Corn Acreage Response and the Set-Aside Program*

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This paper modifies and employs a model previously developed for empirical evaluation of the impact of commodity price-support programs on corn acreage. (See J. P. Houck and M. E. Ryan, "Supply Analysis for Corn in the United States . . . ," Amer. Jour. Agr. Econ. 54: May 1972; and J. P. Houck and A. Subotnik, "The U.S. Supply of Soybeans . . . ," Agr. Econ. Res. 21 (4); 99-108, Oct. 1969.) This model is used to analyze the effect of the set-aside program on corn plantings. Estimates for corn acreage planted in 1971 range from 73.6 to 74.6 million compared with actual plantings of 74.7 million acres. For 1972, 68.1 to 69.7 million acres of corn are predicted.

Key words: U.S. corn supply; Government programs; policy; regression analysis; acreage response.

The recent analytical and empirical work on U.S. corn acreage supply functions discussed in this paper is part of an ongoing research project sponsored jointly by the U.S. Department of Agriculture and the Department of Agricultural and Applied Economics at the University of Minnesota. This investigation builds upon earlier analyses of corn supply by Houck and Ryan[1] and of soybean supply response by Houck and Subotnik.[2] The major goal of this research has been to develop reliable tools for policy advisers to use for estimating the aggregate acreage consequences of changes in Government commodity program provisions. Hence emphasis has been devoted to empirical measurement and analysis of the effects of policy variables on acreage planted.[3]

In the two previous papers the concept of an "effective" or "weighted" price support rate was developed as a means of incorporating both acreage restrictions and announced price supports into a single term subject to empirical measurement or estimation. Support rates were adjusted to account for acreage controls in various annual programs. Additional payments made by the Government for withholding land from production of a specified crop were treated as a supply shifter. Acreage planted was assumed to be a function of the adjusted or weighted price support, land diversion payments, and other supply determinants.

Specific objectives of this paper are (1) to adapt the basic model for analysis of set-aside program provisions, and (2) to modify the calculations of the original policy variables to account for a change in the program introduced in 1966.

The Theoretical Model

Figure 1 illustrates the model. Assume that S_1 is a static acreage supply function for a crop at various price support levels. Acreage is measured along the horizontal axis and support price along the vertical axis. At the announced price support of PA, producers would plant A_1 if there were no restrictions or conditions attached to the price support. But if policymakers wish to reduce acreage to, say, A_2, they could (1) drop the support rate to PF, (2) attach acreage-restricting conditions to obtaining the higher PA so that, on balance, acreage planted falls to A_2, (3) make diversion payments sufficient to shift the supply function to S_2, or (4) employ some combination of these three options. During 1956-58 and 1961-70, all three options were utilized in corn programs. Support payments were lowered somewhat, qualification for payments was tied to restricted corn plantings, and additional payments were made for withdrawing land from corn production. Under the 1971 set-aside program, option (3) was relied upon exclusively to reduce acreage planted. For 1972,

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[1] J. P. Houck and M. E. Ryan, Supply Analysis for Corn in the United States: The Impact of Changing Government Programs, Amer. Jour. Agr. Econ. 54: May 1972.

[2] J. P. Houck and Abraham Subotnik, The U.S. Supply of Soybeans: Regional Acreage Functions, Agr. Econ. Res. 21 (4): 99-108, October 1969.

[3] Research with other objectives, such as evaluation of program costs or income effects on various regions or farm types, would be likely to take different forms.

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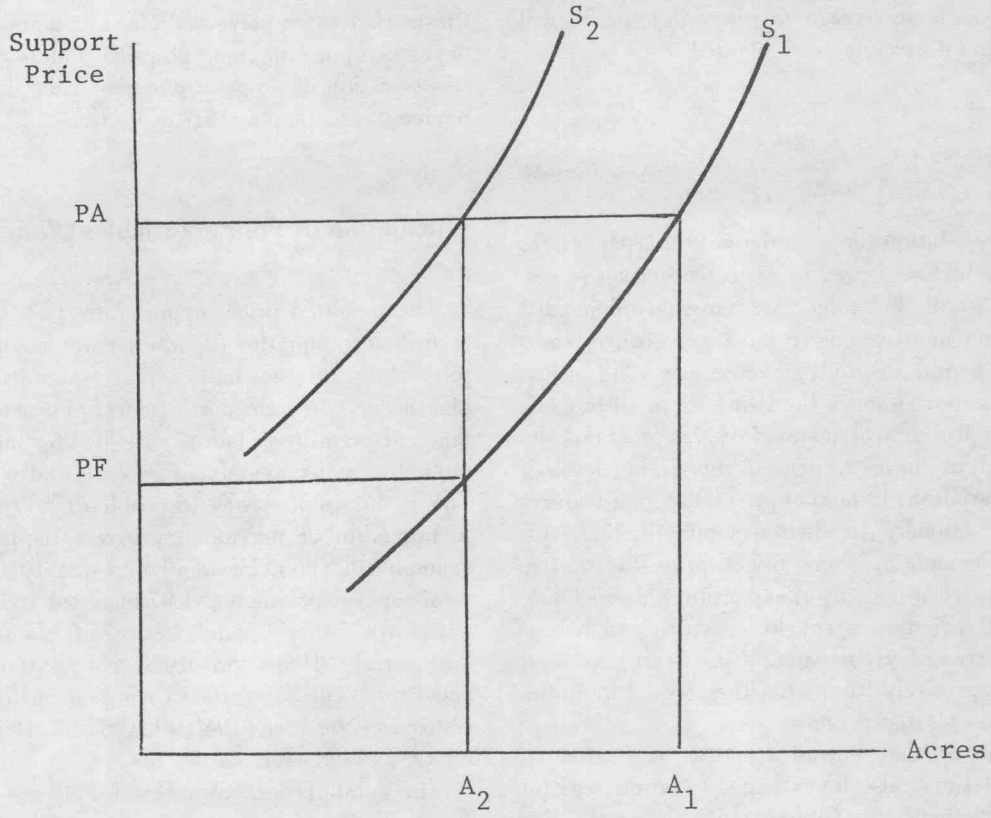

Figure 1

combination of (2) and (3) will be employed again. Option (1) was the method used solely in 1959 and 1960 when no planting restrictions applied.[4]

This model may be expressed as

(1) $A = f(PF, DP, Z)$

where A is corn acreage planted in the United States, PF is the support price weighted by planting restrictions, DP represents payments for diverting land from corn production, and Z includes other supply determinants and random factors. The analytical and empirical problems are to determine how to calculate PF and DP for any given set of program provisions.

Assume that

(2) $PF = rPA$,

and that

(3) $DP = wPR$

where PA is the announced support rate, r is the adjustment factor reflecting planting restrictions, PR is the payment rate for diversion, and w is the proportion of acreage eligible for diversion payments. Generally, the ranges of r and w are between 0 and 1.0. If no planting restrictions are imposed for obtaining PA, r equals 1.0. Similarly, if all land may be diverted for payment, w equals 1.0. The tighter the planting restrictions, the closer r will be to zero; and, the smaller the permitted diversion acreage, the closer w will be to zero. The values of PF and DP are seen to depend both upon payment levels (PA and PR) and upon the amount of acreage eligible for payment (r and w). Changes in any of these four variables, holding the others constant, will affect acreage planted. Increases in r or PA will

[4] In 1959-60, however, the price support was not lowered enough to sufficiently reduce acreage during those years to bring supply into balance with demand. Likewise, diversion payments were insufficient in 1971 to shift the supply function far enough to curtail output to the desired level. This should not imply that options (1) and (3) *cannot* be made to work but merely that they *were not* made to work, for a variety of reasons which are incidental to the argument of this paper.

raise *PF* and increase acreage; increases in *w* or *PR* will increase *DP* and decrease acreage planted.

Market Prices

The supply relationship considered in this paper does not explicitly include lagged or expected market prices. This is because market prices for corn have depended upon Government programs in most years since World War II—the period of study. Even since 1963, when market prices moved above the loan rate in all but one year, the supply control features of the programs, by curtailing output, have influenced the overall level of and annual variations in market prices. Program features are adjusted annually to elicit a supply in line with anticipated demand at some target price. Restrictive features are eased when output expansion is desired and, when output reduction is sought, incentives to reduce output are increased. Hence market prices are depressed or buoyed respectively from what they would be in the absence of changes in programs.

The argument that output response is related to policy variables may also be extended to producers who do not participate in Government programs. For instance, a relatively high price in year *t*-1 indicates a short supply situation. Program planners react to the short supply by easing output control programs in year *t* to increase output. And, if nonparticipants respond to the high price by increasing corn acreage in year *t*, they act in accord with the program changes. In a low-price, surplus situation, the converse would be true. Thus, as long as there is excessive productive capacity at the existing price level (the situation for corn throughout the postwar years) and as long as policymakers effectively control output, supply can be considered a function of Government programs, without separate consideration of market prices.

Policy variables can, in other words, capture the effect of market prices in inducing changes in supply; nothing is added to the analysis by the addition of market prices. Moreover, the close relationship between the two may present statistical difficulties and thereby be detrimental to the analysis.[5] This is not to infer that the market price plays no role. The amount demanded depends upon the market price and is an important consideration of program planners when they determine payment levels and acreage restrictions.

Calculation of Policy Variables (*PF* and *DP*)

The weighted price support rate (*PF*) was calculated according to equation (2) where *r* was assumed to be the proportion of the base acreage permitted for corn planting by program participants.[6] To account for the range of permitted planting provided for most years, the minimum and maximum shares allowed were averaged. This is the simplest way to enable *PF* to reflect changes in minimum or maximum program requirements. For example, in 1963, farmers could qualify for the $1.25 total support payment ($1.07 loan and 18 cents support payment) if they planted between 0.6 and 0.8 of their base acreage. Hence, for 1963, $r = 1/2(0.6 + 0.8) = 0.7$ and $PF = 0.7(1.25) = 0.875$. In years without planting restrictions on corn (1948-49, 1951-53, 1959-60, 1971), $r = 1.0$ and $PF = PA$.

The computations of values for *DP* are according to equation (3). If the payment rate differed for various levels of diversion, equation (3) was disaggregated, i.e.,

$$DP = w_1 PR_1 + w_2 PR_2$$

where the subscripts 1 and 2 refer to different payment rates for different portions of the diverted acreage. Furthermore, since a range of diversion was allowed for most years, minimum and maximum provisions were averaged as was done in calculating *PF*. For instance, for 1966 a minimum of 20 percent and a maximum of 50 percent of the base acreage could be diverted for payment. The payment rate was 75 cents per bushel for estimated production on the first 20 percent of the base diverted and 65 cents per bushel

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[5] For 1949-69, Houck and Ryan, op. cit., found a high correlation between the weighted price support in year *t* (PF_t) and the average price received by farmers for corn in year *t*-1 (P_{t-1}), as well as a linear trend factor (*T*). The regression equation is

$$PF_t = \underset{}{0.1717} + \underset{(4.9)}{0.8983}\, P_{t-1} - \underset{(3.4)}{0.0185}\, T$$

$$R^2 = 0.86$$

where the numbers in parentheses are *t*-values. That is, a given change in the market price was associated with a similar change in the weighted price support for the following year about 90 percent as large as the market price change, adjusted for a small negative secular change.

[6] This method of estimating *r* is treated in more detail in the two papers referred to earlier.

on the next 30 percent of base acreage diverted.[7] Therefore, $w_1 = 0.2$, $w_2 = 0.3$, $PR_1 = 0.75$, $PR_2 = 0.65$, and $DP = 1/2[0.2 \times 0.75) + (0.2 \times 0.75 + 0.3 \times 0.65)] = 0.248$. The term (0.2×0.75) represents the diversion payment for the minimum level of participation only. The other term, $(0.2 \times 0.75 + 0.3 \times 0.65)$, represents *DP* for the maximum diversion of 50 percent of the base. Because the payment rate (*PR*) differs between the first 20 percent and the second 30 percent diversion, there are two parts to this term. The terms for minimum diversion and maximum diversion are averaged in the calculation of *DP* so that changes in either minimum or maximum program requirements will be captured by the policy variable.[8]

Calculations of Policy Variables for Set-Aside Program Provisions

The policy variables *PF* and *DP* can be computed to reflect set-aside provisions as offered in 1971 and 1972 corn programs. For 1971, the announced support price, *PA*, was guaranteed for all corn grown without a specific restriction on corn plantings. Hence, in computing *PF* from the equation $PF = rPA$, $r = 1.0$, implying no restriction on corn plantings, and $PF = PA$. For 1971, the value of *PF* was \$1.05, the loan rate. Compare this with *PF* for 1970 when the loan rate was the same but planting was restricted to between 50 and 80 percent of base acreage. Hence $r = 1/2(0.5 + 0.8) = 0.65$ and $PF = (0.65)(1.05) = 0.68$. The increase of *PF* from 0.68 in 1970 to 1.05 in 1971 reveals the increased incentive to plant corn resulting from removal of planting restrictions, according to our calculations.

In 1971, the only requirement for participation was to idle cropland equal to 20 percent of the participant's base acreage. A payment was made for this diversion, thus shifting the supply function of the participant to the left. The diversion payment rate, *PR*, was 80 cents; thus, according to the equation $DP = wPR$, $DP = (0.2)(0.80) = 0.160$. No additional optional diversion was offered, so no averaging of minimum and maximum provisions is required.

Program provisions for 1972 are more complex. Provisions for minimum diversion are like those for 1971 except that the required minimum set-aside was increased from 20 to 25 percent of base acreage. The loan rate (*PA*) was continued at \$1.05 and the diversion payment (*PR*) at 80 cents. In addition, two plans are offered for additional voluntary diversion: plan A (the original provisions) and plan B (the new option offered in February 1972). For both plans an additional diversion of 10 percent is assumed here to be the maximum possible for payment.

Under plan A, an additional 10 percent of base acreage may be idled for payment at the rate of 52 cents per bushel. No restriction is placed on corn planting. Hence the calculations of *PF* and *DP* are

$$PF = 1.05$$

$$DP = 1/2[(0.25 \times 0.80) + (0.25 \times 0.80 + 0.10 \times 0.52)] = 0.226$$

PF equals the loan rate because $r = 1.0$ (no planting restrictions). The term (0.25×0.80) in the *DP* computation represents the diversion payment for the minimum level of participation only. The other term, $(0.25 \times 0.80 + 0.10 \times 0.52)$, represents *DP* for the maximum set-aside, considered to be 35 percent in this discussion. A simple average of the two terms gives a *DP* reflecting both minimum and maximum participation provisions.

Under plan B, up to an additional 10 percent of base acreage may be idled for payment at the rate of 80 cents *if* corn planting is restricted. The restriction is related to 1971 corn plantings. 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 10 percent of additional acreage is diverted for payment, acreage equivalent to 20 percent of the base must be subtracted from acreage planted to corn in 1971. For this plan, *PF* and *DP* would be:

$$PF = 1/2[(1.0)(1.05) + (0.8)(1.05)] = 0.945$$

$$DP = 1/2[(0.25 \times 0.80) + (0.25 \times 0.80 + 0.10 \times 0.80)] = 0.240$$

[7] The payment for the required 20 percent diversion is called a support payment in the language of the program but since it functions as a payment for minimum diversion it is treated as a diversion payment here. The payment was 30 cents per bushel for 50 percent of the base. By treating this payment as a diversion payment for the required 20 percent diversion, this amounts to 75 cents per bushel for 20 percent of the base ($0.30 \times 0.5 = 0.2X$, which gives $X = 0.75$).

[8] The importance of accounting for both minimum and maximum diversion payments in the calculation of *DP* may be discerned in the calculation for 1965. In that year, the diversion payment for minimum diversion (20 percent) was 40 cents a bushel but the payment for maximum diversion (50 percent) was \$1.00 per bushel for the entire diverted acreage. Hence, $DP = 1/2[(0.2 \times 0.40) + (0.5 \times 1.00)] = 0.290$.

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In the *PF* calculation, the term (0.8)(1.05) reflects the restriction on corn planting to qualify for the program at the 10 percent additional set-aside level. The value 0.8 is used because eligible acreage for corn planting is assumed to be 80 percent of 1971 plantings.[9] The actual percentage reduction will vary considerably from farm to farm depending upon the assigned base acreage and 1971 plantings but, in the aggregate, it can be assumed to average about 20 percent.

For 1972, it is likely that both plan A and plan B will be utilized because A will be more profitable for some producers and B for others. The question, then, is which set of values for *PF* and *DP* should be used to predict 1972 corn acreage, or should some combination of the two plans be used? Without knowledge of participation rates under the two plans, one way to account for both in the estimation process is to take a simple average, which yields: *PF* = 1.00 and *DP* = 0.233. All three values of *PF* and *DP* are employed later to predict 1972 acreage from estimators derived from 1949-70 observations.

Calculated values for *PF* and *DP*, along with the announced support rate, *PA*, are contained in table 1 for 1948-72.[10] For 1948-65 these values are identical with those used in the previous Houck-Ryan corn supply analysis. Beginning with 1966, however, the direct support payment is considered here as a diversion payment rather than as a supplement to the loan rate as it was treated in the earlier work.[11] The variable *PA* is merely the announced national average loan rate, plus direct support payments for crop years 1963-65. Support payments for these 3 years functioned as supplemental payments for production, increasing with output and decreasing if output were cut back. In 1966 and subsequent years, support payments are a fixed amount and hence function as a diversion payment.

Empirical Results

Using the policy variables and other independent variables, corn acreage supply functions for the United States were estimated by ordinary least squares. The statistical estimation encompasses 22 crop years, from 1949 through 1970. The results of three estimations are shown in table 2 and figures 2, 3, and 4.

Corn program policy variables, *PF* and *DP*, contribute importantly to the explanation of changes in acreage planted. A 10-cent increase in *PF* results in an estimated increase of 895,000 to 979,000 acres in planted acreage. The estimated effect of a 10-cent increase in *DP* is associated with a decrease of 4.4 to 5.2 million acres in planting.

Soybeans compete with corn for production resources since corn land is also generally desirable for growing soybeans. The support price of soybeans (*PSS*) is entered to measure this substitution. As estimated, a 10-cent increase in *PSS* leads to a decrease of 0.9 to 1.0 million acres in corn plantings.[12] Grain sorghum has been another important substitute for corn. Before 1961, sorghum acreage was not restricted. A farmer qualifying for feed grain loans could plant any amount he wished and could even plant sorghums on land

[9] This assumption implies that the U.S. corn base available for planting, derived from 1959-60 corn acreage planted, is approximately the equivalent of the acreage planted to corn in 1971. A comparison of the corn base and 1971 corn acreage planted supports this assumption. The comparison was made as follows: 1971 corn acreage on farms participating in the Government corn program was divided into two groups. The first group consisted of acreage planted which was less than 80 percent of the assigned corn base acreage on participating farms, and the second group contained acreage which equaled or exceeded 80 percent of the base. (The 80 percent figure is used because it is the remainder of the base available for planting if the 1971 set-aside of 20 percent had come from the base.) For the first group, actual acreage planted to corn in 1971 was 12 million acres *less* than 80 percent of base acreage for this group; for the second group, actual corn acreage planted in 1971 was 11 million acres *more* than 80 percent of their base. Thus, in relation to the base, "underplanting" by the first group was just about equal to "overplanting" by the second group. Therefore, in the calculation of *PF* under plan B provisions, the average planting restriction for a 10 percent additional set-aside can be presumed to be a 20 percent reduction from 1971 acreage. (Data for the comparison were obtained from 1971 Set-Aside Programs Annual Report, Agr. Stabil. and Conserv. Serv., January 1972, p. 59.)

[10] Calculations are based on program details obtained from various issues of the Feed Situation, Econ. Res. Serv., 1947-72.

[11] This change had no appreciable effect on the explanatory power of the acreage supply equation.

[12] The estimated effect of changes in the soybean support rate should be viewed with special caution. Analyses with shorter time series (1949-59, 1960-69, and 1961-71) indicate that the effect was stronger prior to 1960 or 1961 than in recent years. The estimated coefficient based on data for the 1960's is about one-half the size of the coefficient for the entire series. The possibility that these equations overestimate the effect in recent years is further substantiated by observation of the estimated and actual acreage values for 1966 and 1969. In these 2 years the soybean rate was changed appreciably and the acreage estimates diverged from actual values to a greater extent than in other years. It is therefore suggested that, if the soybean support rate is changed in future years, a coefficient in the range of 4,000 to 6,000 be applied instead of the estimated 9,000 to 10,500. This would mean that a 10-cent increase in the soybean support rate would decrease corn acreage by 0.4 to 0.6 million acres instead of 0.9 to 1.0 million as estimated.

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Using the policy variables and other independent variables, corn acreage supply functions for the United States were estimated by ordinary least squares. The statistical estimation encompasses 22 crop years, from 1949 through 1970. The results of three estimations are shown in table 2 and figures 2, 3, and 4.

Corn program policy variables, *PF* and *DP*, contribute importantly to the explanation of changes in acreage planted. A 10-cent increase in *PF* results in an estimated increase of 895,000 to 979,000 acres in planted acreage. The estimated effect of a 10-cent increase in *DP* is associated with a decrease of 4.4 to 5.2 million acres in planting.

Soybeans compete with corn for production resources since corn land is also generally desirable for growing soybeans. The support price of soybeans (*PSS*) is entered to measure this substitution. As estimated, a 10-cent increase in *PSS* leads to a decrease of 0.9 to 1.0 million acres in corn plantings.[12] Grain sorghum has been another important substitute for corn. Before 1961, sorghum acreage was not restricted. A farmer qualifying for feed grain loans could plant any amount he wished and could even plant sorghums on land

[9] This assumption implies that the U.S. corn base available for planting, derived from 1959-60 corn acreage planted, is approximately the equivalent of the acreage planted to corn in 1971. A comparison of the corn base and 1971 corn acreage planted supports this assumption. The comparison was made as follows: 1971 corn acreage on farms participating in the Government corn program was divided into two groups. The first group consisted of acreage planted which was less than 80 percent of the assigned corn base acreage on participating farms, and the second group contained acreage which equaled or exceeded 80 percent of the base. (The 80 percent figure is used because it is the remainder of the base available for planting if the 1971 set-aside of 20 percent had come from the base.) For the first group, actual acreage planted to corn in 1971 was 12 million acres *less* than 80 percent of base acreage for this group; for the second group, actual corn acreage planted in 1971 was 11 million acres *more* than 80 percent of their base. Thus, in relation to the base, "underplanting" by the first group was just about equal to "overplanting" by the second group. Therefore, in the calculation of *PF* under plan B provisions, the average planting restriction for a 10 percent additional set-aside can be presumed to be a 20 percent reduction from 1971 acreage. (Data for the comparison were obtained from 1971 Set-Aside Programs Annual Report, Agr. Stabil. and Conserv. Serv., January 1972, p. 59.)

[10] Calculations are based on program details obtained from various issues of the Feed Situation, Econ. Res. Serv., 1947-72.

[11] This change had no appreciable effect on the explanatory power of the acreage supply equation.

[12] The estimated effect of changes in the soybean support rate should be viewed with special caution. Analyses with shorter time series (1949-59, 1960-69, and 1961-71) indicate that the effect was stronger prior to 1960 or 1961 than in recent years. The estimated coefficient based on data for the 1960's is about one-half the size of the coefficient for the entire series. The possibility that these equations overestimate the effect in recent years is further substantiated by observation of the estimated and actual acreage values for 1966 and 1969. In these 2 years the soybean rate was changed appreciably and the acreage estimates diverged from actual values to a greater extent than in other years. It is therefore suggested that, if the soybean support rate is changed in future years, a coefficient in the range of 4,000 to 6,000 be applied instead of the estimated 9,000 to 10,500. This would mean that a 10-cent increase in the soybean support rate would decrease corn acreage by 0.4 to 0.6 million acres instead of 0.9 to 1.0 million as estimated.

Table 1.—Announced support prices, calculated weighted support rates, and diversion payment rates per bushel of corn, 1948-72

Year	Announced support price (*PA*)	Weighted support rate (*PF*)	Diversion payment rate (*DP*)
	Dol.	*Dol.*	*Dol.*
1948	1.44	1.44	0
1949	1.40	1.40	0
1950	[a]1.47	1.15	0
1951	1.57	1.57	0
1952	1.60	1.60	0
1953	1.60	1.60	0
1954	[a]1.62	1.30	0
1955	[a]1.58	1.33	0
1956	[a,b]1.50	1.16	[f].043
1957	[a,b]1.40	.96	.043
1958	[a,b]1.36	.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	[c]1.25	.88	.112
1964	[c]1.25	.81	.180
1965	[c]1.25	.81	.180
1966	[d]1.00	.65	.248
1967	[d]1.05	.84	.150
1968	[d]1.05	.68	.241
1969	[d]1.05	.68	.241
1970	[d]1.05	.68	.231
1971	[d]1.05	1.05	.160
1972 (plan A) [e]	[d]1.05	1.05	.226
72 (plan B) [e]	[d]1.05	.94	.240

[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, respectively.

[b] Loan rates of $1.25, $1.10, and $1.06 for 1956, 1957, and 1958, respectively, 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 are 18¢ for 1963, 15¢ for 1964, 20¢ 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, *PA* consists only of the loan rate for these years.

[e] See the text for an explanation of plan A and B calculations for *PF* and *DP*.

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

withdrawn from corn production in accordance with corn program requirements. Beginning with 1961, however, corn and sorghum substitution was curtailed. This program change was hypothesized to alter the corn-sorghum relationship at this point in the study period. The basic assumption is that acreage of these two crops was much more substitutable before 1961 than after. To account for this change in the analysis, actual sorghum acreage is entered as an independent variable prior to 1961 and then for 1961 to 1970 set at the mean value of the previous 12 crop years. The estimates indicate that a 1-acre increase in sorghum planting during 1949-60 reduced corn acreage by about 0.3 acre.[13]

These estimations differ from those in the Houck-Ryan paper in two respects. First, one more year (1970) is included here, and second, these equations contain a dummy variable (*DV* = 1 in 1966-70 and 0 in other years) to account for the change beginning in 1966 when support payments were shifted from the calculations of

[13] For a more detailed discussion of the corn-sorghum relationship, see Houck and Ryan, op. cit.

Table 2.–Estimation of U.S. corn acreage planted, 1949-70 (regression coefficients and *t*-values)

Dependent Variable = *A*

Equation	Constant	*PF*	*DP*	*PSS*	*AGM*	*DV*	*T*	Log *T*	R^2	$\bar{s}$
2-1	99,316.90	8,954.82 (3.2)	-48,061.40 (5.3)	-10,010.35 (4.7)	-0.34 (3.4)	7,016.16 (7.5)	-243.86 (2.2)		0.986	1,114.60
2-2	95,828.97	9,409.48 (3.2)	-52,323.32 (5.7)	-8,997.60 (4.0)	-.28 (2.4)	6,184.16 (7.0)		-2,598.52 (1.7)	.984	1,172.94
First Differences of All Variables										
2-3	-326.47	9,793.71 (3.7)	-43,898.97 (5.3)	-10,494.47 (4.2)	-0.26 (2.0)	8,689.21 (5.4)			0.927	1,450.00

Variable Descriptions

A = U.S. acreage of corn planted, in thousands

PF = U.S. average corn loan rate (plus direct support payments, 1963-65), weighted by acreage restriction requirements, in dollars per bushel

DP = corn acreage diversion payment rate, weighted by eligible diversion acreage, in dollars per bushel

PSS = U.S. average soybean price support loan rate, in dollars per bushel

AGM = U.S. acreage of sorghums planted for 1949-60 and the mean of 1949-60 acreage for 1961-70, in thousands

DV = 0 in 1949-65 and 1 in 1966-70

T = linear trend (1949 = 1, 1950 = 2, etc.)

Log *T* = 1949 = log of 1, 1950 = log of 2, etc.

$\bar{s}$ = standard error of the estimate

The values in parentheses are *t*-values of the regression coefficients.

PF to *DP*. Data used for these estimations are presented in appendix table 1.

Prediction of 1971 and 1972 Acreage

The equations in table 2 were employed to predict 1971 and 1972 corn acreage planted, using the *PF* and *DP* values already calculated and the appropriate values for the other variables. The results in millions of acres are shown in table 3.

Predicted 1971 acreage planted was very close to actual planting, yet it was slightly underestimated by all three estimators. The underestimation might be accounted for by more corn planting on small farms in 1971 than in previous years. (Special small-farm diversion features were discontinued when the set-aside program became effective.) These reasonably successful results suggest that this model and the manner employed

Table 3.–Predicted corn acreage

Item	Actual	Predicted by equation no.		
		2-1	2-2	2-3
1971	74.7	73.6	74.6	74.3
1972:[a]				
Plan A only		70.2	70.8	71.7
Plan B only		68.6	69.0	70.0
Average A & B		69.4	69.9	70.7
1972:[b]				
Plan A only		69.0	69.4	70.6
Plan B only		67.2	67.5	68.7
Average A & B		68.1	68.4	69.7

[a] All estimates based on a maximum allowable diversion of 35 percent of base acreage.

[b] Plan A estimates based on a maximum allowable diversion of 45 percent of base acreage and plan B estimates on a 40 percent maximum.

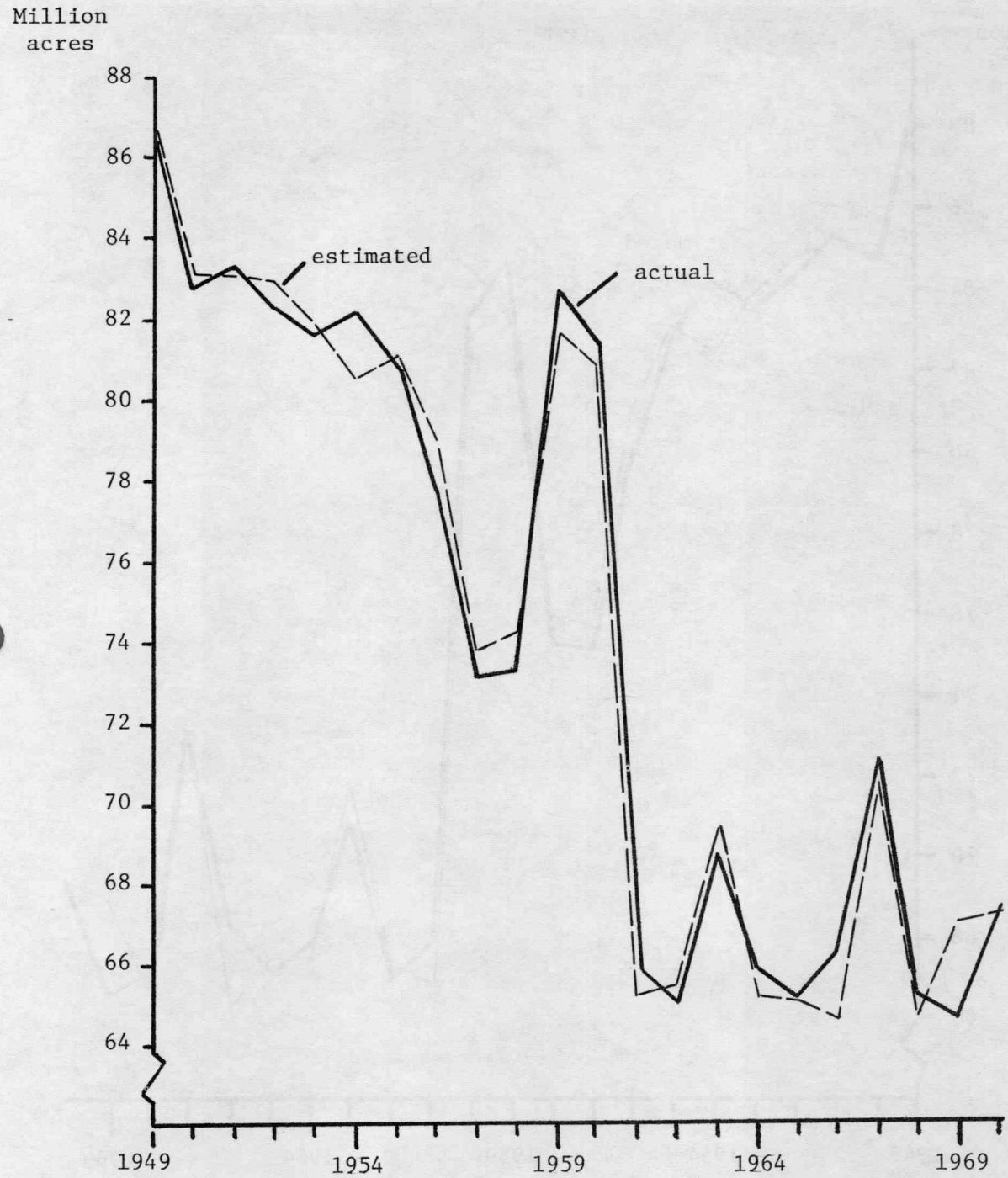

Figure 2.—U.S. corn acreage planted, actual and estimated, 1949-70 (equation 2-1).

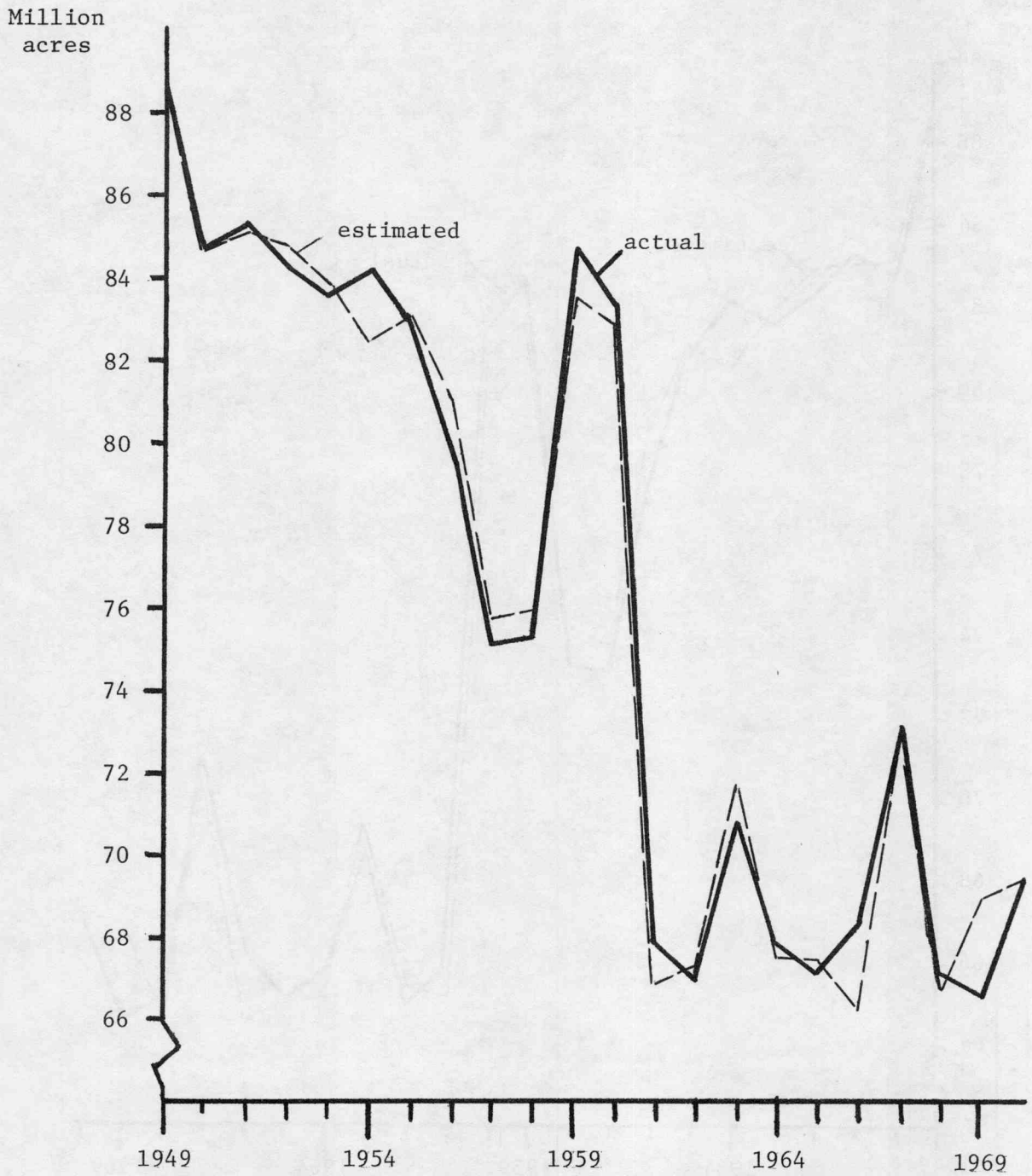

Figure 3.—U.S. corn acreage planted, actual and estimated, 1949-70 (equation 2-2).

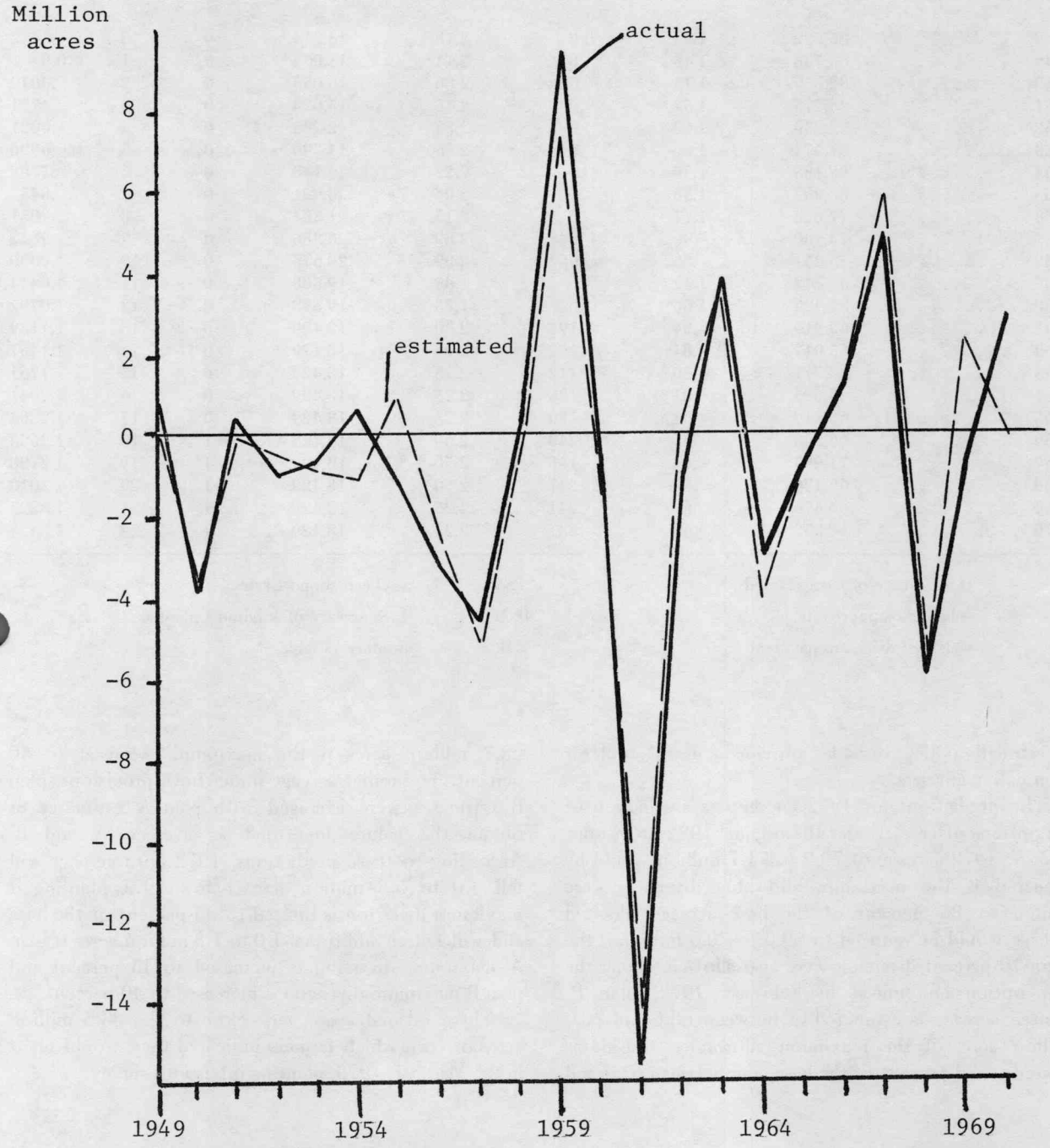

Figure 4.—Annual change in U.S. corn acres planted, actual and estimated, 1949-70 (equation 2-3).

Appendix table 1.—The data series

Crop year	*A*	*PF*	*DP*	*PSS*	*AGM*	*DV*	*T*	Log *T*
	1,000 acres	*Dol./bu.*	*Dol./bu.*	*Dol./bu.*	*1,000 acres*			
1948	85,522	1.44	0.0	2.18	13,214	0	0	--
1949	86,738	1.40	.0	2.11	11,064	0	1	0.0
1950	82,859	1.15	.0	2.06	16,055	0	2	.3010
1951	83,275	1.57	.0	2.45	15,028	0	3	.4771
1952	82,230	1.60	.0	2.56	12,289	0	4	.6021
1953	81,574	1.60	.0	2.56	14,590	0	5	.6990
1954	82,185	1.30	.0	2.22	20,148	0	6	.7782
1955	80,932	1.33	.0	2.04	23,921	0	7	.8451
1956	77,828	1.11	.0	2.15	21,384	0	8	.9031
1957	73,180	.96	.043	2.09	26,886	0	9	.9542
1958	73,351	.86	.052	2.09	20,675	0	10	1.0000
1959	82,742	1.12	.0	1.85	19,508	0	11	1.0414
1960	81,425	1.06	.0	1.85	19,598	0	12	1,0792
1961	65,919	.84	.192	2.30	18,429	0	13	1.1139
1962	65,017	.84	.192	2.25	18,429	0	14	1.1461
1963	68,771	.88	.112	2.25	18,429	0	15	1.1761
1964	65,823	.81	.180	2.25	18,429	0	16	1.2041
1965	65,119	.81	.180	2.25	18,429	0	17	1.2304
1966	66,306	.65	.248	2.50	18,429	1	18	1.2553
1967	71,093	.84	.150	2.50	18,429	1	19	1.2788
1968	65,126	.68	.241	2.50	18,429	1	20	1.3010
1969	64,476	.68	.241	2.25	18,429	1	21	1.3222
1970	67,352	.68	.231	2.25	18,429	1	22	1.3424

A = U.S. acreage of corn planted
PF = weighted support rate
DP = weighted diversion payment
PSS = soybean support rate
AGM = U.S. acreage of sorghums planted
DV = dummy variable

to estimate policy variables provide a useful tool for farm policy advisers.

The predictions for 1972 encompass a selection of the options offered. Under the original 1972 provisions, plan A, 1972 acreage of 70.2 to 71.7 million would be expected if the maximum allowable diversion were limited to 35 percent of the base acreage. Planted acreage would be reduced to 69.0 to 70.6 million if the extra 10 percent diversion were also allowed. Under the new option announced in February 1972, plan B, planted acreage is estimated at between 68.6 and 70.0 million acres if the maximum allowable set-aside is limited to 35 percent of the base, and between 67.2 and 68.7 million acres if the maximum is raised to 40 percent. To predict acreage under both provisions, plan B estimates were averaged with plan A estimates to obtain the values identified as average A and B. According to these predictions, 1972 corn acreage will fall 4.0 to 5.3 million acres below 1971 planting if maximum diversion is limited to 35 percent of the base and will fall an additional 1.0 to 1.3 million acres if plan A maximum diversion is increased to 45 percent and plan B maximum diversion is increased to 40 percent.

These estimates are very close to the 68.5 million acres of corn which farmers indicated they would plant in the March 1, 1972, planting intentions survey.