PROCEEDINGS

44th Annual Meeting

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

Squaw Valley, California
July 25, 26, 27, 1971

Samuel H. Logan, Editor

COMMERCIAL AGRICULTURE: POLICY AND INDUSTRY CHANGES

Chairman: Elmer L. Menzie, University of Arizona

ESTIMATES OF 1972 GREAT PLAINS PRODUCTION RESPONSE TO THE AGRICULTURAL ACT OF 1970

Thomas A. Miller
Farm Production Economics Division, Economic Research Service,
U.S. Department of Agriculture, Colorado State University

Accurate estimates of the impact of government farm programs on future land use and production are essential ingredients in the process of policy making and administration. Presently, the Secretary of Agriculture is in the process of formulating specific details of the Agricultural Act of 1970 as they are to apply to feed grains for the 1972 crop year. Key decisions to be made include the level of the required set-aside acreage for feed grains and whether to offer payments for additional voluntary diversion of feed-grain acreage.

With the changes in commodity programs brought about by the 1970 Farm Act, some past procedures for estimating land use, acreage and production response to commodity program variables are no longer reliable. New approaches are required to recognize the differences in ways to achieve production control. This paper describes a component of the research currently underway in ERS to provide estimates of the impact of current commodity programs.[1/]

Problems of Estimating Response to the 1970 Farm Act

Several characteristics of the 1970 Farm Act make response estimation more difficult than has been true for the farm programs immediately preceding it. "Set-aside" as a method of production control is vastly different from the "diversion" of previous programs. The commodity programs of 1961 through 1970 controlled production primarily by allotments and bases for wheat and feed grains that restricted acreages of these specific crops. Historical adjustments in allotments and diversion from the feed-grain base have statistically accounted for a high proportion of changes in cropland use. The 1970 Farm Act, on the other hand, relies entirely on required minimum acreages in conserving use to control production.[2/] Once a participating farmer agrees to keep a certain acreage in conserving use, he can plant whatever crop he wishes on his remaining acres. The conserving use restraint thus becomes the basis for making estimates of land useage under the 1970 Farm Act.

The problem is that even though previous commodity programs included a requirement for conserving use, statistical analyses of Great Plains data have shown the requirement had little impact on aggregate cropping patterns after other variables were considered. Accurate information on land in conserving use and its impact on crop acreages are difficult to obtain, due at least in part to the extensive nature of land use and the lack of data on summerfallow, pasture, and idle cropland. Thus, two interesting questions arise. Do changes in the set-aside requirement, since they represent additions to the total required acreage of land in conserving use, have any significant impact on aggregate cropland use? If so, is it possible to estimate this impact with enough precision to be useful in estimating cropland use?

Statistical Estimates of Land Use Response

To answer these questions, a statistical examination was undertaken of the historical relationship between the ASCS conserving use requirement and cropland use in the Great Plains. The relationship assumed for each of the six Great Plains states was of the form:

$$Y = a + b_1X_1 + b_2X_2 + e$$

where

Y = Cropland actually devoted to conserving use defined as the sum of hay, seed crops, summerfallow, a part of fall planted small grain abandonment, and other residual cropland.

X_1 = The ASCS conserving use requirement defined as the sum of the conserving base, the acres diverted from wheat and feed grains under annual commodity programs, and acreage diverted under the Conservation Reserve and Cropland Adjustment Program

(CAP).[3/]

X_2 = A dummy variable to measure time shifts in the relationship: 1961 = 1, 1962 = 2, . . ., 1970 = 10.

e = Residual variation.

Ordinary least-squares regression estimates were made for a, b_1 and b_2. Table 1 presents the estimated regression coefficients. The coefficients for b_1 were quite significant in all states except Colorado and ranged from about 0.37 in Wyoming to about 0.63 in Nebraska. In Colorado, although the regression coefficient is not significant, it has a reasonable sign and magnitude. The weighted average of these coefficients for the six states, using acres of cropland in conserving use as weights, is 0.4820. Thus, in the six states, a one-acre increase in the ASCS conserving use requirement in the past has increased the cropland in conserving use by about one-half acre.

The X_2 variable was significant in North Dakota, South Dakota, and Kansas. This variable has the effect of shifting the regression line upward each year. Thus, the shift represented by X_2 in these states represents the annual increase in land in conserving use over the minimum ASCS requirement.

As shown in Table 1, four of the estimated equations are significant at the 1 percent level and one at the 5 percent level. The equations explain from 31 to 88 percent of the historical variation of land in conserving use.

Table 1. Relationship Between Cropland in Conserving Use and ASCS Conserving Use Requirement, 1961-70 Data

State	$\hat{a}$	$\hat{b}_1$	$\hat{b}_2$	F_t	S_e	R^2
North Dakota	7493.8	0.39662** (0.06281)	66.58* (25.43)	20.0**	175.1	.8695
South Dakota	3906.0	0.45697** (0.10891)	72.92* (26.22)	8.85*	141.7	.7469
Nebraska	3799.3	0.63374** (0.10039)	---	39.9**	201.9	.8328
Kansas	5907.2	0.50232** (0.07402)	136.95** (28.31)	24.9**	228.1	.8766
Wyoming	770.1	0.36547** (0.09075)	---	16.2**	16.0	.6697
Colorado	3719.6	0.44578 (0.23407)	---	3.63	270.2	.3119

Note: Standard errors of regression coefficients are shown in parenthesis.
* = Significant at the 0.05 level; and ** = Significant at the 0.01 level.

Estimated 1972 Cropland Use

The estimated equations provide a basis for estimating land in conserving use in future years. For the 1970 Farm Act, the conserving base, the wheat and feed-grain set-aside, and CAP land become the ASCS requirement for conserving use. Given an exogenous estimate of participation in the program and specified set-aside requirements, land in conserving use can be determined from the estimated equations. Then by subtracting land in conserving use from total cropland and correcting for any double counting, land devoted to major crops can be estimated.

A decision about the future expected level of X_2 must be made in order to use the estimated equations for predictive purposes. At least two arguments are possible: (1) the excess of land in conserving use will maintain or increase its level under the 1970 Act, or (2) the 1970 Act would result in a reduction in this excess land in conserving use back to

earlier levels. For the analysis reported in this paper, the second argument is assumed valid. It is anticipated that the program would put rather intense downward pressure on this excess land in conserving use because of the sole reliance on land in this category as a production restraint. Thus, the change to the new program would be expected to result in a shift in the historically determined least-squares estimates to earlier 1961-1963 levels.

Figure 1 shows the 1961-70 aggregate regression line between the ASCS conserving use requirement in the Great Plains and cropland devoted to major crops as determined by subtracting the acreage in conserving use estimated by the regression equations from the total cropland. Also plotted are actual 1961 to 1971 relations and the 1972 estimate. Cropland use for 1972 is estimated nearly 1.3 million acres above the historical least-squares regression line as determined by the X_2 variable and the anticipation that the set-aside program will result in rather significant upward pressure on land use by major crops. In the states analyzed, the expected relationship for 1972 moves back toward its level in 1961-1963, as shown in Figure 1.

The 1972 estimate is based on an assumed set-aside requirement of 85 percent for wheat and 25 percent for corn and grain sorghum with participation rates of 95, 85, and 86 percent, respectively. Currently there is a high degree of uncertainty surrounding the extent and impact of ASCS conserving base adjustments in 1971 and 1972. This analysis has assumed a 1972 conserving base of 21,878,500 acres in the Great Plains (a level that may turn out to be on the high side). As shown in Figure 1, these assumptions result in 75,396,000 acres being devoted to major crops.

Figure 1 shows the relationship of July 1971 SRS planted acreages and 1971 program sign-up data. The 1971 data are about 150,000 acres below the average regression line and 1,440,000 acres short of the anticipated 1972 relationship. This divergency may be explained by (1) the fact that the 1971 winter wheat crop was small and planted before the program was known to farmers and (2) the expectation that farmers will require more than one year to make the implied adjustment between the low level of cropland devoted to major crops in 1970 and the normal level expected under the set-aside program.

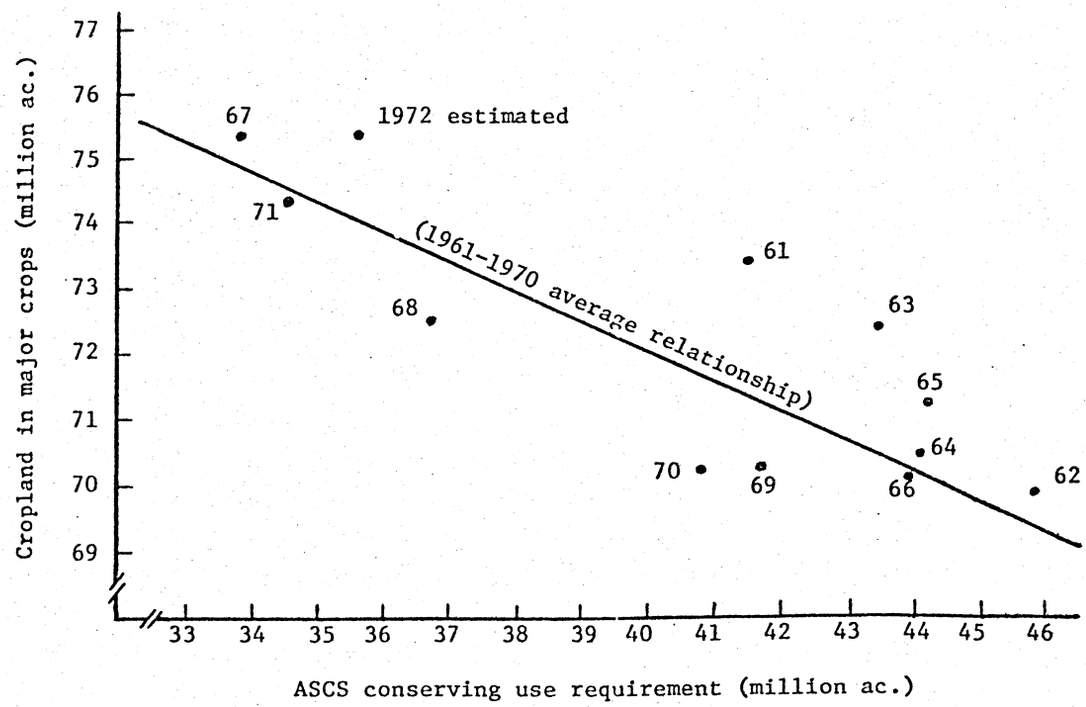

Figure 1. Relationship Between the ASCS Conserving Use Requirement and Cropland Devoted to Major Crops in the Great Plains.

Table 2 shows the allocation of this cropland acreage to major crops as estimated by the linear programming model component of APAS. It also compares the major estimates of land use with data for the previous five years. The subtotal of land devoted to major crops for 1972, 75,396,000 acres, is quite close to 1967 levels. 1967 was the least restrictive farm program year in recent history with a large (68,200,000 acres nationally)

Table 2. Comparison of 1972 Estimated Land Use With 1967-1971 Actual Acreages -- Six Great Plains States

	1967	1968	1969	1970	1971	1972 estimated
			1,000 acres			
Planted acres:						
All wheat	31,310	29,406	26,332	24,134	26,818	29,380
Barley	3,616	3,780	3,366	3,194	3,770	3,371
Oats	5,386	5,935	6,539	7,040	5,979	6,364
Rye	845	758	1,151	1,228	1,556	1,305
Corn	11,312	10,690	11,073	11,883	13,076	12,159
Grain sorghum	8,100	7,627	7,001	7,141	8,600	7,666
Flax	1,717	1,741	2,144	2,426	1,440	1,947
Soybeans	2,324	2,298	2,087	2,338	2,072	2,585
Tame hay (harv.)	10,753	10,338	10,662	10,886	11,105	10,619
Subtotal	75,363	72,573	70,355	70,270	74,416	75,396
Seed crops (harv.)	228	248	224	330	274	250
Other crops	1,462	1,588	1,787	1,802	1,822	1,635
Summerfallow	20,027	21,193	21,600	21,870	21,065	20,182
Subtotal	97,080	95,602	93,966	94,272	97,577	97,463
Other unspecified	10,623	12,015	13,564	13,396	9,948	9,919
ASCS cropland	107,703	107,617	107,530	107,668	107,525	107,382
Diversion or set-aside:						
Mandatory wheat	--	--	3,444	6,185	6,714	7,636
Voluntary wheat	--	--	1,492	1,124	--	--
Feed grains	4,560	7,812	10,084	9,620	4,671	5,682
Total	4,560	7,812	15,020	16,929	11,385	13,318
Conserving use required:						
Conserving base	24,648	24,648	24,648	23,182	22,530	21,746
Conservation Res. & CAP	4,676	4,272	2,034	699	621	550
Diversion or set-aside	4,560	7,812	15,020	16,929	11,385	13,318
Total	33,884	36,732	41,702	40,810	34,536	35,614

wheat allotment and feed grain diversion limited to the minimum 20 percent. The 1972 estimates show different relationships between crops as compared to 1967 due primarily to changes in farmer price expectations. Wheat acreage is significantly lower, while corn acreages are higher.

The primary purpose of this paper has been to describe some of the analytical problems associated with estimating the 1972 impact of the Agricultural Act of 1970 and to outline possible solutions. The model presented identifies major variables, relationships and assumptions that are expected to affect response to the new Act. Admittedly, the data and procedures used are somewhat imprecise and other researchers may make different judgments when faced with the same information. However, the model possesses the basic simplicity and versatility to be useful in answering a range of questions concerning production response to the 1970 Farm Act.

FOOTNOTES

1/ The analysis is part of the Aggregate Production Analysis System (APAS) which is designed to provide estimates of response in aggregate production and resource use to changes in costs, prices, resource availabilities, and government programs. For a description of APAS and its organization see [1].

2/ Cropland required in conserving use includes the conserving base (1959-1960 adjusted average acre in conserving use) plus the acreage set-aside under the wheat and feedgrain programs and the acreage diverted under general cropland retirement programs.

3/ Significant problems were encountered in obtaining 1961-1970 data for both Y and X_1. The residual cropland category was defined as the difference between land uses reported by SRS and total cropland figures compiled by ASCS. This residual includes cropland pasture, idle land, diverted acres not included elsewhere and any discrepancy between the two data sources. ASCS cropland data are not available prior to 1969 in some states, so the 1969 level was used for all earlier years. ASCS figures for conserving base are available only for 1966, 1969, and 1970. The conserving base for 1961 to 1965 was assumed to equal the 1966 level while 1967 and 1968 were assumed equal to 1969; as such, the series could contain rather significant errors. In addition, the 1966 and 1969 conserving base figures compiled by ASCS may include Conservation Reserve land; attempts were made to correct for such double counting in X_1 where it was known to exist.

REFERENCES

1. Sharples, Jerry A., and W. Neill Schaller, "Predicting Short-Run Aggregate Adjustment to Policy Alternatives," American Journal of Agricultural Economics, Vol. 50, No. 5, December 1968, pp. 1523-1536.