PART-FARM GENERAL CROPLAND RETIREMENT: EFFECTS OF SOME ALTERNATIVE PROGRAM SPECIFICATIONS

George D. Irwin, Jerry A. Sharples, and John H. Berry*

The impact of technological advance in reducing the need for agricultural land has been more or less recognized since at least the early 1950s. After experiments with general cropland retirement in the 1956-60 Conservation Reserve Program, U. S. farm policy turned to annual acreage adjustments, commodity by commodity. Now farm policy proposals once again include the general cropland retirement approach, either alone or in combination with annual commodity programs.

Three general ways have evolved for obtaining acreage reductions: (1) diverting land from individual crops, (2) retiring parts of farms, and (3) retiring whole farms from crop production. Combinations of the three have also been considered. Our topic centers on part-farm general cropland retirement, alone and in combination with annual crop programs similar to recent feed grain, wheat, and cotton programs. Linear programming results from a recent aggregate study of Indiana farms helps identify several principles related to part-farm general cropland retirement programs which are relevant on a national scale.

Evaluation of land retirement proposals often revolves around the triple objectives of (1) inter-commodity and inter-area efficiency, (2) longrun land utilization at levels that afford "reasonable" producer prices, and (3) handling temporary imbalance arising in weather and uncontrolled elements, unforeseen international developments, uneven rates of technological improvements, etc. It is sometimes hypothesized that efficiency and longrun over-surplus problems suggest the longrun general cropland retirement approach, and the temporary imbalance can be alleviated with annual commodity programs. It is imperative under the general cropland retirement approach to understand the interplay of the most significant parameters in order to determine how desired program results can be achieved. Conceptually, program features can easily get out of balance and force the bulk of adjustments onto particular regions, commodity groups, or types of farms.

THE RESEARCH MODEL

Other studies have examined general cropland retirement at a national and regional level [2, 3, 4, 6]. Our objective was to see if additional insight could be gained by taking an intensive look at the problem at a more micro-level.

In using the linear programming approach with some of its inherent advantage for part-farm adjustment analysis, comparisons can be made in a controlled or synthesized environment, but in translating to a real world environment, one must subjectively discount the results for the inadequacy of the optimizing assumption.

Previous analyses, both of participation in earlier land retirement programs and of efficient farm organizations, suggest that most programs encounter considerable "slack." Production is reduced less than one would anticipate from the number of acres retired. One reason is that less productive land is usually idled [5]. A second reason is that most farms have some land that is under utilized, or which may easily fit into a program because it would otherwise be idle for rotation, drainage, moisture conservation, or other reasons. This land would be included in a general cropland retirement program at fairly low payment rates, but would not result in significant output reduction. To test this hypothesis, two different definitions of land eligible for retirement were used. The first was all tillable land, including the part which would not be row-cropped in any one year for soil conservation or other reasons. The second included only the portion of total cropland which could be row-cropped in an average year. They are referred to as the TILL and ROW programs, respectively. Definitions of the land categories were based

*Agricultural economists, Farm Production Economics Division, Economic Research Service, U. S. Department of Agriculture. George D. Irwin and Jerry A. Sharples are stationed at Lafayette, Indiana and John H. Berry at Urbana, Illinois.

on soil conservation needs data. Each of the two retirement systems was studied first in combination with present feed grain and wheat programs (FGW), and then under the assumption that there were no annual programs (NO FGW).

Thus, four alternative sets of program features were considered. They differ in (1) the method of specifying land eligible for retirement (TILL or ROW), and in (2) whether or not the present feed grain and wheat programs are assumed in effect (FGW or NO FGW). An area optimizing model, including two sizes of each of two types of farms in each of five areas, was used to compare the four programs under efficient organization.

The model was an adapted version of an analytic system developed by Berry to estimate corn, hog, and beef supply functions for Indiana farms [1]. A Markov Chain analysis of Census data projects numbers of farms to 1970. Proportions of grain and livestock farms are determined from a regression based on trends and expected price ratios. A multifirm-multiarea linear programming model finds a constrained maximum net social product for the State. Under certain conditions, (i.e., when area constraints are binding) this yields a monopoly solution to the constrained optimizing problem, rather than a perfectly competitive solution. Results presented in this analysis were not so affected. Prices, costs, and yields used were 1966 projections of 1970 expected conditions, except for soybeans. The soybean price was $2. with $0.92 corn. Further analysis was made to consider $2.25 and $2.50 soybean prices. Wheat price plus certificate payment was the equivalent of $1.80 in the programs, and price was $1.30 under no program solutions.

Resources on grain and livestock farms with 100-259 acres and over 260 acres are included in each of five areas of the State for a total of 20 farm groups. Using the 1964 Census as a guide, the proportion of Indiana production derived from these farms would be around 80 percent and would vary by crop. This reaffirms that absolute estimates were of a reasonable size.

Each farm group is constrained in the use of land, labor, and capital and has a range of crop, hog, and beef production alternatives. Hay may be transferred among farms in each area, and at a minimum, the State must have no deficit in feed grains. An upward sloping hired labor supply function is specified for the State.

In the model, each farm could rent land to the general cropland retirement program up to a limit of 30 percent of the land in each of the five geographic areas. Rental rates of $0, $15, $30, $45, and $60 were used, in turn, and the resulting 5 solutions for each of the four farm program situations were used to develop the analysis.

FINDINGS

The results may be condensed under headings corresponding to six critical questions related to general cropland retirement:

(1) How far out of equilibrium is crop production under present programs? One needs to estimate an answer to this question before he can evaluate a farm policy consisting only of a general cropland retirement program.

(2) What is the general shape of the supply of retired land function?

(3) What interralationships must be considered in designing a general cropland retirement program either in conjunction with a set of commodity programs or alone?

(4) What are the impacts of various ways of specifying the land eligible for retirement?

(5) How are the impacts likely to be felt in different areas and on different types of farms?

(6) How are the impacts altered by uncertainty about the future price of soybeans relative to other crops?

The questions apply equally to commodity, part-farm, and whole farm general cropland retirement programs, but we restrict our analysis to part-farm programs. The results have national implications though the research model was specifically for Indiana.

Because of space limitations, much available detail, used in deriving the conclusions, has been omitted. Profit maximizing plans are referred to as "efficient" herein.

Disequilibria in Present Programs

Efficient production patterns in the shortrun with no annual (FGW) or general cropland retirement (GCR) programs call for two substantial changes in cropping patterns. The present real world situations may, thus, be viewed, in part, as program-induced disequilibria. One adjustment would be to place most of the currently diverted acres into soybeans. The explanation of the choice of soybeans over corn, which is normally considered the more profitable, will be covered later. The other would be a very large increase (3 times) in wheat acreage, with much of the

production coming from the portion of total cropland that must annually be in close-grown crops for soil conserving reasons. Much of this acreage is no longer needed for livestock.

These conclusions are, of course, shortrun, because they are based on an assumed set of product prices. Some adjustments were made in these results under the free market situation, but not enough, perhaps, to fully account for quantity effects on price. Yet the net prices used (for wheat, $1.80 price plus certificate under programs, and $1.30 under free market, $2 for soybeans, and $0.92 for corn) did assume substantial dampening of expectations, and, or course, returns would be affected. Without programs, the gross output effect would be about a 30 percent increase. There is some question whether a price of wheat corresponding to its feed grain value would be favorable enough to encourage this sort of acreage shift, though the alternatives are not very attractive.

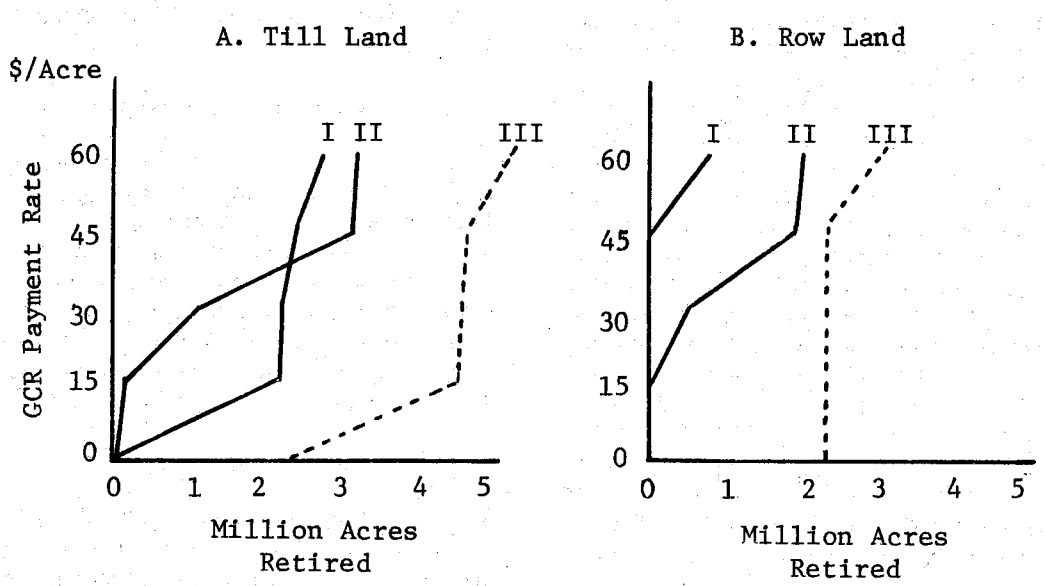
Supply Functions for Retired Land

The most significant feature for program design is that "elasticity" of the retired land supply functions varies, depending on the general level of retirement payment assumed. In most cases the bulk of farms have similar curves, though the payment prices which are the breaking point between different kinds of program response do differ. In certain price ranges, a change in payment rate has little effect and in others it is quite large. Cost of program, response to it, and incidence of the impacts are, thus, strongly affected.

Generally, the TILL land base programs show more response to changing retirement payment rate than the ROW land base and those with NO FGW programs more than those having such competitive programs.

For the TILL base with FGW, the curves are elastic in low and high price ranges with little response between. The elasticity at low prices for retirement results from picking up "slack" cropland and the elasticity at higher prices from bidding land away from soybean production (Figure 1, part A, Curve III). In NO FGW programs, the low range elasticity is eliminated because the "slack" land can more profitably raise wheat (curve II). Elasticity occurs instead in mid range as the payments become high enough to outbid wheat and in the high range to outbid soybeans.

With the ROW base, "slack" land is defined as ineligible for the retirement program, so we get little elasticity in low price ranges. In combination with FGW programs, response is nil until the high price range, where payments are competitive with returns from soybean production. In NO FGW programs, wheat acreage is larger and can be attracted to GCR



Legend: I Combined programs, acres in GCR
II GCR program only, acres in GCR
III Combined programs, acres in GCR and FGW

FIGURE 1. SUPPLY OF RETIRED LAND, TILL AND ROW GENERAL CROPLAND RETIREMENT PROGRAMS, WITH AND WITHOUT FEED GRAIN AND WHEAT PROGRAMS.

at somewhat lower payment rates. Thus, the curves show substantial elasticity over the range of payment levels.

Two significant summary points can be made: (1) Combined participation in FGW and GCR is greater than in a GCR alone, but this reflects an assumption in the model of 20 percent mandatory FGW diversion in order to study effects of the program, as well as somewhat higher average payment rates under FGW. (2) We can specify a general order of land uses, based on increasing GCR payments needed to attract land (slack, then wheat, then soybeans, then corn), but, as will be noted in the next section, this general pattern is modified by several complementary relationships. Thus, simple crop budgets cannot provide a complete measure of program effects.

Interrelationships in Program Design

Two types of interaction were found to affect program results: (1) between current programs and GCR, and (2) among crops in the rotation. Feed grain and wheat programs play the role of competitor, introducing an opportunity cost in addition to those provided by cropping alternatives, on obtaining land for GCR. Thus, their presence at current payment levels[1] effectively places a minimum price on GCR if it is to get a portion of the land eligible for these programs. In Indiana, this means that payments need to be over $60 per acre to compete with the feed grain program for feed grain land, over $45 for soybean land to compete with market opportunities, and over $30 for wheat land.

Among crops, soybeans and wheat exhibited a surprisingly strong complementarity in the model. This explains the shift of diverted feed grain land to soybeans rather than corn when programs were dropped. The complementarity arose (1) because soybeans, but not usually corn, can be removed in time for fall seeding of wheat, and (2) because of a soil conserving impetus for close-grown crops. Soybeans appear to hold a much stronger competitive position against corn in Indiana than they would appear to have by comparing expected returns from an acre of each. This result suggests that crop complementarity cannot be completely ignored, a fact we have tended to overlook in this age of technologically induced increasing gains to specialization.

This possibility needs some further study. The model has built-in conservation requirements, as well as relative prices, yields, and costs which appear reasonable, but the importance of the tentative conclusion suggests the need for careful verification. It also suggests that analyses in other areas and for other crops may need to take into account the possibility of complementarity, especially when major program changes are being studied.

Defining Eligible Land Base

Choice of the eligible land base is crucial in determining influence on the amount of output, the crop acreage reduction, and the degree of participation at various payment rates. A TILL base program reduces output less, gets more acreage participation at given payment levels, and reduces wheat production. A ROW base program reduces output more, gets smaller acreage participation, reduces corn and soybean acreages, and has no direct effect on wheat adjustments. At minimum payment levels, almost all response to a TILL base program is from otherwise under utilized land. The program, thus, provides an income transfer payment with little output effect.

With either kind of land base, combined participation in joint FGW and GCR programs usually exceeds participation in the GCR with NO FGW program. The difference is slight under the ROW land base at $45 and $60 annual payment rates since the two programs draw from the same land base. Under the TILL land base, we find a slight complementarity between the two programs. As payment rate and participation under GCR increase, participation in the optional additional 30 percent part of the feed grain program also increases.

Area and Farm Type Considerations

Areas can be arrayed according to amount of participation for any specified GCR payment level. Those having the least productive land and the highest percentages required in soil conserving crops will have the largest participation. In 3 of the 5 Indiana areas, the assumed limit of 30 percent of retired cropland could be attracted with $60 payments. Conversely, differential payment rates or area limits are required to distribute participation among areas.

Crop farms participated much more heavily than livestock farms, and total output of meat was affected only slightly by variation in the programs. This reflected a general shift toward non-pasture livestock systems. The small and large livestock farms displayed dissimilar responses to the removal of FGW programs. The large farms decrease GCR when annual crop programs are removed in order to concentrate on

[1]Feed grain diversion payments ranged from $71.65 to $82.90 on first 20 percent, and from $57.40 to $66.51 on optional up to 50 percent. Wheat support amounted to the equivalent of $0.50 certificate per bushel on yields of 40 to 45 bushels per acre.

production. The smaller farms generally shifted some of the diverted land into GCR (a response also found on the large grain farms). This suggests that the commodity programs have more disruptive organizational consequences for the large livestock farms (an observation which appears to be supported by their lack of participation in past programs).

Soybean Price Effects

The soybean price influences both the patterns of crop production and the crop affected by a GCR program. At $2 and $2.25 soybean prices, there is a complementarity between corn production and the CGR program. As the retirement payment is increased some land is retired from wheat and soybeans. Some additional land is shifted from these crops to corn. With soybeans at $2.50, much of the effect came in the form of reduced corn acreage. Thus, the recent decrease in soybean price support from $2.50 to $2.20 (no. 2 basis) would, if market prices adjusted similarly, shift the crop affected by a GCR program from corn to wheat and soybeans.

IMPLICATIONS FOR PROGRAM DESIGN

The findings appear to point up at least five central relationships which must be considered in program design for any area:

(1) Joint programs create implicit opportunity costs for each other.

(2) The extent of disequilibrium between current and free market situations is creating substantial adjustment pressure. This pressure emphasizes the difficulty of managing any phaseout from present programs.

(3) Substantial quantities of "slack" land must be considered in designing a program by making allowances in the cost-control budgets or by appropriately defining eligibility.

(4) The type of crop production retired in the shortrun will be directly related to the definition of land eligible for retirement.

(5) The possibility of crop complementarity arises as a factor in program design whenever price relationships among crops are altered and especially when major changes in long existing programs are considered.

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