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HOW GOVERNMENT PROGRAMS AFFECT THE SUPPLY OF CORN*

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Corn is the most valuable crop grown by U.S. farmers. Production in 1971 was worth $5.9 billion! It is also a major dollar earner in export markets. Moreover, policy to guide feed grain output is a cornerstone of commercial farm policy in the United States. Feed grains are the link between the crop and livestock sectors of American agriculture.

Remarkable advances in feed grain production technology have more than doubled per acre yields since World War II. However, this surge in supply has not been fully matched by growing utilization. The result has been general downward pressure on feed grain prices, incomes, and, through several government programs, acreage. During the postwar period, feed grain programs to regulate the level of production have been altered from year to year to reflect changing shortrun views of economic conditions, and from administration to administration to reflect changing political views of farm problems and their solutions.

But do government programs actually achieve the output, price, and income goals stated by the policy? And can the impact of a particular program be predicted in advance? These questions are of fundamental importance to all concerned with the feed-livestock sector. An aid for answering these questions is provided by the research reported in this article. We focused our study on the relationship between government programs and acres planted to corn since World War II in order to measure the effect on corn supply of changes in program features.

THE SETTING

Corn programs during the 1948-70 period assured minimum prices through loans to farmers complying with certain requirements, usually acreage restriction, that applied in all but 7 years. Besides loans, qualifying farmers obtained additional payments as incentives for participation during 1956-58 and 1961-70. These supplemental payments have been either per bushel "bonuses" on corn produced (called support payments) or "rent" for idled land (called diversion payments). In some years, varying degrees of program participation were available to farmers. Thus, within a specified range, a producer could choose how much of his corn land to rent to the government.

Other feed grains and soybeans are major competitors of corn both for production resources and for markets. During the study period, soybean acreage expanded sharply while oats acreage declined. Trends are less evident for sorghum and barley plantings; however, yearly fluctuations were substantial during the fifties, when acreage restrictions were periodical-

(continued on page 2)

*This article is based on Staff Papers P72-4 and P72-10, Department of Agricultural and Applied Economics, 212 Haecker Hall, University of Minnesota, St. Paul, Minnesota 55101. Copies are available on request. The research upon which this article is based was done cooperatively with the Economic Research Service, U.S. Department of Agriculture.

THE SET-ASIDE FEED GRAIN PROGRAM*

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Last year a new government program became effective for the nation's feed grain farmers. The Set-Aside Program, covering crops for 1971, 1972, and 1973, differs in a crucial way from programs of the previous 10 years. In this article, we will describe these recent changes in programs and predict 1972 corn supply, employing the findings of the research reported in the accompanying article.

From 1961 through 1970, feed grain producers had to cut back their plantings of feed grains by a specified minimum amount to be eligible for price supports. For most years, farmers could voluntarily reduce their feed grain acreage beyond the minimum and obtain government payments for the optional diversion. From year to year the degree of required restriction on plantings and the amount of optional diversion allowed were varied as the need for feed grains expanded and contracted.

Under the Set-Aside Program as operated in 1971, receipt of feed grain price supports by farmers was not contingent upon planting restrictions on feed grains. Farmers were eligible for price supports on feed grains if they diverted a certain quantity of their **cropland** from production. The diverted acres could come out of any crop, not just feed grains. Therefore, for a given level of acreage diversion, the Set-Aside Program was much less restrictive on feed grain producers than were previous programs. To some extent output control was sacrificed for greater freedom to plant.

An example of a hypothetical participating farmer illustrates the difference between 1970 and 1971 programs.

Total cropland in farm	300 acres
Feed grain base	200 acres
Conserving base	50 acres

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*A more detailed paper on this subject is available as Staff Paper P72-10 from the Department of Agricultural and Applied Economics, 212 Haecker Hall, University of Minnesota, St. Paul, Minnesota 55101.

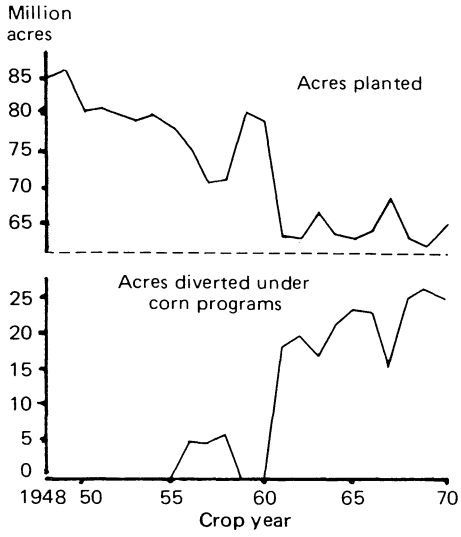

Figure 1. U.S. corn acres planted and diverted, 1948-70

ly applied to corn but not to these last two competitive crops.

Land diversion from corn to conservation or other approved uses also competes with corn plantings. This substitution is evident in figure 1. The figure also reveals that diversion has been sizable in recent years. In fact, acreage diverted from corn exceeded acreage planted to barley or sorghum in most years since 1961 and to oats in 5 of the 10 years.

Despite the downward trend in corn acreage, production climbed consistently but irregularly throughout the past 2 decades as yields increased. Production, total use, and carryover from one crop year to the next are shown for recent years in figure 2. It is apparent that production has been held close to use for the period as a whole. But when production exceeded use (1958-60, 1963, and 1967), carryovers mounted. To work off the large stocks built up by 1960, it was necessary to hold production below use until the mid-sixties.

Some carryover from year to year is, of course, not only necessary but desirable as a reserve for unexpected demand or for a short crop caused by poor weather or disease. For instance, peak export demands in 1965 and 1969 were met by drawing upon carryover stocks. In 1970, stocks were also drawn down to fill the gap between demand and reduced supply levels resulting from corn blight, but stocks were not large enough to prevent prices from reaching the highest level since 1955. Nevertheless, stocks beyond a reasonable level are costly to maintain and tend to depress the price of corn and thus corn farmers' incomes.

EFFECT OF PROGRAMS

In the absence of government programs to limit corn acreage, we would expect farmers to decide how much corn to plant, if any, on the basis of the expected profitability of corn compared with alternative uses of their land and labor. To estimate profitability, a farmer could count on the government support price as the minimum price he would receive. But under the feed grain programs that have prevailed in most years since 1948, only farmers who restricted their planting of corn were eligible for price supports.

The restricted level of production would be equivalent to an unrestricted level of production at some price lower than the support rate. For example, say that a farmer has 120 acres of corn land that yields 100 bushels an acre. And, to be eligible for a guaranteed price of $1.20 a bushel, he must limit his corn planting to 100 acres (yielding 1,000 bushels). That would return him the equivalent of $1 a bushel if he did not restrict his planting; i.e., if he planted all 120 acres to corn (yielding 1,200 bushels). This means that we can calculate a price of corn ($1 in the example) that would give the same return for unrestricted production as prevails with restricted production at the support price ($1.20 in the example). We call the calculated price the **effective support rate.**

The programs during the 1948-70 period also offered farmers the option of diverting land from production in return for a rental payment from the government. The amount of land diverted would depend on the profitability of diversion payments compared with returns from producing corn. We have also developed a measure for this rental payment and call it the **diversion payment rate.**

The announced support rate, the calculated effective support rate, and the diversion payment rate are presented in table 1. **These values can be obtained or calculated directly from feed grain program provisions announced by the government prior to planting time.** We would expect that the lower the effective support rate, the less acreage would be planted to corn because farmers would find corn less profitable than at higher rates. Alternatively, the lower the diversion payment rate, the more acreage would be planted to corn, since at lower rates acreage diversion is less attractive than producing corn.

From the data in table 1 we can observe how the degree of restrictiveness of feed grain programs varied over the years. For instance, in 1959 and 1960 no land diversion payments were offered,

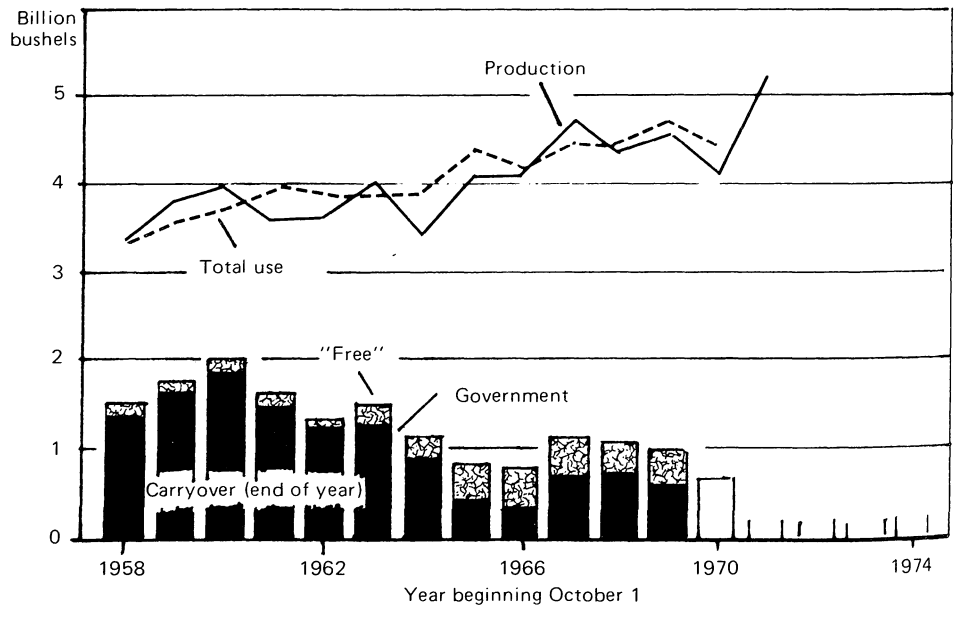

Figure 2. Corn production, use, and carryover (From 1970-71 preliminary data; 1971 based on September indications. Source: Economic Research Service, U.S. Department of Agriculture.)

Table 1. Announced support prices, calculated effective support rates, and diversion payment rates, dollars per bushel, 1948-1970

Year	Announced support price	Effective support rate	Diversion payment rate
	dollars per bushel		
1948	1.44	1.44	0
1949	1.40	1.40	0
1950	1.47[a]	1.15	0
1951	1.57	1.57	0
1952	1.60	1.60	0
1953	1.60	1.60	0
1954	1.62[a]	1.30	0
1955	1.58[a]	1.33	0
1956	1.50[a, b]	1.16	.043[e]
1957	1.40[a, b]	.96	.043
1958	1.36[a, b]	.86	.052
1959	1.12	1.12	0
1960	1.06	1.06	0
1961	1.20	.84	.192
1962	1.20	.84	.192
1963	1.25[c]	.88	.112
1964	1.25[c]	.81	.180
1965	1.25[c]	.81	.180
1966	1.00[d]	.65	.248
1967	1.05[d]	.84	.150
1968	1.05[d]	.68	.241
1969	1.05[d]	.68	.241
1970	1.05[d]	.68	.231

[a]Loan rate in commercial corn area. Rates for noncommercial areas were $1.10 for 1950 and $1.22, $1.18, $1.24, $1.27, $1.02 for 1954 through 1958.

[b]Loan rates of $1.25, $1.10, and $1.06 for 1956, 1957, and 1958 were available for noncompliers in the commercial area. These values did not enter into calculations for this study.

[c]Direct support payments are included. They were 18 cents for 1963, 15 cents for 1964, and 20 cents for 1965.

[d]Direct support payments beginning with 1966 are included with diversion payments because they have functioned as a payment for minimum diversion since then. Hence, the announced support price consists only of the loan rate for these years.

[e]This value was omitted from analyses of corn acres planted, since planting occurred before the program provisions were announced.

and farmers did not have to restrict acreage to be eligible for price support loans. Thus, the diversion payment rates were zero and the effective support rates were identical to the actual support rates. Compare these years with the rest of the sixties, when both diversion payments and acreage restrictions were in effect as part of eligibility for price supports.

Notice that the level of effective support generally declined, while the level of diversion payments generally increased between 1961 and 1970. This reveals that the administrators of government programs were reducing incentives to plant corn and raising incentives to hold land out of corn production to avoid surpluses.[1] The effect of these actions on corn production and stocks can be seen in figure 2.

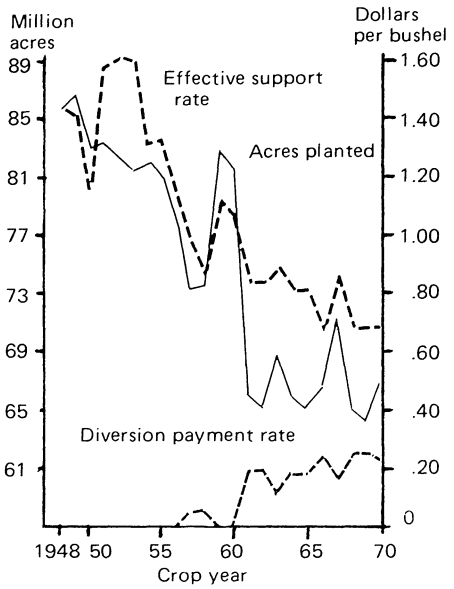

Figure 3. U.S. corn acres planted, effective support rate, and diversion payment rate, 1948-70

Figure 3 compares our two measures of government programs, the effective support rate and the diversion payment rate, with actual planting of corn. It is clear that farmers did raise and lower corn acreage in accord with changes in government programs.

We accounted for changes in these two measures of government programs, along with the price support rate for soybeans and acreage planted to grain sorghums, in a statistical analysis. We were able to explain about 99 percent of the variation in planted corn acreage for the 1948-70 period. The solid line in figure 4 shows actual corn plantings; the dashed line shows the estimates derived from our research.

Three interesting features of our work are worth highlighting.

1. Farmers quickly adjusted their planted corn acreage to changes in provisions of feed grain programs. This was true even when there were sharp changes in program provisions and, therefore, in corn acreage. An example is the sharp drop in planted corn acreage from 81.4 million acres in 1960 to 65.9 million acres in 1961.

2. Our research accurately portrays the changes that have taken place in planted corn acreage on the basis of the effective rate of support, the diversion rate, the soybean price support rate, and acreage planted to grain sorghums. This means that we have been able to capture in a few measures the essence of the widely different feed grain programs that prevailed in the 1948-70 period.

3. We have developed a basis for predicting in advance the level of corn plantings that would result from different feed grain program provisions. This should be useful to policy and program administrators, to farm and commodity organizations, and to farmers in evaluating the production, price, and income implications of alternative programs and program provisions.

[1]It cannot be concluded, however, that the profitability of corn production fell simply because price supports declined, since production costs per bushel were falling during the same period as a result of increased yields.

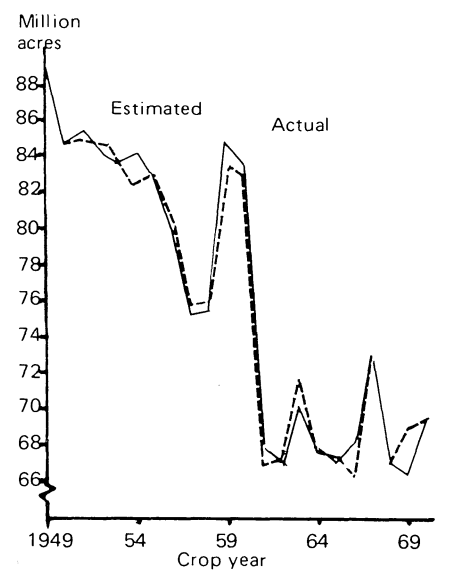

Figure 4. U.S. corn acreage planted, actual and estimated, 1949-70

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Views expressed herein are those of the authors, but not necessarily those of the sponsoring institutions.

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In 1970, the farmer could:	With minimum diversion	With maximum diversion
	acres	
Plant to corn*	160	100
Devote to conserving use (conserving base + diverted acreage)	90	150
Plant to another crop (e.g., soybeans)	50	50
But in 1971, the farmer could:		
Plant to corn*	210	
Devote to conserving use (conserving base + set aside)	90	
Plant to another crop	0	

*Maximum allowable

In 1972, the farmer could:	Minimum set-aside	Maximum set-aside Plan A	Maximum set-aside Plan B*
	acres		
Plant to corn	200	160	150
Devote to conserving use (conserving base + set aside)	100	140	130
Plant to another crop (e.g., soybeans)	0	0	20

*These calculations assume that 210 acres, the maximum allowed under the program, were planted to corn in 1971.

In 1971 the only requirement for government diversion payments and price support loans was to idle cropland equal to 20 percent of the participant's base acreage. No restriction was placed on planting. Because of the short corn crop in 1970 caused by blight, the government wished to encourage some increase in 1971 corn production to replenish stocks. However, with the significant relaxation of controls on feed grain acreage, there resulted a sharp increase in acres planted. Corn acreage in 1971 rose to 74.7 million from a level of 67.4 million in 1970, a jump of nearly 11 percent. The result of this acreage increase, together with good yields, was a record corn crop of 5.5 billion bushels, 600-700 million bushels above anticipated use.

For the 1972 crop year, the Set-Aside Program is more complex. The government wishes to reduce corn acreage from the 1971 level to bring output more into line with expected use. Target acreage, set by the U.S. Department of Agriculture, is 63 million acres.

To achieve this goal, the minimum set-aside for the 1972 Feed Grain Program was increased from 20 to 25 percent of the base acreage. In addition, two plans are being offered for additional voluntary diversion of crop acreage. Under one plan (plan A), an additional 20 percent of the base acreage may be idled, and farmers will receive a payment for it. As in 1971, no restriction is placed on corn planting. Under the other plan (plan B), up to an additional 15 percent of base acreage may be idled at a higher rate of payment if corn planting is restricted. The restriction is related to the acreage planted to corn in 1971. For each acre voluntarily idled for payment, corn acreage must be reduced 2 acres below the amount planted in 1971. For instance, if the entire 15 percent of additional acreage is diverted for payment, acreage equivalent to 30 percent of the base must be subtracted from acreage planted to corn in 1971.

For our hypothetical farm, the options available to a farmer in 1972 are:

For 1972 it is likely that both plans A and B will be utilized because A will be more profitable for some producers and B for others. In our predictions of 1972 corn plantings, we assumed that half the participants will opt for plan A and half for plan B.

Under the maximum diversion provisions (45 percent of base acreage under plan A and 40 percent under plan B), our estimates of corn plantings in 1972 are:

	Acres of corn planted (million)
Plan A only	69.4
Plan B only	67.5
Average, A and B	68.4

On the assumption that half opt for plan A and the other half for plan B, estimated corn plantings are 68.4 million acres. This latter number is very close to the USDA's March 1972 corn acreage intentions estimate of 68.6 million acres for 1972.

Our estimated corn acreage for 1972 of 68.4 million acres represents a reduction of 8 percent from the 1971 level. With normal yields prevailing in 1972, this would imply an estimated corn crop of about 5.1 billion bushels, which would be the second largest corn crop on record, exceeded only by the 1971 crop.

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