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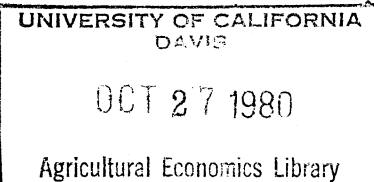
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## INFLATION, AGRICULTURAL OUTPUT AND PRODUCTIVITY

D. Gale Johnson

Why should inflation have an adverse effect upon agricultural output and productivity? Since most economists accept the view that inflation is bad and should be avoided--if doing so doesn't cost too much--our knee jerk reaction is that inflation has significant adverse effects upon output and productivity.

True, inflation redistributes wealth and income, as most of us who work for universities and, in addition, have annuities derived from defined contributions realize. And when inflation rates reach some levels, the breakdown of confidence in money and financial institutions can have serious economic, social and political consequences. But have the inflation rates of 10 to 15 percent to which we have been subjected during the past year had significant resource and productivity effects in agriculture? When I started to write this paper I wasn't sure how I would answer this question. Was I surer when I finished? I leave it to you to judge.

The first issue that I address is what has happened to productivity in the economy and in agriculture during the 1970s. In considering what may have happened to the growth of productivity in agriculture, we should consider that change in the context of the national picture.

The available data on changes in national productivity, whether as measured by total factor productivity or by labor productivity (average

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labor product) show clearly that national productivity growth has been significantly slower since 1973 than in the years before. What is much less clear is why the slowdown has occurred.

What do the data show? Table I gives data on total factor productivity for the private domestic economy and selected segments. There can be little doubt that productivity growth after 1973 was at a lower rate than in any other period since 1948. Table II provides similar data on labor productivity and the general picture is the same as for total factor productivity.

There are those who argue that the productivity slowdown started before 1973. Tables I and II give some support for that view, though the pre-1973 slowdown seems to have been concentrated in areas other than manufacturing.

However, there is little doubt that the sharp break in productivity growth occurred from 1973 on. There are at least two important competitors for explaining the decline. One is that 1973 was the year that oil prices were increased substantially. Another is that it was in 1973 that we started on a roller coaster of inflation, deflation and inflation again. Other factors could be the adverse effects of environmental regulations, the low rate of capital investment in the U.S. economy and the decline in real support of research. After noting how little can be attributed to these factors, Zvi Griliches came to the following equivocal but not unreasonable conclusions:

"There remain three interrelated forces: the rise of energy prices, accelerating inflation, and errors in our measures produced by the inability of the existing statistical framework to cope adequately with such changes. To me they appear to be the

most likely suspects in this case. The main source of this suspicion lies in the coincidence of timing and the fact that the productivity slowdown appears to be worldwide, and not just restricted to the United States. Hence, any explanation for it must be based on factors that are not unique to recent U.S. history" (pp. 12-13).

Table III shows quite clearly that the decline in productivity, as measured by labor productivity in manufacturing, has not been only an American phenomenon. Of eleven high income countries all but one (Germany) had a decline in labor productivity in manufacturing in 1973-76 compared to 1970-73.

#### Agricultural Productivity

In recent years there has been concern that productivity growth has slowed in agriculture. The National Academy of Sciences expressed its concern on this issue in Agriculture Production Efficiency. That study concluded that while there was inadequate evidence to support the conclusion of declining agricultural productivity (though 1972 or 1973) there were some trends pointing in that direction.

Have the concerns noted in the Academy report materialized?

Table IV indicates that the answer seems to be in the negative. I say "seems to be" because the inadequacies of our data base make it difficult to be quite certain that the growth of agricultural productivity has remained unchanged in recent years compared to earlier periods. Stated briefly, our currently available total factor productivity measure for agriculture suffers from three significant defects: (1) A failure to measure most changes in the quality of inputs, especially labor and

machinery; (2) The use of base periods for weighting inputs that are too far apart in time; and (3) The failure to adjust output measures for climate changes. Other problems or difficulties are detailed in an excellent report of a task force of the AEAA. Given these difficulties one must be quite circumspect. If one accepts the data as they are, recognizing the qualifications, certain conclusions follow:

1. The growth of total factor productivity in agriculture during the 1970s was at least as high as for the two decades 1950-70. Productivity growth was higher during the 1950s than during the 1960s but the average for the two decades was essentially the same as for the 1970s.
2. Agriculture has not suffered the significant decline in either total factor productivity or labor productivity growth that has occurred in the nonfarm economy, either the total or private, since the mid-1960s.
3. There does not appear to have been any significant decline in the rate of growth of agricultural productivity after 1973, in contrast to what occurred in the rest of the economy. Thus agriculture appears to have escaped the sharp decline in productivity evident in the nonfarm economy after 1973.

There is a rough independent measure of growth of productivity in agriculture, namely the change in output to input prices. This measure suffers from whatever defects there may be in the price indexes used, but avoids some of the difficulties of measuring input quantities. It introduces, however, the difficulty of comparative resource returns in agriculture and the rest of the economy. It should be noted that change in the relative output-input prices in agriculture is not a measure of the absolute

TABLE I

## TOTAL FACTOR PRODUCTIVITY GROWTH, UNITED STATES, 1948-1976

	Manufac- turing	Mining	Contract Construc- tion	Transpor- tation	Private Domestic Economy
1948-53	2.9	4.1	2.6	1.8	3.4
1953-57	1.0	2.2	1.8	2.7	2.0
1957-60	1.1	0.6	4.2	2.3	2.1
1960-66	3.9	4.6	2.0	4.2	3.4
1966-69	0.9	1.7	-0.3	1.9	1.5
1969-73	2.7	-0.7	-5.0	2.3	1.8
1973-76	0.1	-4.6	1.8	0.3	0.7
1948-76	2.1	1.7	1.0	2.4	2.3

SOURCE: John W. Kendrick, "Productivity Trends and the Recent Slowdown: Historical Perspective, Causal Factors, and Policy Options," Contemporary Economic Problems 1979, ed. by William Fellner (Washington: American Enterprise Institute, 1979), pp. 28-29.

TABLE II

## LABOR PRODUCTIVITY GROWTH, UNITED STATES, 1948-1980

(Percent Change per Year)

	Nonfarm		Nonfarm Economy	Private Business Economy
	Manufacturing	Nonmanufacturing		
1948-55	3.3	2.4	2.7	3.4
1955-65	2.9	2.4	2.6	3.1
1965-73	2.4	1.7	2.0	2.3
1973-77	1.5	0.6	0.9	1.0
1977-78	2.5	-0.3	0.6	0.4
1978-79	0.9	-	-1.1	-0.9
1979-80	0.1	-	-1.5	-1.2

SOURCE: Council of Economic Advisers, Annual Report, 1979, p. 68,  
and U.S. Bureau of Labor Statistics, Productivity and Costs, USDL 80-343,  
May 28, 1980.

TABLE III

GROWTH RATES OF OUTPUT PER MANHOUR IN MANUFACTURING IN  
DIFFERENT COUNTRIES

(Percent per Year)

	1970-73	1973-76	Difference
United States	4.4	1.3	-3.1
Canada	5.0	1.1	-3.9
Japan	6.7	2.8	-3.9
Belgium	8.4	6.7	-1.7
Denmark	7.1	5.4	-1.7
France	5.7	4.7	-1.0
Germany	5.4	5.8	+0.4
Italy	7.6	2.9	-4.7
Netherlands	8.0	5.2	-2.8
Sweden	5.6	1.2	-4.4
United Kingdom	5.0	0.6	-4.4

SOURCE: U.S. Bureau of Labor Statistics, International Comparisons of Productivity and Labor Cost Trends in Manufacturing, USDL 78-444, May 12, 1978.



TABLE IV

FACTOR PRODUCTIVITY GROWTH IN AGRICULTURE,  
UNITED STATES, 1940-1979

(Percent Change per Year)

1940-50	1.7
1950-60	2.4
1960-70	1.3
1970-79	2.1
1940-79	1.9
1950-79	1.9
1960-79	1.7

SOURCE: U.S. Department of Agriculture, Changes in Farm Production and Efficiency, 1978. ESCS Stat. Bul. No. 628, p. 71.

change in total factor productivity but of the change in relative factor productivity. If real resource returns in the economy were increasing at, say, 2 percent annually and if the output-input price index for agriculture declined by 0.5 percent annually, the growth in agricultural productivity would be 2.5 percent annually.

The use of the measure assumes that the return to agricultural resources increases at the same rate as in the rest of the economy. If the returns to agricultural resources (labor, land and capital) increase relative to the returns elsewhere in the economy, the decline in the output-input farm price index would underestimate the increase in agricultural productivity.

From 1960 to 1970 the adjusted parity ratio (1910-14 = 100) declined from 82 to 77 or by 6 percent. From 1970 to 1979 the decline was from 77 to 73 or by 5 percent. During each of these two decades the returns to agricultural resources increased relative to similar resources in the rest of the economy. A rough indication of the improvement was the increase in the ratio of per capita disposable incomes of the farm population to the nonfarm population during the two decades.<sup>1</sup> During the two decades the increase in the ratio was from approximately 55 percent in 1960 to near equality in 1979, with the improvement in terms of points being approximately 20 during each of the two decades. It is true that much of the improvement in the relative incomes of the farm population has been the result of a more rapid increase of nonfarm than of farm income. But the farm production activities of the rural farm population adjusted and apparently adjusted very well to the labor force changes associated with the increased importance of nonfarm employment of members of farm families.

These rough comparisons are consistent with the view that

agricultural productivity has been maintained at a relatively high growth rate for the past two decades. In addition, there seems to be no support for the view that productivity growth in agriculture was lower in the 1970s than in the 1960s.

Whatever factors may have been responsible for the slow down in the growth of productivity after 1973 in the U.S. and other economies seem not to have had much effect upon agricultural productivity in the United States. Or if there had been some effects, the effects were not large enough to have been caught by our inadequate measures of productivity growth. We perhaps have more of a puzzle on our hands because U.S. agriculture has apparently escaped unscathed from the dramatic economic events that have occurred since 1972 than would have existed if productivity growth in agriculture had slowed significantly.<sup>2</sup>

In the longer run there is likely to be some effect of national productivity growth upon agricultural productivity growth. While the current episode shows that this long run potential has so far not had adverse effects upon our agriculture, it would not be safe to assume that the lack of effect can go on indefinitely. In any case, farm people realize the benefits of productivity growth primarily through the increasing value of human effort. Slow or nil productivity growth in the rest of the economy means slow or nil increases in real labor earnings and thus in the alternatives available for the use of the human capital of farm people.

#### Expected Adverse Effect of Inflation

Why should we expect that inflation would have an adverse impact upon agricultural productivity or output? There are three reasons why negative effects may exist. One is that the rate of inflation is not

correctly anticipated. A second reason is that a change in the rate of inflation may have effects on the prices of some or most agricultural products relative to input prices. Finally, the policies and interventions by government in response to the inflation may have inhibited the appropriate responsiveness of the markets. Each of the reasons implies that inflation increases the degree of uncertainty confronting farmers--uncertainty about prices and availability of inputs since the government may impose price ceilings or force the rationing of credit or specific inputs.

The economy of the United States does not have many of the institutional relationships that permit it to exist moderately well with inflation. We still function with long term bonds and mortgages with fixed interest rates. But there is an indication that the sharp and generally unexpected rate of inflation has led to the introduction of a number of modifications of debt instruments. These include variable rate mortgages, rollover mortgages and the various certificates of deposits tied to short and intermediate term treasury security rates. I do not know if there have been variable rate or rollover farm mortgages written during the past year, but such a possibility must certainly be under consideration by some financial institutions.

#### Inflation and Resource Allocation

For a rate of inflation--say in the range of 5 to 20 percent--it is unlikely that the errors in resource allocation due to incorrect anticipations will have a significant impact upon the real output level or productivity. True, some if not most asset prices will need to be re-adjusted as the true rate of inflation is revealed, but actual resource misallocations will have been quite small, especially in the short run of

one production period. I am not saying that the effect is nil; certainly one would not expect such a statement from the author of Forward Prices for Agriculture. But the uncertainty created by variable inflation rates is an addition to existing uncertainty rather than entirely new phenomena. Thus we can hardly expect that the added effects of variable inflation upon uncertainty could be of sufficient magnitude to be picked up by our imperfect measures of output and productivity.

I know of but one study that may throw some light on the adverse productivity effect of very high rates of inflation. Unfortunately the agricultural area involved was afflicted with civil disturbance as well as a high and apparently unexpected rate of inflation. Briefly, Dittrich and Myers obtained access to detailed farm management data collected by the Japanese for three villages in North China for various years from 1937-40. These data were used to fit production functions which were then used to estimate the efficiency of resource allocation in the different villages and years. In one village data were available for three consecutive years. In 1937 it was estimated that the actual resource allocation compared to an ex post reallocation of resources resulted in an income loss of 1.4 percent. Between 1937 and 1938 farm prices increased by 21 percent; the income loss due to resource misallocations was 3.3 percent. Between 1938 and 1939 farm prices increased by 136 percent; the income loss from resource misallocations was 17.5 percent. The authors concluded: "The findings . . ." suggest strongly that the peasants of these farm surveys--operating within a framework of traditional agriculture and private ownership of land--were able to allocate scarce resources fairly efficiently. This was true as long as economic conditions reflected by rising farm prices did not change very rapidly" (p. 895).

As a net debtor in terms of financial assets, farmers usually gain from an unexpected increase in inflation rates. However, this benefit is through an increase in real wealth and has rather little effect on current output and productivity.

#### Farm Output Prices

The second reason for an adverse effect of inflation is that the fact of largely unanticipated increase in inflation may result in adverse changes in relative prices and thus reduce output. This effect may arise where the domestic prices of major farm products are significantly affected by international market conditions. This is the situation for many U.S. farmers. Unless the U.S. exchange rate falls, an increase in the rate of inflation in the U.S. relative to the weighted inflation rate in the export destinations will not result in an increase in the absolute price of U.S. farm products. While in the long run purchasing power parities are likely to be reflected in exchange rates, in the short run relative exchange rates can move quite independent of relative inflation rates. This has clearly been the case for the dollar exchange rate since last October and especially from January 1980. When real interest rates rose absolutely and became significantly real; the exchange values of the dollar increased significantly. Between January and April 1980 the value of the dollar increased 13 percent in terms of the DM, 12 percent in terms of the yen and 6 percent in terms of the pound. But when interest rates fell in April and the U.S. inflation rate appeared to be on the way to stabilization or decline, the exchange rate for the dollar fell and by July has returned to approximately the levels of a year earlier. Consequently during the period of high absolute and real interest rates from

December 1979 through April 1980, farmers were faced with high capital costs and declining real product prices. Some product prices fell in absolute as well as real terms though a partial source of the absolute declines for the grains and soybeans may have been the U.S. suspension of grain sales to the Soviet Union. But even if there had been no suspension of grain sales, the prices of grain and other export products would have been under pressure due to the strength of the dollar in response to the inflow of funds attracted by high short term interest rates. Later, starting in April and May, there was an outflow of funds as U.S. short term interest rates fell; the dollar lost value in the foreign exchange market and the net effect was to provide some strengthening of the dollar prices of major export products compared to what they otherwise would have been. In the context of circumstances in 1979/80, high interest costs were not offset by farm prices of the major export product rising at approximately the same rate as prices generally; in fact, quite the contrary occurred. High relative U.S. interest rates put downward pressure on the domestic prices of many farm products for a period of several months. These were critical months since many planting decisions had to be made during the period.

Since the slowdown in the inflation rate has been associated with a recession induced decline in demand for the farm products with positive income elasticities of demand, the potential positive domestic price effect of the decline in the U.S. exchange rate has been at least partially offset by domestic events. The U.S. market for feed grains and corn is sufficiently large that changes in the domestic market can affect international market prices.

It is probable that the consequences of varying and unanticipated

changes in the rate of inflation have had some small negative effect upon agricultural output and productivity. But these effects have been too small to be reflected in our measures. But not all of the consequences of the inflation dominated events of 1979 and 1980 will be felt in the short run; both farmers and financial institutions will almost certainly modify their behavior for some time to come.

#### Governmental Policies

I will not dwell on the third reason for an adverse effect of inflation upon output and productivity—namely, governmental policies instituted in response to political demands to "do something about inflation." The sharp increase in interest rates, and the probable severity of the 1980 recession, resulted from an unwillingness of the administration to take appropriate action to reduce inflation before late 1979. By then circumstances demanded that drastic action be taken by the Federal Reserve System. The drastic action taken will have ramifications upon prices and output for all of 1980 and probably well into 1981. One can only hope that since we have received the shock it will not be all for naught due to a rapid shift from contraction to expansion in the money supply.

#### Slow Economic Growth

Far, far more disturbing than any of the effects of inflation upon productivity in agriculture is the slow rate of growth that has afflicted our economy for the past decade. Sooner or later, and probably sooner, the competitive position of U.S. agriculture in world markets will be eroded by the slow growth of our economy. Agriculture's strong position in world markets is the result of efficient and competitive markets for inputs and outputs. The dynamic nature of American agriculture is due to the characteristics of our farm operators, the investment in research and



the rapid translation of research results into useful inputs produced at competitive prices (Johnson). One important advantage of U.S. agriculture has been an efficient, low cost transportation system to move products from the farm to the city, with reasonable dispatch and remarkable responsiveness to the rapid growth of exports. But important components of the system, particularly the railroads, appear to be on a path to disintegration at worst and much higher costs at best. We seem to be paying the price for a regulatory atmosphere that has never had the capacity to look more than a year or so into the future or to understand that the sources of competition for rail transport have changed in a century. Agriculture has not been without fault in the disintegration of the rail system--it has long pressed for low rates in the forlorn hope that someone else would pay to keep the system in a state of good condition and repair.

#### Inflation and Value of Assets

Earlier I noted that farmers, as net debtors, gained from unanticipated increases in the rate of inflation. I gave no emphasis to this gain, noting that it did not significantly affect resource allocation. This is not strictly correct since wealth is a variable that affects a number of decisions, such as consumption-savings or the form of investment or the desirability and availability of credit.

There is a potential effect of inflation that I have not mentioned, namely the effect of farm land being considered one of the few good inflation hedges. Farm land prices have increased in real terms for the last four decades and have done so almost every year. However, during the past twenty years there seems to have been little relationship between the rate of inflation or the change in the rate of inflation and the size of the increase in the real value of farmland.

The price behavior of farmland does not appear to differentiate it from other types of real estate. Housing prices appear to have behaved in approximately the same manner as agricultural land prices. The only possible difference is that farmland is a major production asset for agriculture and except for mining and forestry, this is not the case for other types of production. Thus to the degree that farm land has been an inflation hedge and part of its current price so reflects, the acquisition of land becomes more difficult for those who must acquire it by purchase. But except for the greater difficulty of acquisition, primarily because our credit system does not provide for 100 percent loans, the fact that farmland is an inflation hedge is a disadvantage only if it should cease to be such a hedge. At that time the owners of land would suffer a capital loss.

The very large real capital gains in agriculture during the 1970s have perhaps been an important factor in the ability of farmers to adjust to and to overcome the unanticipated events of the decade. In terms of 1967 dollars the value of farm proprietors' equities increased by \$110 billion or almost 50 percent (Melichar and Waldheger, p. 34). The real value of liabilities increased by less than \$22 billion. While there have been numerous claims that farm operators who have acquired their farms since 1972 have suffered such severe financial problems that increased foreclosures were inevitable, data through 1979 show no increase in the percentage of farm real estate sales due to foreclosures (Melichar and Waldheger, p. 57). The situation in 1980 and 1981 may be different, given the sharp drop in farm income that is likely to occur in the second half of 1980.

One reason that farm financial troubles have not dominated the agricultural concerns in recent years has been that during the 1970s real interest rates paid on all farm mortgages have been significantly negative.

During the 1970s prices received by farmers increased at an annual compound rate of 9 percent; interest rates on outstanding mortgage debt averaged about 7 percent. And it was not until 1979 that short term interest rates paid by farmers were significantly higher than the annual rate of increase of farm product prices.

### Concluding Comments

The inflation experienced by the United States during the 1970s has not had a measurable impact upon agricultural production or productivity. This statement should not be assumed to mean that inflation has had no effect but simply that our measures are not sufficiently refined to pick up what effects there may have been. The prices of major export products were erratically affected by the high rate of inflation in 1979/80, the monetary policies that resulted in high rates of interests and a short run significant increase in the dollar exchange rate.

Some of the potential adverse effects of inflation on resource use may have been offset by the positive transfers received by agriculture as a result of land's role as an inflation hedge and the negative real rates of interest that have prevailed in most years since 1972. Since agriculture is a very capital intensive sector of the economy, its output may have been favorably affected by a low real cost of obtaining and holding capital.

The most alarming aspect of the performance of the U.S. economy since 1973 has been the low rate of productivity growth and the modest or nil growth of real wages. American agriculture is highly dynamic and progressive. But much of that dynamism depends upon the way in which the rest of the economy functions. When the rest of the economy is sluggish and floundering, eventually agriculture must be affected adversely.

#### FOOTNOTES

D. Gale Johnson is Eliakim Hastings Moore Distinguished Service Professor and Chairman, Department of Economics, The University of Chicago.

<sup>1</sup>This measure is a rough indication since no effort is made to determine the amount of resources per capita in agriculture and in the rest of the economy. Thus it is possible that resources per capita increased much more in agriculture than in the rest of the economy, though I doubt if such a change could account for much of the improvement in relative incomes.

<sup>2</sup>In a paper given at this meeting last year, Vernon Ruttan gave a paper with a similar title: "Inflation and Productivity." While there are a number of similarities in our presentations, Ruttan is significantly more pessimistic than I am concerning recent and future productivity growth in agriculture (p. 901).

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