop yields, which grew at more than 3 percent per year during the 1950's and early 1960's, began growing more slowly after 1965,

and since 1972 overall yields have risen at only slightly faster than 1 percent per year; see Fig. 14. At the same time, in order to increase output to keep pace with world demand, the government ceased requiring farmers to restrict acreage in order to obtain government loans and other program benefits, and as a result, harvested cropland increased by about 55 million acres after 1972; see Fig. 15. This means that the harvested land base grew at the rate of about rate of about 1.8 percent per year since 1972. Total crop production grew at about 2.2 percent per year, and given the fact at the new land brought back into cultivation probably was not as productive as the land already cultivated, we concluded that somewhat more than half of the increase in crop production came about from the addition to the land base, with the rest coming from increased land productivity.

The important export crops, including wheat, soybeans and corn and grain sorghum all exhibit similar yield trends, as can be seen in Table 5; all but soybeans have experienced yield reductions of 50 percent or more during the most recent period in comparison to earlier post-War periods. Today, demand is growing considerably faster than yields. Since 1972, the physical volume of wheat exports increased at a compound rate of about 3.4 percent per year, soybeans at 7.0 percent, and corn exports at over 9 percent per year; there has no increase in sorghum exports, which constitute a small part of overall grain exports.

Just to meet this export demand, production had to grow considerably faster than allowed by increasing yields. However, domestic demand for these three crops has also increased during the past nine years, if at a much slower rate. Therefore, since 1972, wheat output has increased at over 2.6 percent per year, corn at 4.1 percent and soybeans at 5.5 percent; only grain sorghum showed no growth. As should be clear from comparing these

Figure 14

CROP YIELDS & REGRESSIONS

ORDINARY LEAST SQ. REGRESSION COEFFICIENTS:

1940-1955 : YIELD = .61(YEARS) - 1122.29 R^2 .59
(S.E. .14) t = 2.14

1955-1965 : YIELD = 2.65(YEARS) - 5097.34 $R^2 = .95$
(S.E. .21) t = 2.26

1965-1972 : YIELD = 2.41(YEARS) - 4645.3 $R^2 = .81$
(S.E. .47) t = 2.45

1972-1980 : YIELD = 1.22(YEARS) - 2287.63 $R^2 = .2$
(S.E. .88) t = 2.36

1.1 annual mean % increase

2.2 annual mean % increase

3.0 annual mean % increase

0.9 annual mean % increase

YIELD INDEX

YEARS

Figure 15

HARVESTED CROPLAND

TABLE 5

YIELDS AND LABOR PRODUCTIVITY IN
SELECTED AGRICULTURAL ACTIVITIES

Crops/Livestock Activities	1945–49 to 1955–59	1955–59 to 1965–69	1965–69 to 1975–79
	Annual Rates of Change (percent)		
	YIELDS		
Corn	3.0	4.0	1.9
Sorghum (grain)	5.1	6.1	–0.1
Wheat	2.8	2.1	1.3
Soybeans	1.5	1.4	1.3
Milk per cow	2.4	3.4	2.2
Eggs per hen	2.2	0.6	0.7
	LABOR (hours per unit output)		
Corn	–9.5	–10.0	–5.5
Sorghum	–8.6	– 8.7	–1.4
Wheat	–6.7	– 4.4	–2.0
Soybeans	–5.5	– 1.8	–4.5
Milk	–4.1	– 7.2	–8.0
Eggs	–2.0	– 7.8	–6.5
Chickens (broilers)	–13.0	– 9.1	–15.0
Cattle	– 2.2	– 4.2	–4.0

Source: USDA, Agriculture Statistics, 1980.

growth rates with the yields of Table 5 that this rising production required considerable increases in land. Thus, wheat acreage increased by 47 percent since 1972, corn by 24 percent, soybeans by 46 percent, sorghum has remained unchanged; all told, over 68 million acres have been added to the production of these three crops. Some of this increase came at the expense of other crops, but most of it came from land idled by government policy.

If demand for these three crops, which now require about 65 percent of the entire cropland base of the nation, were to continue rising in the future as over the past eight years, and demand shows littl sign of slackening, then it would be necessary to expand the overall cropland base by as much as 8 million acres per year, or about 2.0 percent per year. This assumes that yields do not begin rising faster and that other crops hold their present share of the cropland base.

A recent report by the National Agricultural Lands Study team estimates that over the next twenty years, the volume of demand for US farm products will increase by 60 to 85 percent, requiring from 84 to 143 million additional acres in the principal crops to meet project demand at constant real prices. This range of estimates is based on the assumptions of a slower rate of growth in demand than during the post-1972 period and somewhat higher rates of growth in yields than those experienced over the past decade. In short, this estimated land requirement is probably conservative. Nevertheless, it implies adding from 4 to 7 million new acres per year to the cropland base, which represents a formidable obstacle. The question is, can it be done without a substantial increase in crop prices?

Agricultural Productivity and Land Availablility

The expansion of the cropland base in the future will not have the luxury of the 60 million acres idled by government programs; if there is to be expansion, it will come, for the most part, from the conversion of land that is not now in the cropland base. Some additional land for expanding export crops may be obtained by diverting existing cropland from less profitable uses, but to the extent that this should occur, prices of these displaced crops will rise. Therefore, if food prices are to be kept stable, new land must be found.

One optimistic government survey identified an additional 36 million acres, presently in pasture as having high potential for conversion to cropland at current prices. If this land has the same productivity as existing land and can be converted at the rate of say six to eight million acres per year, it would be possible to increase agricultural output at a sufficient rate to meet the expected annual growth in export demand for the next five years, assuming that yields do not continue their current tendency toward ever-slower rates of increase. Obviously, if yields should rise even less rapidly, then more land will be required and we will be unable to meet demand even for the short five-year time period.

The same survey indicates another 90 million acres, currently in pasture, forest or grazing uses, has moderate potential for conversion to cropland. However, this land could be brought into production only if the relative prices of farm commodities increases from present levels. In short, if these government surveys are accurate in their projection of potential available cropland, we should be able to increase production over the next ten to fifteen years, assuming no break-through in yield-increasing technology, if we are willing to accept somewhat higher

real agricultural prices. What happens after this period is uncertain.

But there are several problems with these surveys. Obviously, there is a reason why the land identified as having potential for conversion to cropland is not now being cultivated in crops. Either its soil quality is very low, it is far from markets, it does not have access to adequate water, or its terrain is not conducive to modern farming techniques. To make such land into viable cropland, considerable investments must be made in infrastruture, irrigation, land-leveling and clearing, etc. Such improvements are expensive and will not take place until the price of crops is sufficiently high to make the investments worthwhile.

It is interesting to note that there has not been much additional conversion of such land to cropland over the past decade, even though agricultural land prices have risen dramatically, creating considerable incentives to convert land and make profits. In light of this, it can be presumed that conversion costs must be very large. In other words, even if there is land available, it will not be very helpful in keeping down agricultural prices, since apparently much greater prices must be achieved before it will be converted.

This concern with the lack of availability of new land is reinforced by studies that have examined in detail the potential for land conversion in two important agricultural regions, Iowa and the Mississippi Delta. These studies have found the potential land is much more limited than indicated by the national surveys. For example, the maximum potential new cropland was found to be ten percent in Iowa and eleven percent in the Delta; these estimates are less than one third as large as the national surveys have reported, casting considerable doubt as to whether the 120 million acres is even potentially available, no matter what the cost.

In addition to the availability of new land, there is increasing concern over the continued availability and productivity of existing cropland. These concerns are sufficiently important to warrant more detailed discussion.

The Loss of Land to Nonagricultural Uses

Any analysis of the need for new cropland must recognize the fact that part of the cropland base is lost to residential and industrial uses. The National Agricultural Land Study estimates that this loss amounts to about three million acres per year, of which one million comes from the existing cropland base, and two million from land that is included in the category of land having high or moderate potential for conversion to crops. Moreover, the impact of residential development may be more widespread than indicated by these numbers because of antagonistic relations that develop between farmers and the new owners of the land adjacent to the farms. Farming practices involve noise and the use of chemicals that are unwelcomed by the new nonfarm community, and as a result of rising tensions, farmers may simply cease farming in close proximity to development, leaving the land unproductive for agriculture and unneeded by nonagricultural users. This unfarmed land may include some of the most productive of all the nation's prime cropland. Thus, even though apparently available for agricultural uses, such will be not be converted back to farming.

If this trend were to continue, the conversion requirement would be increased from the estimated seven or eight million acres to eight or nine million acres annually. The available supply of land for conversion would have to be cut by about one third. These considerations imply thatthe

agricultural system will begin to experience land limits sooner than would be predicted, using the national cropland surveys. As these limits are approached, assuming nothing is done to blunt export demand, commodity prices will be forced much higher.

Soil Erosion

Soil erosion is a growing threat to land productivity. The expansion of cultivation on to more marginal land has increased the rate of erosion substantially over the past decade. Moreover, increasing pressure on farmers from rising land prices and rapidly increasing input costs, is encouraging the neglect of soil conservation practices.

Very little is known about the precise trade-off between erosion and crop yields, but we do know that plants grown in topsoil have much better yields than those grown in subsoil, and we also know that topsoil provides a more stable environment, allowing plants to survive better under more variable weather conditions. We do not know the nature of the precise relationship between loss of a given quantity of topsoil and plant yields or production costs. Therefore, we do not have a very clear idea of the immediate loss incurred from the topsoil that we know is being dumped in streams, lakes, rivers, and oceans. (Sedimentation of rivers, of course, imply further costs to society in terms of loss of reservoir capacity, lower water quality, greater chemical concentrations in water supplies, etc.).

The point remains that under existing conditions, relatively large areas in he Corn Belt and Mississippi Delta are being eroded at a much faster rate than the soil is being reproduced. For example, the Soil Conservation Service reports that on the 23 million acres of the most

erosive land, the average loss is over 30 tons per acre, roughly 6 times the 5 ton per acre rate at which the the land can erode without sustaining long-term injury. At such high rates of erosion, much of this marginal land could be stripped of topsoil within a generation.

The regional land conversion studies, referred to above, found that available land for cropland conversion was generally more susceptible to high rates of erosion than other land. For example, if soil loss were to be restricted to no more than 5 tons per acre in Iowa, only half of the available land could be converted to crops, assuming the best soil conservation practices to be used.

This evidence suggests that if the U.S. policy of expanding exports is pursued without regard to erosion, there will be serious permanent impacts on the viability of U.S. agricultural productivity within a relatively short time. As these effects become more evident, our ability to meet the world's food needs will be reduced. However, if soil conservation is given a high priority, short-run output will be restricted so as to insure a sustainable system over the long-run. In this case, our ability to meet the export goals in the short-term will be much more limited.

Limited Water Supplies

The other major area of concern for future agricultural productivity is water availablity. About 12 percent of the cropland is irrigated, though this land contributes more than proportionately to output. Most of the additional irrigation acreage over the past fifteen years has come from the development of center-pivot irrigation devices, rather than from large Federal reclamation projects. Over 70 percent of all new irrigated land since the mid-1960's is found in Nebraska and Kansas, where this new

technology has been most heavily used. The relatively better yield performance of corn most probably owes much to such irrigation, which increases corn yields by from 20 to 30 percent, even in regions that get adequate rain, because it allows irrigation at critical times.

However, there are serious questions as to whether the current level of irrigation in the mid-West can be sustained, let alone expanded. The problem is the rapid overdrafting of the important underground acquifers that feed support this irrigation development. Already farmers have been forced to give up irrigation in parts of the High Plains region for lack of water. Moreover, the water supply need not be totally depleted for irrigation to stop, for has the water table falls, the energy costs of pumping water to the surface rise. If these costs become sufficiently high, then the benefits of the additional production allowed by the water cease to be sufficient to off-set the costs and irrigation is discontinued.

The basic problem that underlies this common behavior is the lack of private incentives to consume less so that the water table will not fall as fast and production can be sustained over a longer period. Such incentives are lacking where many individuals pump from a common pool. If one should decide to conserve, his actions will benefit others, but not himself in proportion to the costs he experiences. Therefore, unless there is a system of water rights or a groundwater management plan that entitle an individual to a share of the groundwater and allow him to decide how and when he will use his share, excessive pumping in the present must occur. This excess manifests itself in a temporary spurt of productivity that cannot be maintained.

If more rational water use is forthcoming in the future, it will certainly imply a lower rate of pumping and hence less irrigation. If no

such plan should emerge, then there will also be less pumping in the future. In either case, then, overall productivity of irrigated Mid-Western agriculture probably cannot continue to rise from additional irrigation and it may well be forced lower down. Therefore, to compensate for this, more dry land will be required to meet increasing export demand.

In the arid West, where agriculture is totally dependent on either ground water or surface water supplied by large projects, overdraft is also an extensive problem along with increasing soil salinity, which gradually reduces productivity. In addition to these problems, there is increasing competition for scarce water from residential and industrial development (as the population shift from the "snow belt" to the "sun belt" continues) and from energy development.

Agriculture can no longer be confident that it will be able to sustain its current level of use; further expansion is even less likely. New public investments in additional water supplies are not as readily forthcoming, in large part because there is very little water in the West that has not already been captured, and the remaining projects are both expensive and produce little net water supply. Moreover, the public is increasingly unwilling to spend the large sums necessary to bring in the last marginal projects.

These considerations all point to the conclusion that additional production from new irrigation is unlikely in the West. The more likely result is a declining agricultural land base in this region, which will put more pressure on the land in rain-fed regions, thus reinforcing our earilier conclusions that the availablity of land to meet expanding export demand is more limited than optimistic projections imply.

New Technologies and Productivity

In the past, land has not been the constraint on agricultural development that Malthus and Ricardo anticipated; for with the introduction of the tractor and synthetic fibers, cropland was made available for producing food for humans. Later, yield-increasing biological/chemical technologies proved effective substitutes for land and allowed continued increased production without increasing pressure on land. Yet, as pointed out above, yields have failed to keep pace with demand the past decade, necessitating the new emphasis on land expansion. Has the fabled efficiency of U.S. agriculture finally reached its limits?

If we look at Table 5, we see that while crop yields have ceased their rapid rate of increase, productivity increases in the use of labor have not slowed materially. Thus, the U.S. continues to produce more food with fewer workers than ever. The problem is, while labor productivity may help keep the farmer's cost down, it does not increase total output unless the lower costs allow farmers to expand the total land cultivated. In other words, if land is limited and yields do not grow, reducing the labor requirements of agriculture may add to the farmer's profit, but will not contribute to lower commodity prices (since total supply is not changed and prices are determined by supply and demand). What is needed to keep food prices from rising is an increasing supply of food at existing prices, as occurred during the 1950's and 60's, and if land availability is limited, this can occur only if yields increase. This leads us to confront the question of why yield increases have slowed in recent years and whether there is hope for a reversal in this trend.

While there is consensus that there has been a slowing in the growth of land productivity, there is controversy as to why this has occurred.

Some argue that the introduction of more marginal land after 1972 helped to reduce the overall yields, even though on the better land, yields continued to improve. This explanation may help to account for the poor performance in 1974 and 1975, when much of this land came into production, but it does explain the slow growth in 1976 and 197/; see Fig. 16. The high yields of 1978 and 1979 are generally regarded as resulting from exceptionally favorable weather conditions; the decline in 1980, when drought reduced yields emphasizes the importance of weather factors.

Another explanation for the yield slow-down emphasizes the fact that existing bio-chemical technology has been fully-exploited, especially in view of the fact that this technology was designed to take advantage of cheap fossil fuel energy, which no longer exists. Table 6 provides some supporting data that underscores the impact of changing relative input costs. For example, chemical and fertilizer prices, which historically fell relative to crop prices, have reversed this trend, creating a new economic reality for producers.

This logic is further developed in Fig. 16, which illustrates crop yields, fertilizer application per acre, and relative fertilizer/crop prices. As is evident, fertilizer applications initially rose in response to rapid crop price increases in 1972. However, this increased application has little impact on yields, suggesting that farmers had already exploited most of the potential productivity and that larger applications had only marginal benefits. The fact that applications leveled off after 1976, when fertilizer prices began rising again, further supports the notion that higher energy costs have made it uneconomic to extract the marginal productivity increases that are still possible, since costs are not justified by returns.

Fig. 16

Crop Yields, U.S.

Application of Nitrogen Fertilizer/Acre

Fertilizer Price/Crop Prices
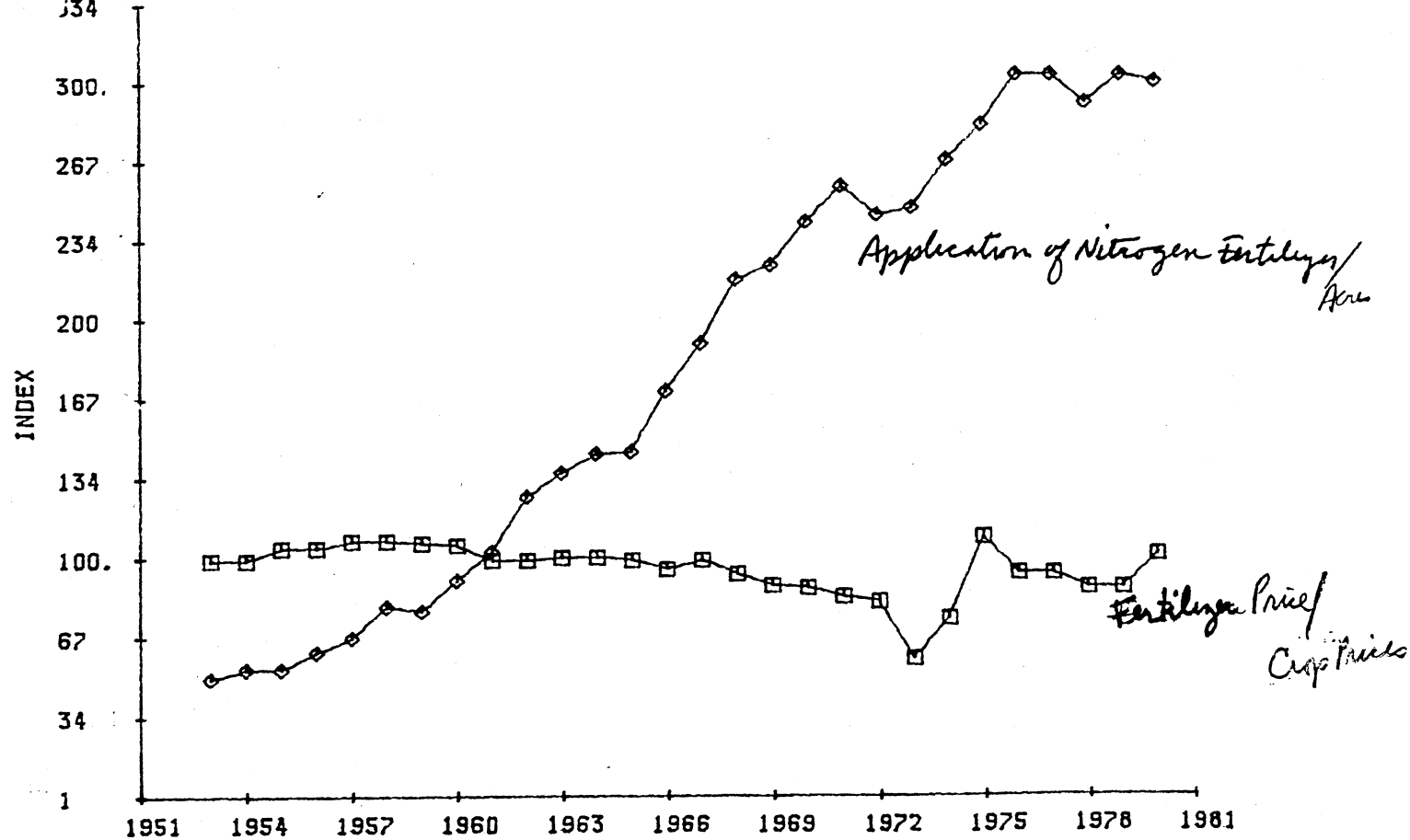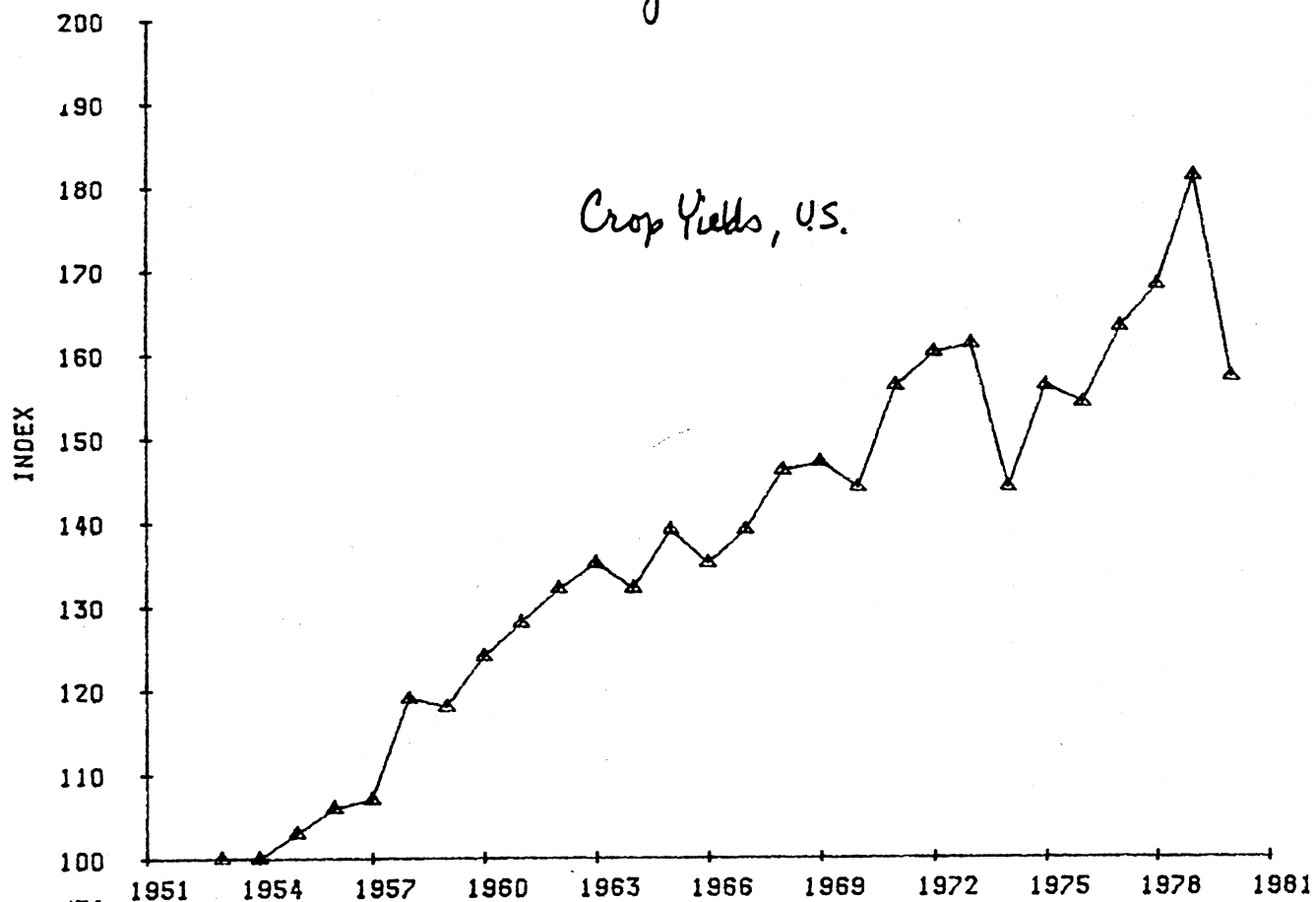
TABLE 6

FACTORS RELATING TO AGRICULTURAL
PRODUCTIVITY: 1950 TO 1979

	1950-51 to 1965-66	1965-66 to 1970-71	1970-71 to 1978-79
	Annual Percentage Change		
Land Productivity			
Crop Output per Acre	3.0 [c]	2.2 [a]	1.1 [a]
Units of Nitrogen Fertilizer/Acre	9.8	10.2	2.5
Index of All Chemicals/Acre	10.9 [b]	7.8	3.2
Irrigated Cropland as Percent of Harvested Cropland	3.6	1.8	-2.0 [c]
Labor Productivity			
Crop Production/Hour	6.0	4.6	4.4
Tractor Horsepower/Hour	8.8	5.9	3.6
Input Prices			
Crops, All	-0.5	0.0	9.1
Fertilizer	0.2	-2.4	9.8
Chemicals	n.a.	0.0	5.3
Land	5.4	5.8	15.3
Farm Machinery	2.8	5.2	10.9
Wages, Agricultural	3.5	8.1	8.6
Non-Agricultural	4.1	6.0	7.5

a/ based on regression equations shown in Fig. 14
b/ refers to 1959-60 to 1965-66 period only
c/ Through 1974 only

Source:
   USDA, Agricultural Statistics, 1967, 1980
   US Department of Commerce, Statistical Abstract of the U.S., 1980.

Today, the prime determinant of yield appears to be weather. As can be seen for Fig. 16, variability of yields has increased in recent years, perhaps because of changing weather patterns and because of the full exploitation of existing technological potential.

One aspect of modern agricultural technology is chemical pest control. The introduction of specialized machinery has encouraged specialization in crop production, increasing vulnerability to pests. Chemicals, first introduced in the 1950s, initially had significant beneficial impacts on yields. Over time, however, pest resistance led to the increased use of pesticides to maintain control over increasingly immune pests. At the same time, new pests, previously held in check by natural forces, emerged when their natural enemies were eliminated.

By the mid-1970's, in-field pest loss was approximately the same as during the early 1950's, though pesticide use had increased five-fold. This "pesticide treadmill" has been further exaggerated by rising chemical costs; farmers must not only use increasing amounts of pesticides, but also pay more for them as well. Thus, the profitability of using pesticides has fallen, reducing incentives to control insect damage. Parallel to the case of mining ground water, past productivity that derived from pesticide use may have been of short-term duration which we are only now beginning to witness.

Integrated pest management strategies offer a means of reducing the dependence on pesticides without loss of pest control. These strategies will require extensive new kinds of information and research as well as new delivery systems. Economic logic will eventually dictate their widespread use, but because the technology threatens the large profits of chemical companies, research on such systems is under-funded and efforts to require

more rational use of pesticides are attacked by these powerful interests, who use the rhetoric of "excessive regulation" to justify their actions. In the meantime, farmers are denied the chance to adopt a more genuinely productive technology.

There is a new generation of land-saving technologies on the horizon that may break the dependence on high-cost energy that have the support of the large chemical firms. These are associated with the developments of manipulation of DNA. Through new genetic research, plants can be "bred" with a variety of characteristics can are unattainable using the old breeding techniques. Moreover, since the manipulation takes place in a laboratory, new strains can be developed in a period of a few years rather than decades. New hybrid wheat seed varieties, which are about to be introduced, hold considerable promise for increased yields and production. Other possibilities include developing disease and pest resistant varieties of corn, improving protein content of grains, improving nitrogen-fixation in plants, and developing varieties that are capable of growing in salty water.

Should genetic engineering deliver on the extravagent promises, the chances of continuing to increase exports while maintaining control over inflation in the U.S. are certainly improved. However, the new technology is still on the drawing boards; the promise must be translated into products available to farmers, and its long-term impacts must be evaluated before we can be too optimistic. If there is a considerable lag before theory can be translated into viable technology, say ten years, then we still face a major problem in producing the food to meet demand.

Moreover, it must also be recognized that as great as the promise for future productivity may be, the magnitude of the potential demand is

also great. Even if we were to match the performance of the last three decades with this new technology, we would not escape the problems discussed above. We have seen that demand for the major export crops is likely to grow at rates in excess of 4 percent per year; even in the period of greatest productivity, yields did not grow this fast on a sustained basis. Therefore, it is difficult to imagine that technology will come to the rescue once again, making land availability unimportant. Even the most optimistic view must recognize the limits posed by our land and water base, let alone the difficult problem of rising energy costs on an energy-intensive technological system.

There is one additional problem that is raised by the new biological developments. Most of the research is being conducted by private firms; the research is very costly and requires highly specialized knowledge and equipment. If a firm is successful in creating a miracle plant, it will be in a position to extract a high price for its innovation, especially if food shortages have driven up the price of farm commodities and increased farm incomes. In this case, the producer of the technology will be able to use its monopoly power to extract surplus from agriculture and from consumers. High prices will retard the rate of adoption of the innovation and prevent widespread distribution of its benefits.

In the past, most important biological technology was developed within the public sector and made widely available to the private sector for distribution. In this way the benefits were widely dispersed. Unless the public sector plays a more important role in the new genetic engineering research than is now the case, the promise of this new technology may never come to pass, even if the technology can be successfully developed.

Foreign Agricultural Development

There is still considerable opportunity to make better use of existing technologies to increase food production. As Table 7 suggests, land yields throughout much of the world are very much lower than they might otherwise be, were agricultural technology better utilized. That is, while the returns to additional fertilizer applications in the U.S. are relatively low, these returns in other areas of the world are still potentially very great. This means that returns to investments in helping to improve agricultural productivity in the Third World should have a greater potential payoff in terms of increased food production than the same money spent for traditional technology in the U.S. The investment is not taking place at a very rapid pace however, thus increasing the likelihood of growing world food deficits that will be translated into increasing pressure on U.S. supplies and subsequently higher domestic commodity prices and inflation.

Implications for Agricultural Policy

The long-run problem of increasing food supplies will not be solved by policies intended to deal with short-run imbalances in demand and supply. The latter policies can do much to reduce the threat of inflation from situations such as developed in 1973/74, but they can do little to rectify world-wide food deficits and their impacts on world markets and prices.

The United States faces very difficult decisions regarding its future role in the world's agricultural markets. There is little doubt that the demand for U.S. grain will continue rising and, given the constraints on supply, that commodity prices will generally rise over the next decade.

Commodity price stabilization policies can reduce some of the most serious consequences of this development for consumers by restricting foreign pressure when commodity stocks are drawn down and prices start exploding. Stabilization may also provide a better environment within which the farmer can make better investment decisions, thereby encouraging greater productivity.

But there is no way such policies can "even out" chronic shortages. Perhaps it would be possible to insolate the domestic economy from rising world commodity prices, but over the long-run, this would not be politically feasible and it would lead to other undesirable results. In either event, export-restrictions are not designed to deal with long-run supply problems; ultimately, other kinds of policies must be undertaken to minimize the adverse effects of inadequate food supplies.

The solution to the long-term food price problem depends on increasing food supplies without also destroying the long-term productivity of the world's agriculture while, at the same time, diminishing pressures on the land by reducing the growth of demand. To improve productivity, policies should concentrate on both the U.S. and Third World agricultural systems.

With regard to the U.S., public support for agricultural research must be increased. In light of the above discussion, public research on land-saving biological technologies is imperative, not only to insure development of the potential, but also to insure the broad availability of new plant varieties so as to prevent monopoly benefits from being captured by the private sector. Research could also be profitably directed at the problems of developing new methods of water conservation, of converting land to cropland uses, of preventing the further loss of agricultural land

to nonagricultural uses, and of further refinement of integrated pest control strategies.

In addition to research, there could be substantial benefits derived from developing new institutional arrangements to handle the common property problem of groundwater overpumping. Similarly, the substantial disincentives for rational use of western irrigation water inherent in large water subsidies could be eliminated by effective reform of Federal water pricing under the Reclamation Act. Erosion of topsoil is another problem for which there are no simple answers but which must be reduced if long-term productivity is to be maintained. It is widely recognized that the Soil Conservation Service has not been able to stem this growing problem. As in the case of groundwater management, a new incentive structure that forces the individual to recognize the full effects of is private decisions is necessary.

The second way to improve output is for the U.S. to play a much larger role in stimulating foreign agricultural development, not in the crops produced for export (such as cocoa and coffee), but in grains, pulses, tubers. The difficult task that must be addressed is in developing effective delivery systems for yield-increasing technologies without destroying agrarian social stability and in a way that distributes the benefits of technology to the entire rural population.

The requirement that agricultural development be widespread and equitable is necessary if the other important goal is to be achieved; namely, the eventual control over population growth. Experience suggests that where economic growth is equitablity distributed, and all members of the society enjoy some degree of security, birth rates drop and population growth can be limited. Without a widespread distribution of economic

benefits, traditional motives for having large families, associated with providing security for the parents in their old age, continue to predominate among the poor.

Foreign agricultural development is not now a high priority within our overall foreign aid budget. The most recent budget allocated less than $700 million for all such programs, less than ten percent of all U.S. foreign aid. While financial aid is not a sufficient condition for successful development, it is certainly a necessary condition, especially at a time when rising energy prices have forced many nations to use scarce foreign exchange simply to purchase oil in sufficient quantities for current levels of development. This situation generates pressures to increase production of export crops so as to offset foreign exchange difficulties, at the expense of production for domestic consumption.

The capital requirements of agricultural development can be massive, especially in the provision of new irrigation systems, which hold considerable promise for increased productivity. Investments in other kinds of infrastructure such as roads, storage facilities, and delivery of technical assistance are all expensive and necessary parts of programs needed for increased food production.

The U.S. can also aid in the development process through its food aid programs. The Food for Peace Program, PL 480, was originally set up to provide an outlet for dumping surplus crops around the world, and through its depressing impact on crop prices, the program probably discouraged Third World farmers from investing in the production of crops for domestic consumption and thereby helped to create the present dependence on world grain markets. Perhaps the program could be structured so as to encourage increased independence from world grain markets; however, far more useful

would be the maintenance of the Food for Peace Program for humanitarian famine relief purposes only, using whatever other resources might be freed up to increase the direct support of international agricultural development.

In addition to direct support, the U.S. could serve the purpose of increasing world food production by eliminating all subsidies to its agricultural export programs. Trade promotion generally results in reduced incentives elsewhere to produce food through depressing prices below their real costs. Foreign producers thus not only have to compete with U.S. farmers, but also with the U.S. government.

If export subsidies are necessary to improve the balance of trade, then almost any other economic activity would be a better candidate than agriculture, for agricultural commodities can be a major source of domestic inflation, while pressure to expand output threatens resource depletion and environmental degradation. Moreover, agriculture is capital-intensive and its expansion does little for labor. From this perspective, we would be far bettter off subsidizing the foreign sale of computers and other electronic equipment which are decreasing cost industries whose expansion would increase the demand for labor with relatively little impact on the environment. Because these goods are produced on assembly lines, and are priced according to costs, they would not be a source of price instability. These comments are not intended as an endorsement of subsidized exports, but rather to highlight the costs of promoting agriculture because of its unique character.

Last, perhaps the most important step the U.S. could take to promote world agricultural development would be to support the establishment of world commodity stocks so as to stabilize prices, reducing the problems of periodic episodes such as the 1973/74 period when scarce foreign exchange

TABLE 7

Yields in Wheat, Rice, and Tubers and Sources of Land Productivity by Region and Country, 1974-75 Average

Region and country	Yields, 1974-75 average			Sources of productivity				Literacy ratio[a]
	Wheat	Rice	Tubers	Fertilizer	Tractor	Tractor	Workers	
	1	2	3	4	5	6	7	8
	metric tons per hectare			kilograms per hectare	horsepower per hectare	horsepower per worker	number per hectare	percent
World	1.6	2.4	10.8	25.8	.45	.88	.51	[b]
Africa	1.0	1.7	7.2	5.1	.10	.22	.45	26.2
Egypt	3.4	4.8	18.0	124.1	.23	.12	2.00	11.5
Nigeria	2.0	1.9	4.0	.6	[c]	[c]	.55	
Ivory Coast	--[d]	1.1	7.0	.9	.01	.05	.22	
Kenya	1.5	4.9	10.0	10.8	.12	.06	2.00	
North and Central America	1.9	3.8	19.3	32.5	1.20	17.15	.07	
Canada	1.7	—	20.0	11.8	.85	42.50	.02	99.0
United States	1.9	5.0	26.5	37.7	1.43	71.50	.02	99.0
Mexico	3.3	2.4	11.7	23.9	.57	2.55	.23	72.2
Guatemala	1.1	2.9	3.8	24.7	.06	.09	.70	29.4
Dominican Republic	3.1	3.6	10.6	47.0	.19	.24	.80	64.5
Cuba	—	2.1	5.1	37.8	.43	2.15	.20	77.9
South America	1.3	1.8	11.1	8.5	.15	.63	.24	
Argentina	1.5	3.9	12.0	1.6	.15	3.00	.05	91.4
Brazil	1.0	1.4	12.1	10.8	.15	.40	.38	61.1
Colombia	1.3	4.4	9.9	24.9	.05	.10	.50	72.9
Peru	1.1	3.8	7.4	39.3	.12	.17	.71	61.1
Asia	1.3	2.5	9.7	19.6	[c]	[c]	1.25	
Turkey	1.2	3.6	12.3	13.7	.21	.53	.40	46.0
India	1.2	1.7	11.8	11.0	.04	.04	.90	27.8
Indonesia	—	2.7	8.0	21.7	[c]	[c]	1.43	39.0
China	1.4	3.5	9.7	30.2	.04	.02	2.00	
South Korea	2.0	5.2	5.8	186.2	.30	.12	2.50	70.2
North Korea	1.7	5.0	6.7	120.0	[c]	[c]	1.67	
Taiwan	—	4.3		130.0	[c]	[c]	2.00	62.4
Japan	2.7	5.9*	20.0	123.0	5.00	2.50	2.00	98.0

(Continued on next page.)

TABLE 5—continued.

Region and country	Yields, 1974-75 average			Sources of productivity				Literacy ratio[a]
	Wheat	Rice	Tubers	Fertilizer	Tractor	Tractor	Workers	
	1	2	3	4	5	6	7	8
	metric tons per hectare			kilograms per hectare	horsepower per hectare	horsepower per worker	number per hectare	percent
Europe	3.2	4.8	19.0	78.9	1.71	5.90	.29	
Bulgaria	3.3	4.3	11.0	73.1	.62	6.20	.10	91.2
Denmark	5.2	—	26.0	111.0	2.41	5.30	.45	98.5
France	4.3	3.7	23.0	82.7	2.48	14.59	.17	98.5
West Germany	4.6	—	29.0	148.3	6.25	25.00	.25	98.5
East Germany	4.3	—	18.5	136.9	1.01	4.60	.22	98.5
The Netherlands	5.4*	—	34.0	540.9	7.32	15.25	.48	98.5
Sweden	5.2	—	25.0	78.3	2.25	22.50	.10	98.5
United Kingdom	3.6	—	44.0	131.1	2.31	23.10	.10	98.5
Oceania	2.8	5.2	10.5	4.4	.33	8.25	.04	98.5
Australia	1.4	5.5	18.0	3.9	.26	26.00	.01	98.5
New Zealand	3.4	—	24.0	22.5	4.15	29.64	.14	98.5
U.S.S.R.	1.2	3.9	10.5	29.0	.39	3.00	.13	98.5
Developed countries	1.8	5.4	18.0	40.0	.91	7.58	.12	98.5
Market	2.1	5.7	21.0	41.3	1.25	12.50	.10	
Centrally planned	1.4	3.7	13.0	37.3	.46	2.56	.18	
Developing countries	1.2	2.3	9.0	14.1	.07	.12	.59	
Market	1.2	1.9	8.5	10.6	.07	.12	.63	
Centrally planned	1.3	3.2	9.5	31.1	.06	.11	.53	

a/ Refers to most recent estimates between 1960 and 1970.

b/ Blanks indicate no data available.

c/ Insignificant amount.

d/ Dashes indicate not applicable.

* Highest national yield.

Sources:

  Cols. 1-7: United Nations, Food and Agriculture Organization, Production Yearbook, 1975 (Rome, 1976).

  Col. 8: United Nations, Demographic Yearbook, 1971, 23rd issue (New York, 1972).

had to be used to buy high-priced grain imports. Stable prices also provide a better investment environment for farmers all over the world and would thereby encourage productivity.

Looking briefly at the demand-side, we have already mentioned the possible double role that agricultural development can play in promoting greater food supplies and in helping to create the conditions for effective population control, which is obviously the most important long-term goal of any world food policy. But in the short-run, pressure could also be reduced in world commodity markets if consumption of grain-fed livestock were reduced. The reason for increased pressure on food supplies is the fact that much of the world's grain is fed to animals, and in the conversion, much of the food energy is lost. If the current production of corn and feed grains were converted to crops for direct human consumption, and if this resulting energy and protein were distributed around the world, there would be no problem meeting dietary needs of the world's population for the next several decades.

Of course, this is an unrealistic scenario, but more modest progress can be made by encouraging the consumption of range-fed rather than grain-fed beef. To some extent, high grain prices will create incentives for such changes without any public intervention, since grain-fed beef will become relatively more expensive. Indeed, a recent Wall Street Journal article predicted that grain-fed beef would "go the way of the V-8 engine" because of prices.

However, the shift away from grain-fed beef could be facilitated by eliminating certain government policies. For example, beef import quotas now serve to prevent the public from complete access to cheaper range-fed, imported beef. Were these relaxed, the feed-lot industry would be forced to

compete and offer cheaper beef fed with less grain. Even a few weeks less feeding on grain per animal could have a measurable impact on domestic feed grain consumption, and allow more for export with less risk of the dangers outlined above. Similarly, Government grading regulations should be changed to facilitate this shift by allowing lower "quality" beef to be sold under the "choice" grade.

The motivation for all of these policies is to find effective ways of dealing with a rising threat to the entire domestic economy. While cutting back on the consumption of grain-fed beef is frequently urged by those concerned with feeding a hungry world, the purpose of encouraging such a sift in this analysis is simply to increase the supply of grain for export so as to keep food prices in check. A similar justification can be made for making massive investments in overseas agricultural development and technology; the most urgent "agricultural" policy for the U.S. consumer is to support the efforts of others to feed themselves.

Ultimately, while farmers would deny that such policies are also in their interest, a case can also be made that divesting ourselves of our mission to "feed the world" is in the farmer's long-term interests as well. If we can create an environment in which farmers an pay attention to the long-run consequences of their current production practices, without incurring the threat of bankruptcy, we will be able to maintain a more productive economic and ecological agricultural system. There are real limits that we have to learn to live within; we can overstep some of these limits for a short-time, but not indefinitely. If we allow the limits to dictate events, then our past problems with food and intlation will be viewed with considerable nostalgia from the perspective of a few years hence.