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Differing Effects of Farm Commodity Programs on Land Returns and Land Values

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The effects of commodity programs on land returns and values are greater for wheat than for corn and soybeans. Without commodity programs in 1986, returns and value of land producing wheat would decline more than land producing corn and soybeans. After declining in 1986 and 1987, returns and land values would increase. By 1990, wheatland values would still be below the level they would have been with continued supports. Values for land growing corn and soybeans could reach the level they would have been with the commodity programs in place.

This study examines the likely effects of discontinuing farm programs in 1986. Such a change is unlikely. While this study deals with a hypothetical change rather than an actual policy proposal, it illustrates the relative effect of farm commodity programs on returns and value of land producing major commodities.

The effects of changes in farm commodity programs on farmland values depend on the following factors:

- **Demand for and supply of farm products.** For example, terminating commodity programs in 1974, when market prices of grains, soybeans, and cotton were 1.5-2.3 times higher than those of 1972, would have affected land values very differently than terminating the programs in 1982, when prices of major commodities were 10-30 percent below their 1980 level. The differences in recent price trends between 1974 and 1982 would lead to different expectations of price trends without government support. The effects of changes in commodity programs on farmland values are not constant and will vary with changes in demand and supply. Changes in supply are functions of production costs, which in turn are functions of production technology. The longrun effects are more difficult to estimate than the shortrun effects. I limit my estimates in this report to the shortrun effects, that is, the effects that take place approximately 5 years after the program changes are implemented.

- **Scope of changes and the speed with which they are made.** This study is limited to estimating the effects of discontinuing farm commodity programs in 1986. While unlikely, the results illustrate maximum short-term impacts.

- **Perceptions about the likelihood of changes and about land earnings.** Land market participants (that is, landowners and potential land purchasers) will have perceptions about whether the announced changes will actually be implemented and about land earnings if the changes are made.

- **Land market participants' financial resources.** The literature on farmland values generally assumes that land market participants are not limited in capital required to act on their expectations. In contrast, literature, such as (*12*),[1] advising individuals how much they can afford to pay for land typically warns that a bid price based on expected land returns is likely to lead to cash flow problems unless a sufficiently large downpayment is made or financial reserves are available. The effect of this assumption is to underestimate the impact of changes that lead to sharp declines in farm income.

Thus, to appraise the short-term effect of a change in commodity programs on land prices, one must evaluate the demand-supply outlook for farm products, translate this outlook into land returns as perceived by land market participants, and evaluate the participants' financial abilities to act on their expectations. Available methodology has too many uncertainties and gaps for me to make predictions. However, within a given demand outlook, I can estimate the general direction and magnitude of land value trends.

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[1]Italicized numbers in parentheses refer to items in the references.

Land Value Theory

A number of studies have estimated benefits of farm commodity programs by value per acre. These studies, such as (*15*) and (*2*), are limited mainly to the value of peanut and tobacco allotments and are difficult to extend to other commodities (*20*). Even if the studies were extended to all program commodities, the sum of benefits would understate the value of farm commodity programs because the value of the right to receive program benefits for any individual commodity equals the income losses of foregoing program benefits, while other commodity programs remain in place. For example, the value of the right to receive benefits from the peanut program may be based on the alternative of producing corn, cotton, or soybeans. Commodity programs enhance the price of each of these alternatives.

Recent research shows that increases in land returns can largely explain increases in U.S. average land values in recent decades. Melichar estimated that constant dollar returns to farm production assets, principally to land, for 1954-78 rose 4.25 percent annually, while real capital gains from farm production assets were 3.1 percent (*13*). Reinsel and Reinsel showed that trends in farm asset values during 1940-80 followed trends in farm asset returns (*21*). In a study of western Indiana, Dobbins and others found that land returns can fully explain farmland value increases for 1960-77 (*3*). Alston concluded similarly in a study of eight Midwestern States (*1*).

Harris stressed that, if changes in land returns are a major determinant in land values, the "growth model" is an appropriate expression of land values (*7*).

The land valuation formula based on the growth model follows in its simplest form:

$$V = \frac{a}{i - g},$$

where: V = value per acre,

a = return to land per acre expected in the current year,

i = interest rate at which future returns to land are discounted, and

g = proportion by which returns to land are expected to grow annually.

The growth model, like most models, is a simplification of reality in that it summarizes in a single fraction all future incomes from land. This simplification necessitates use of a single interest rate and a single income growth rate for all future periods and facilitates examination of how a change in commodity programs would affect land values.

I use historical estimates of land returns for the 1960-82 period to illustrate how changing commodity programs would affect land values. Farmland income can be estimated from two sources: Returns to farm production assets and net returns to cash-rented farmland. Farmland constitutes the bulk of all farm production assets, accounting for 69 percent of the value of farm production assets in 1960 and 76 percent in 1984 (*27*). The rate of return to farm production assets, therefore, has been used as a proxy for the rate of return to farmland. Land returns should ideally be the estimated net of income taxes. However, this would require estimating the weighted mean of effective tax rates. In view of the close historical association between pre-tax land returns and land values, I did not attempt to estimate returns after taxes.

ERS' *Economic Indicators of the Farm Sector* series gives residual income of farm production assets (*27*). ERS calculated returns by deducting the estimated value of labor and management inputs from the income accruing to farm assets, labor, and management. Operator's labor is valued at the hourly cash wage rate for farm labor, and management is valued at 5 percent of gross receipts, excluding the cost of feed and livestock purchases. The agricultural sector's rate of return to farm assets averaged 4.3 percent for 1960-82. Net cash rent per acre for the same period averaged 4 percent of the value per acre (*6*). Net rent is gross rent less landlord's expenses. No deduction was made for landlord's management inputs, but the resulting overestimate of net rent is believed to be small because landlord's management is minor on cash-rented farms.

Historical studies show returns to both land and farm assets ranging from negative for farm enterprises with low sales volume to close to 9 percent for farms in the upper sales classes. Johnson estimated residual returns to farm real estate for 1966-68 to range from negative for farms with sales up to $10,000 to 8.7 percent for farms with sales of $40,000 or more (*11*). Hottel and Reinsel estimated the returns to equity capital in 1970 to be negative for farms with sales of less than $10,000 and 6.9 percent for farms with sales of $100,000 and over (*10*). Comparable estimates for recent years are not available, but continuation of the same relationship is suggested for 1982 when net farm income ranged from negative for farms with sales of less than $20,000 to 13 percent of farm assets for farms with sales of $500,000 and over (*27*). Many farms with lower sales volumes have either expanded or were absorbed in larger units. In 1960, 3.85 million farms had annual sales of less than $40,000, and 113,000 farms had sales of $40,000 or more. In 1982, 1.7 million farms had sales of less than $40,000, and 691,000 farms had sales of $40,000 or more. Inflation of farm product prices accounted for probably less than 25 percent of the decline in the number of farms with sales of less than $40,000 (*27*).

Quantity g, the proportion by which returns to land grew for 1960-82, was 9.1 percent per year in nominal terms and, by deflating the returns by the Consumer Price Index, 3.3 percent in real terms. During this period, the index of average value per acre of farmland increased at a somewhat higher rate, 3.8 percent in real terms and 9.6 percent in nominal terms.

The growth model can illustrate how a reduction or elimination of commodity programs would affect land values. I use real or deflated values for the key variables to simplify the presentation. I set the quantity a at 4.3 percent, which is equal to the rate of return to farm assets for 1960-82. Quantity g is also set at the historic level for 1960-82 at 3.3 percent. This gives the following values for the growth model:

Recent Studies and Historical Experience

This section briefly evaluates recent studies on, and historical experience in, the effects of terminating commodity programs on land values.

Farm Income. Ray and Heady estimated that, in the absence of farm programs, farm income would have fallen below actual levels for the 35-year period 1932-67, ranging from a 28-percent drop for 1932-39 to a 46-percent drop for 1959-67 (*18*). Nelson estimated that eliminating all farm programs in 1953 would have caused average farm income to fall approximately 40 percent below actual levels for 1953-63 and 20 percent for 1963-67, and to rise 40 percent for 1968-72 (*14*). Ray, Richardson, and Li projected that farm income during 1982-85 under a free market would decline 46 percent below income under the 1981 farm bill (*19*). ERS estimated that farm income during 1986-90 would fall 45 percent below income under a program of high levels of commodity supports (*29*).

All of the above studies reflect conditions of excess supply capacity in agriculture. The opposite conclusions of Ray and Heady (*18*) and Nelson (*14*) regarding the long-term effects on land values of terminating farm commodity programs reflect the greater uncertainty of longrun effects.

Land Values. Farm income has not had a sustained fall of 40 percent or more since the Great Depression. Farm income during 1930-34 was approximately 50 percent of what it was during 1925-29 (*27*), and the index of average farmland value per acre fell 42 percent (*28*). Because prices fell and the purchasing power of the dollar increased during this period, the constant dollar declines were 41 percent for farm income and 37 percent for land values.

Economic conditions during the Great Depression were different from those in 1984, but the effects on land prices of a sustained fall in farm income of the same magnitude could be similar. During the Depression, most farmers had no alternative employment opportunities. They, therefore, tried to absorb the farm income reduction and hang on to their land. Forced sales, either actual bankruptcy sales or sales necessitated by the prospect of bankruptcy, accounted for most of the land value declines. Raup reported that farm transfers reached a rate of 91 per 1,000 farms in 1933, a record high that has not been surpassed. Fewer than one in five transfers represented a voluntary sale. Foreclosures, tax forfeiture, inheritance, gifts, and miscellaneous reasons accounted for the rest (*17*).

Nonfarm employment has become much more important to farm operators since the thirties. For example, in 1978, approximately 1.2 million farm operators, slightly more than 50 percent of all operators for whom information was available, reported at least 100 days of work off the farm. Nearly 50 percent did not consider farming their principal occupation (*25*). With greater availability of nonfarm employment since the thirties, lower farm income would translate into lower land prices because farmers would place a value on their labor and management skills when estimating a return to their land investment. Moreover, absorbing lower farm income by accepting a lower return on labor and management would be less feasible in the eighties when production expenses, excluding operators' management and labor, are approximately 80-90 percent of the gross income from farming than in the thirties, when such production expenses were approximately 50 percent of gross income (*27*). A decline of 30-40 percent in inflation-adjusted land values appears quite plausible when combining information from studies on the effects of terminating commodity programs on farm income, a decline in farm income of 40 percent or more in real terms, and the historic impact of such a decline in farm income on land values.

$$V = \frac{0.043V}{i - 0.033}.$$

This yields an interest rate of 0.076, which is close to the interest rate of 7.3 percent found by Alston for eight Midwestern States (*1*). The ratio of current income to value is $1 \div 0.043 = 23.25$, that is, $V = 23.25a$.

The growth model is based entirely on expectations of land market participants. If current return turns out to be less than expected, land values would not be affected provided expectations are unchanged, that is, the decline in current return is considered a random variation from the long-term trend.

Consider the contrasting effect of an announcement that commodity programs will be terminated next year. Assume that little or no effect would be expected on returns for the current year but that the historic growth in farmland returns is expected to cease, that is, $g = 0$. The resulting land value would be as follows:

$$V = \frac{a}{i - g} = \frac{a}{0.076 - 0} = 13.16a,$$

and the decline in land values would be:

$$\frac{23.25a - 13.16a}{23.25a} = 43 \text{ percent.}$$

The decline in land values would exceed 43 percent if land returns were expected to fall rather than remain constant. On the other hand, the decline would be much less if land market participants were confident that commodity programs would soon be reinstated or replaced by another program. Land values would decline substantially once land market participants were convinced that the termination of commodity programs was permanent and that the growth in land returns would be less than in recent decades. The 43-percent decline in land values caused by termination of commodity programs is illustrative only. Actual declines depend on the returns and discount rates that land market participants expect. The example demonstrates that the decline in land values would be proportionately greater than the decline in land returns.

Estimating the effect of a reduction in commodity programs on farmland values may be improved if the causes of historic increases in farmland returns are known. I hypothesize that farmland returns increased mostly on land purchased or rented for farm expansion. Considerable evidence supports this hypothesis. Heady and Tweeten (*8*), Herdt and Cochrane (*9*), Reynolds and Timmons (*22*), and Tweeten and Martin (*24*) identified farm enlargement as significantly contributing to historic increases in farmland values. During 1960-82, the combined returns to land, labor, and management remained constant in real terms. Residual returns to farm assets increased, in part, because larger farm machinery has permitted the operator to farm additional land. A historical series of farm asset returns for farms grouped by volume of business is unavailable. However, for 1960-82, net income per farm declined substantially for all size groups even when measured in current dollars. By contrast, average net income per farm more than tripled (*27*). Expanding farm size can explain the apparent contradiction. This result does not prove, but is consistent with, high returns to farmland purchased for expansion of existing units. Many farm operators who did not enlarge their operations may not have experienced increasing land returns, although nearly all farmland owners enjoyed increasing land values from the demand for "add on land."

Projecting Returns and Their Effects on Land Values

This section presents projected effects of changes in commodity programs on land returns and discusses the subsequent effects on land values.

Land Returns

I use a procedure I call "the bid price model" to analyze the effects of changes in commodity programs on land returns to expansion buyers who have sufficient machinery, storage, and overhead capacity to purchase additional land to enlarge their operations. Expansion buyers are the principal purchasers of farmland. In 1979, the last year for which data are available, purchases by expansion buyers accounted for 63 percent of all farmland purchases (*28*). Therefore, the trends in land values will likely follow trends in bid prices of expansion buyers. The bid price approach is simpler than and requires fewer assumptions than estimates for average returns to all U.S. farmland and has the added advantage of yielding estimates for land used for specified crops and major regions.

This report illustrates the method with land producing wheat, corn, and soybeans. These three crops combined account for approximately 66 percent of the U.S. harvested acreage. I limited the analysis to national averages because of limited time and resources.

I calculate land returns as gross receipts, less variable costs and real estate taxes, and assume that expansion buyers would have sufficient excess machinery and storage capacity to farm the additional land without increasing fixed costs. Some expansion buyers will incur at least some additional capital outlays when more land is purchased, either at the time of the purchase or when existing machinery and structures are replaced. The underestimate of production costs is not known but believed to be small. Additional labor is included as a variable cost. Even if expansion buyers do not hire additional labor, they are likely

to value their own time required to operate the additional acreage.

ERS' Food and Agricultural Policy Simulator (FAPSIM) projected prices, yields, and variable costs (*5, 23*). The FAPSIM projections were for 1986-90, with the 1981 farm bill and its termination beginning in 1986, and the demand-supply outlook for farm products of May 1984. Nutritional programs and export promotion and assistance programs were left in place. The simulation excludes random fluctuations in supply, such as those caused by abnormal weather. The results for the "no-program" situation, therefore, can be interpreted as no support above expected market prices but as retaining a price stabilization program through the equivalent of an "ever normal granary program." The results should be interpreted in terms of direction and magnitude of trend rather than absolute numbers.

Table 1 gives returns per acre to an expansion buyer for 1980-82 and projected to 1986-90 with continuation of commodity programs mandated in the 1981 farm bill. For wheat and corn, the returns include participation in the voluntary wheat and feed grain program in each year when program payments exceed revenue given up by land diversion. Table 2 gives comparable estimates with all price and income support payments ending in 1986.

Returns per acre to an expansion buyer producing wheat would be about the same in 1980-82 and 1990 with existing programs. Returns to an expansion buyer producing corn and soybeans would increase but at a rate below the inflation rate. In constant dollars, the 1980-82 level would decline approximately 38 percent by 1990 for wheat, 24 percent for corn, and 11 percent for soybeans. Because corn and soybeans are often produced on the same land, the difference in

Table 1—Returns per acre to expansion buyers, 1980-82 and 1986-90 projections with 1981 farm bill commodity programs

Crop	1980-82	1986	1987	1988	1989	1990
			Dollars			
Wheat:						
Nominal	56.0	64.6	63.1	61.1	63.8	63.8
1967 dollars[1]	20.8	18.6	17.2	15.8	15.6	14.9
Corn:						
Nominal	126.2	121.8	134.2	140.8	148.9	152.1
1967 dollars[1]	46.9	35.1	36.7	36.4	36.4	35.5
Soybeans:						
Nominal	102.3	121.4	125.5	136.5	145.4	144.8
1967 dollars[1]	38.0	35.0	34.3	35.3	35.6	33.8

[1]Calculated from the Consumer Price Index.

Sources: Yields, prices, and variable costs 1980-82 (26); 1986-90 Food and Agricultural Policy Simulator; real estate taxes estimated by author.

Table 2—Returns per acre to expansion buyers, 1980-82 and 1986-90 projections with termination of commodity programs in 1986

Crop	1980-82	1986	1987	1988	1989	1990
			Dollars			
Wheat:						
Nominal	56.0	3.3	16.1	19.0	25.7	24.5
1967 dollars[1]	20.8	1.0	4.4	4.9	6.3	5.7
Corn:						
Nominal	126.2	71.0	62.4	83.2	103.2	116.2
1967 dollars[1]	46.9	20.5	17.1	21.5	25.2	27.2
Soybeans:						
Nominal	102.3	110.6	106.8	118.2	126.1	130.9
1967 dollars[1]	38.0	31.9	29.2	30.5	30.8	30.6

[1]Calculated from the Consumer Price Index.

Sources: Yields, prices, and variable costs 1980-82 (26); 1986-90 Food and Agricultural Policy Simulator; real estate taxes estimated by author.

the percentage declines of per acre returns for both crops may be questioned. A more realistic approach would be to say that returns to an expansion buyer producing corn and soybeans are estimated to decline 11-24 percent.

Returns to expansion buyers during 1980-82 averaged 7.2 percent for those producing wheat, 7.2 percent for those producing corn, and 6.8 percent for those producing soybeans. This rate compared with an average rate of return to production assets for 1960-82 of 4.3 percent and a total rate of return, including gains from a real increase in asset price, of approximately 7.5 percent.

Land Values

Land values depend on four factors: The land returns expected for the current year, the expected future trends in returns, the interest rate at which future returns are discounted to a present value equivalent, and the financial resources available to land market participants to act on their expectations. Too many uncertainties deter an attempt at numerical estimates of these factors and the absolute level of land values. Economists should not forget the oversimplification of reality that usually characterizes their complex models, a factor that makes numerical predictions hazardous (*4, 16*). However, the general direction of land value and, more importantly, the consequences for the structure of agriculture and the policy implications can be evaluated.

If land values were based solely on land returns to expansion buyers, the real decline in land values from the 1980-82 level would be 38 percent for land producing wheat and 11-24 percent for land producing corn and soybeans. However, these are the minimum declines that could be expected because of the following:

- The rates of decline given above are equal to the declines in returns to expansion buyers. For example, if expansion buyers expect returns from add-on acreage to be 10 percent less, they will have to reduce their maximum offer price 10 percent to maintain their return rates. However, with declining real returns, expansion buyers may be unable to raise the funds required for their maximum offers. Moreover, with declining real returns in the farm sector, expansion buyers may be able to negotiate prices below their maximum offers.

- The rates of return to expansion buyers for land producing wheat, corn, and soybeans averaged about 7 percent for 1980-82. Thus, the ratio of land value to land earnings was 100 to 7, or 14.3. With limited prospects of increasing land returns and land values in the near future, expansion buyers may require higher than a 7-percent return rate from current earnings, resulting in reduced offer prices.

Land values would sharply decline for the no-program situation followed by a trend of increasing values. Judging from the fall in land returns, wheatland would probably decline by more than 50 percent from the level that would prevail with continued support. Land producing corn and soybeans would decline by approximately 35 percent. By 1990, prices of land producing wheat would still be substantially below the level that would have prevailed with continued commodity programs as provided by the 1981 farm bill. Land prices in the corn-soybean areas could reach the level that would have prevailed with the 1981 program because of optimistic expectations caused by rising land returns. However, this prospect is uncertain because the very low returns in 1986 and 1987 would leave many farm operators with insufficient capital to expand operations.

Impacts on Structure of Agriculture

Approximately 229,000 farms with annual sales of $50,000-$500,000 were classified, as of January 1985, as having serious financial problems because of indebtedness (*30*). If commodity programs were rapidly terminated, many of these farms would be liquidated, with the land often sold at low prices compared with prices of 5-10 years ago. The purchasers of this land would likely be farm operators with strong management and access to capital.

Reduced income and equity, especially in the first year after termination of commodity supports, may create a demand for investment capital from the nonfarm sector through farmland rental and possibly through partnerships. Expansion buyers and other investors who survive the years of low returns would likely experience increasing land values. A more efficient agricultural sector would likely emerge, but the transition period would entail hardships for operators forced out of agriculture.

Issues for Policy and Policy-Oriented Research

The longrun effects of reduced commodity programs appear desirable for an efficient agricultural sector and for lower farm program expenditures. The problem is how to implement such a change so that adversely affected farm operators can adjust, either within agriculture or by changing to nonfarm occupations.

One question concerns the timing of the transition. At a time of excess capacity in agriculture, a gradual phasing-in of reduced supports would lessen the

shock of a very rapid fall in farm income and land values to farm operators, agricultural credit institutions, and rural communities. However, the period of decline would be longer, and the upturn would come later.

Another question would be transition programs. First, the objective of transition programs should be identified. Is the objective to mitigate adverse effects for (1) farmers only? (2) farmers and others connected with agriculture? or (3) those with the greatest needs? Or is the objective to provide adjustment help either within the farm sector or for changing to nonfarm occupations? Once the objective is established, operational criteria should be developed for identifying those eligible for transition programs. Direct financial assistance probably would be preferable to such measures as higher commodity support levels for small producers, which may be difficult to phase out.

Farm sector statistics, econometric models, and simulations need to be continually improved and expanded to provide information to officials on how program changes would affect producers of different commodities, farms of different sizes, and the general economy. However, expecting more than a general indication of the effect of program changes on land values is unrealistic.

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