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United States
Department of
Agriculture

Economic
Research
Service

Agriculture
Information
Bulletin
Number 504

October 1986

Agriculture's Links to the National Economy Income and Employment

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NO. PRINTED 4000 DATE _____
NEW ☒ RPT _____ SL. REV. _____ REV. _____
REFER ER6 PRICE 1/5

The economic and employment links between agriculture and the industries supplying its inputs and marketing its output determine how a change in the agricultural sector will affect the rest of the economy. These links can work differently for large economic shocks or policy changes than for small ones. For example, minor changes in farm programs (such as temporarily reducing commodity acreage or production to limit Government stock accumulation) have little effect on employment and income in the rest of the economy. But substantial changes in farm programs (such as large, permanent acreage reductions to significantly raise farm commodity prices) affect the entire economy by forcing cutbacks in industries linked to agricultural production.

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Natural disasters, changes in domestic or export demand, world crop shortages, and changes in Government commodity or environmental policies are among the events that can shock the agricultural economy. These shocks can change agricultural production and its demand for production inputs. A small shock may be felt just in the agricultural sector. But, a much larger shock, involving the economic and employment patterns linking the agricultural sector with the entire economy, may be felt throughout the Nation's economy. Analysis of the economic and employment linkages helps us understand and measure the extent to which they transmit shocks throughout the economy.

The Food Security Act of 1985 broadened the responsibility of the U.S. Department of Agriculture (USDA) for analyzing how farm programs affect both the farm economy and the input and processing industries linked to it, and how changes in farm programs affect trade, consumers, the general economy, and tax revenues. The first step in this process is to understand what can and cannot be concluded about agriculture's role in generating employment and income in the Nation's economy.

Our objectives are to explain the input and output relationships of the agricultural sector for 1984 and to show how changes in the farm sector can alter the Nation's economy. We use two alternatives—a small annual acreage reduction program and a large permanent acreage reduction program—to illustrate how the effects of changes in Government commodity programs can differ greatly depending on the size of the changes and how much of the Nation's economy is affected. Relatively small changes in farm programs can leave the rest of the national economy largely untouched. But large program changes, especially if they are permanent, can pervasively influence employment and income throughout the economy.

We base our analysis on an ongoing Economic Research Service program analyzing the effects of economic and policy changes on the farm sector and related industries.

LIMITATIONS

This study focuses on linkages based on input/output relationships in the national accounts maintained by the U.S. Department of Commerce which portray the structure of the economy for 1977. These relationships are stable over time even though the level of economic activity in various industries varies yearly. We have updated these relationships to the actual output levels for 1984 for this analysis.

The estimated relationships are subject to several limitations. First, the analyses of the effects of farm programs compare situations only "with" versus "without" an economic shock or change in agricultural programs. Moreover, these comparisons show only effects after the farm sector and the economy have had several years to adjust to a sustained change in programs.

Second, some necessary assumptions of the methods of analysis may introduce errors. However, these errors tend to balance each other, and the resulting estimates are as correct as possible given current knowledge and analytic techniques. Three assumptions tend to overstate the adjustments the economy would make:

- o The analysis assumes no "redeployment" of factors (labor, land, inputs). Each industry or sector will continue to use exactly the same methods of production and proportions of inputs in producing its output as it did before the change or economic shock. In reality, each sector can alter the mix of inputs it uses to create its products in response to a change or shock.
- o The analysis assumes no "reemployment" of factors released by a change in the level of economic activity. For example, labor displaced from a sector is assumed not to be reemployed in another sector. Changing the use of factors from one sector to another is another way that the economy adjusts to a change or shock.
- o The analysis assumes that prices of all goods and services in the economy remain constant relative to each other. Changing the relative prices of goods is a third way that the economy accommodates a change or shock.

However, these assumptions are balanced by considering only direct changes in input, farming, and downstream processing activities. For example, we ignore effects of the changes in automobile sales caused by employment changes in agriculturally related industries. These indirect linkages are strong throughout the economy and tend to balance the errors inherent in the previous assumptions. Nevertheless, the input/output method of analysis, while relatively accurate over 2 to 4 years, progressively loses accuracy for longer periods, especially for very large program changes. This is because more factors can be redeployed or reemployed, and relative prices of goods and services can change over time in response to a large shock or policy change.

AGRICULTURAL LINKAGES

Farming is linked to the rest of the food and fiber system, and ultimately to the entire economy, through a network of input purchases and product sales. Farmers buy inputs such as equipment, supplies, feed, seed, fertilizer, labor, and financing from "upstream" industries. And they sell products to "downstream" sectors that store, process, transport, manufacture, distribute, retail, consume, or export the products. Some downstream linkages can involve many steps. For example, cotton may be ginned, spun into thread, woven into fabric, manufactured into garments, and sold in retail stores. Other downstream linkages can be short, as with grain destined for storage or export, which may only be transported to a central terminal or port.

Agriculture is only one link in this interrelated network of industries. It neither drives nor pulls the whole economic system. The agricultural sector can purchase inputs and sell its own products only because there is demand for the final products that will be produced from them. The farm sector cannot unilaterally increase its output and expect to proportionally increase activity in the rest of the economy. This could happen only if agriculture were the only factor limiting the output of the economy. This has seldom been true; agricultural production usually exceeds demand, both domestic and foreign. Since the excess is stored by farmers or by Government, farm production can frequently be cut, within limits, without proportionally reducing activity in the rest of the economy. In addition, the entire economic system is driven by the volume of output of each industry, not the value of output. Changing prices of outputs cannot directly affect the volume of output or employment in the economy. Thus, simply raising agricultural commodity prices cannot, by itself, increase income or employment in the economy.

Ties between farming and its linked industries and, ultimately, the general economy have strengthened over the last two decades. For example, inputs purchased to produce farm products increased from \$51 billion in the early 1960's to \$81 billion (inflation factored out) in the early 1980's. Also, far more value is now added to agricultural products beyond the farm. Activity in downstream industries rose from \$235 billion in the early 1960's to \$440 billion (inflation removed) in the early 1980's.

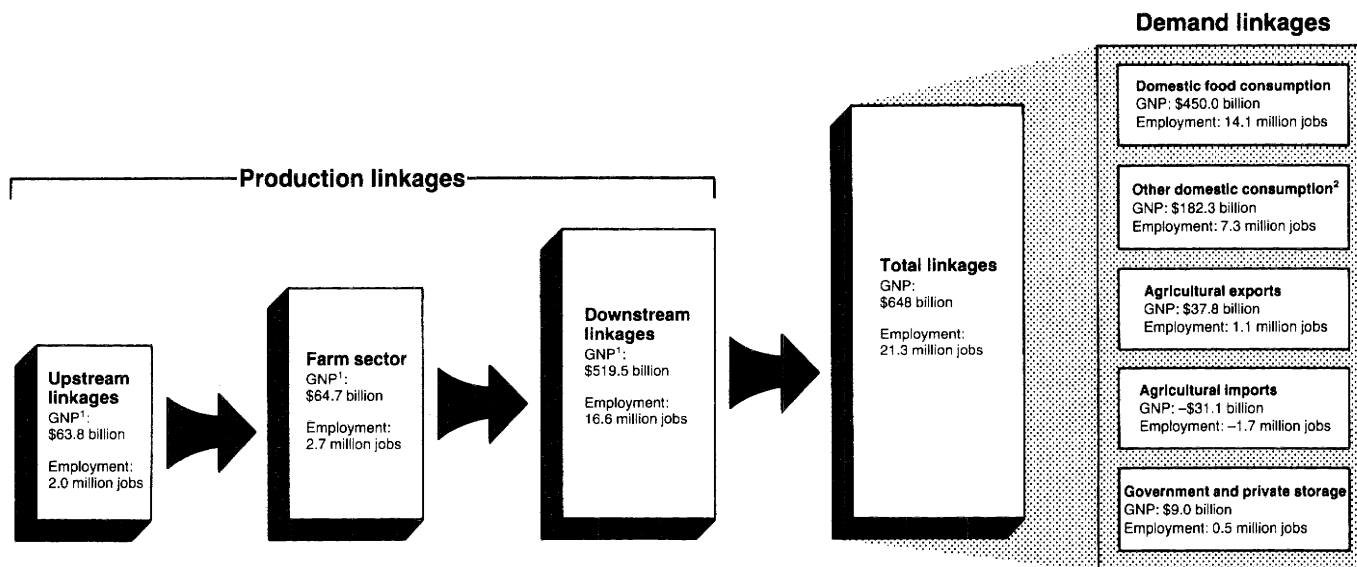
CURRENT LINKAGES

Figure 1 illustrates the links between the food and fiber system and the whole economy. The \$648 billion in final consumer, export, and stock demand for farm products reported in 1984 was linked to \$520 billion in downstream activities, \$65 billion in onfarm activities, and \$64 billion in upstream activities. Another view shows that \$1 of farm business activity was actually comprised of 64 cents in upstream input activity and 36 cents in onfarm activity, to which \$3.20 was added in downstream activity if the product was ultimately consumed domestically. However, this same \$1.00 in farm and upstream activity was linked to only 31 cents in downstream activity if the product in question was exported as raw product, or a negligible amount if it was stored by the farmer or Government as surplus.

The entire agribusiness complex accounts for 18 percent of the U.S. gross national product (GNP). Farming accounts for 2 percent of total GNP, upstream activities account for another 2 percent, and downstream activities account for 14 percent. Of the 21.3 million jobs involved in meeting consumer and export demand and storing surplus farm products in 1984, 16.6 million jobs were in downstream activities, 2.7 million jobs were in onfarm activities, and 2.0 million were in upstream activities.

Figure 1

Agricultural sector GNP and employment linkages, 1984



¹Scaled to level of demand to correct for small errors introduced in calculation.

²Clothing, shoes, tobacco, cut flowers, seeds and potted plants.

FARM PROGRAM EFFECTS

We use two farm program alternatives to illustrate how closely changes in employment and economic activity are linked with changes in farm programs.

- o Alternative 1 is a small annual acreage reduction program designed to limit accumulation of excess Government stocks and leave longrun farm prices essentially unaltered.
- o Alternative 2 is a large permanent acreage reduction program designed to significantly raise farm commodity prices.

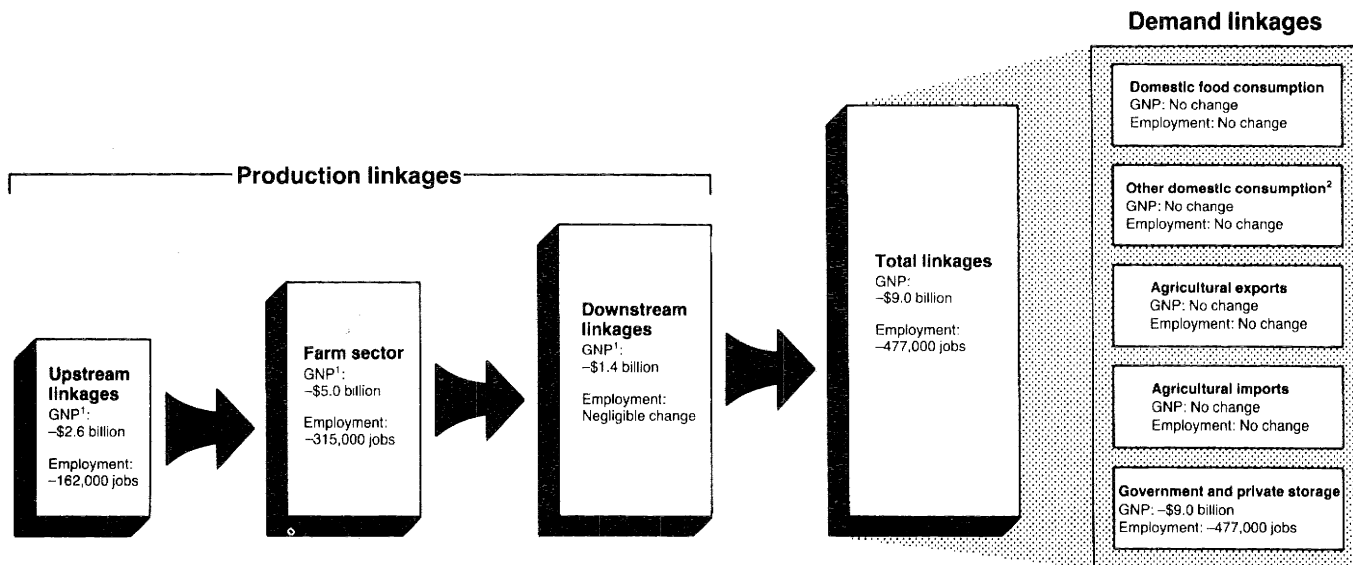
Figure 2 shows the linkage effects of the first alternative, a typical voluntary acreage reduction program. Acreage in the commodity programs declines 30 million acres, roughly 10–15 percent of the total program acreage. Such a reduction is roughly equal to the average of the programs in effect since the midsixties. Most acreage reduction comes from wheat and feed grains, with smaller reductions for cotton and rice. Because this reduction only minimizes excess production that would otherwise end up as surplus Government stocks, the effect on final demand for farm products is limited to changes in stock demand.

With no changes in consumer or export demand, economywide effects of this relatively small acreage reduction program are small, falling mostly on farming and input industries. A 30-million-acre reduction reduces final stocks \$9 billion, onfarm activity \$5 billion, input industry activity \$3 billion, and downstream activities \$1 billion (fig. 2). The program's effects on employment are also largely limited to those same industries: 315,000 jobs lost in farming, 162,000 jobs lost in upstream input industries, and very few jobs lost in downstream industries.

Figure 2

Alternative 1:

How a small acreage reduction program would change agricultural sector GNP and employment



¹Scaled to change in demand to correct for small errors introduced in calculation.

²Clothing, shoes, tobacco, cut flowers, seeds and potted plants.

These estimates of GNP and employment effects must be qualified, in addition to the limitations noted in the box. First, although the estimates are measured relative to a base situation that assumes full use of our agricultural production capacity, the farm sector has not operated at full capacity for 7 of the past 10 years. Hence, part of the losses noted are hypothetical because the economy has already absorbed them in arriving at the current level of income and employment. Second, a large part of the employment change in the farm sector is more likely to be felt as underemployment of farm operators and their families than as loss of jobs.

The effect of alternative 2, a large acreage reduction program aimed at balancing supply and use at much higher commodity prices, is substantially larger than the effect of alternative 1 (fig. 3). A 125-million-acre reduction designed to raise commodity prices to 80 percent of parity would idle roughly 50 percent of the program acreage base and raise farm prices 30 to 40 percent above 1985/86 levels. (Parity is a measure of the purchasing power of agricultural products from a 1910 to 1914 base period.)

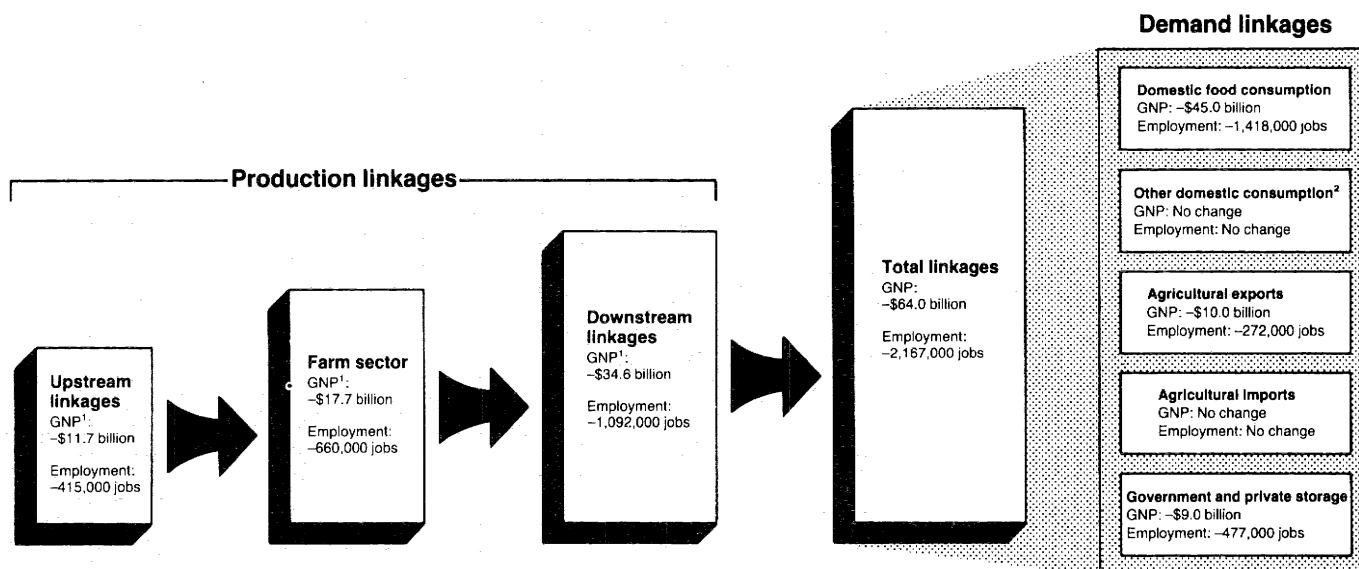
A 30- to 40-percent rise in farm prices discourages domestic use and cuts exports sharply. Domestic food demand could fall at least 10 percent, export demand for farm commodities could fall 40 percent, and stock demand could be essentially eliminated (fig. 3). The drastically reduced volume moving through the system reduces downstream activity by \$35 billion, onfarm activity by \$18 billion, and upstream activity by \$12 billion. Corresponding employment losses are 1.1 million jobs downstream, 660,000 jobs on farms, and 415,000 jobs upstream.

A 125-million-acre reduction involves the full range of agribusiness linkages, so its effects are much larger than those of a 30-million-acre reduction. The smaller reduction involves only the input, farm, and storage sectors, which account for relatively little of the economy's total labor force and economic activity.

Figure 3

Alternative 2:

How a large acreage reduction program would change agricultural sector GNP and employment



¹Scaled to change in demand to correct for small errors introduced in calculation.

²Clothing, shoes, tobacco, cut flowers, seeds and potted plants.

CONCLUSIONS

Farm sector linkages to the agricultural complex and the general economy provide the analytical basis for assessing effects of farm commodity programs on the affected industries and the general economy. These linkage measures support two conclusions:

- o Temporary farm programs using small acreage reductions or supply restrictions to limit Government accumulation of excess stocks have little effect on employment and income in the rest of the economy.
- o Permanent farm programs involving large acreage reductions or supply restrictions to significantly raise farm commodity prices affect the entire economy by reducing farm production, increasing farm prices, and forcing cutbacks in industries linked to agricultural production.

Domestic income and employment linkages allow us to measure how effects of economic shocks or policy changes are transmitted from the farm sector to the agricultural complex and then to the general economy. Although income and employment linkages are only one set of measures, they help us evaluate how agricultural policies affect the rest of the economy. More complete analyses must include short- and long-term effects on domestic and export demand, competitor responses, economic efficiency, program effectiveness, and other factors.