Cost/Benefit Analysis of the Conservation Reserve Program

by

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ABSTRACT

The economic consequences of retiring 45 million CRP acres were compared to a baseline situation. Net economic benefits of the CRP were estimated to range from $3.4 - $11.0 billion as farm income increases, consumer costs increase, and environmental quality improves. If the baseline conditions had assumed greater commodity acreage reduction levels, the net economic benefits would be different.

INTRODUCTION

The Conservation Reserve Program (CRP) will be the largest conservation-oriented cropland retirement program in the nation's history, when it reaches its enrollment target of 40-45 million acres in 1990. As such considerable interest exists in the overall economic efficiency of the program and of potential modifications of the program. The probable economic effects on national income resulting from the retirement of 45 million CRP acres by the end of 1990 are discussed in this paper. The paper summarizes the results of a detailed ERS study (Young and Osborn).

The CRP, administered by the United States Department of Agriculture (USDA), is a voluntary long-term cropland retirement program. In exchange for retiring cropland fields with highly erodible soil for ten years, the USDA pays CRP participants (farm owners or operators)

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an annual per acre rent and one-half of the cost of establishing a permanent land cover (usually grass or trees). The primary goal of the CRP is to reduce soil erosion on highly erodible cropland. In addition, secondary objectives of the Program include protecting the Nation's long-run capability to produce food and fiber, reducing sedimentation, improving water quality, fostering wildlife habitat, curbing the production of surplus commodities, and providing income support for farmers.

CONSERVATION RESERVE PROGRAM EVALUATION

For purposes of evaluating the economic impact of the CRP, it is important to draw a distinction among the various types of effects that occur with a program such as the CRP. Some effects, such as decreased crop production and reduced soil erosion damages, represent changes in the quantity or quality of goods and services comprising total national income or wealth. Others, including reduced costs for government commodity programs, do not represent changes to real goods or services but are merely adjustments in transfer payments between sectors or regions of the economy.

The evaluation focused on the effect that the CRP will have on total national income in the present and near future. This perspective, sometimes referred to as economic efficiency or benefit-cost analysis, included only Program effects which change the quantity or quality of real goods and services. Results of this perspective give an indication of whether the social benefits of the Program warrant the social costs.

To estimate the full net national income effects of the CRP, it would be necessary to estimate values for all the real resource benefits and costs that occur with versus without the program. Real resource benefits would include all improved environmental services, decreased costs of surplus commodity storage, and increased future supplies of timber. Real resource costs of the program would include higher production costs from restructured production of

crops, program administrative costs including the cost-sharing of vegetative cover establishment and technical assistance, and unemployment or underemployment of immobile production and marketing resources caused by reduced crop production.

CRP ENROLLMENT AND PROJECTIONS

Following the sixth signup held in February 1988, total CRP enrollment was 25.5 million acres representing over 239,000 contracts. About 24 million acres were scheduled for retirement as of 1988 with the remainder of the enrolled acreage to be retired in 1989. The long-run average annual erosion reduction rate for all land enrolled in the first six signups was approximately 21 tons per acre (Magleby, et al.). Rents paid to farmers averaged $48/acre/year while one-time cover establishment costs averaged $37 per acre.

Projections of enrollment culminating in a 45 million acre CRP were developed based on actual enrollment through the sixth signup and remaining eligible cropland (Young and Osborn). Analysis indicated that the current distribution of CRP enrollment was strongly influenced by geographic differences in the amount of eligible cropland and the ratio of annual CRP rental payments to market rents for cropland. For this reason, the projections assumed continuation of pre-1988 rules and regulations affecting eligibility and economic benefits from participation. Of course, changes in CRP rental payments and/or changes in eligibility in future signup periods could alter the existing pattern of enrollment. The CRP is estimated to cost the Federal government $19.5 billion in rental (transfer) payments to participants, $1.6 billion in establishment costs and $.1 billion in administrative costs

ECONOMIC EFFECTS OF THE CRP

Because interest should be focused on the Program's net effects, CRP impacts were uniformly compared to a baseline situation characterized by the absence of the CRP. Clearly,

estimates of the economic effects of the CRP depend critically upon the assumptions of the baseline, particularly with respect to assumed levels of other supply control programs (i.e. Acreage Reduction Programs, Paid Land Diversions). Since agricultural programs and policies that would have occurred without the CRP are unknown, there is no single correct baseline scenario. For this analysis, the without-CRP baseline was assumed to be comprised of ARP and PLD requirements identical to those required by current legislation. This assumption was adopted since there exists no consensus on the level of supply control that would have occurred in the absence of the CRP, or the mix of other programs (loan rates, target prices, and annual PLD payment rates) needed to achieve a similar level of supply control.

An equally valid but different baseline would expand ARP and PLD levels in the absence of the CRP to achieve supply control identical to that provided by the CRP. However, identification and estimation of the economic effects of this expanded ARP/PLD situation would be difficult and would have necessitated numerous arbitrary assumptions. Had this alternative baseline been adopted, resulting estimates of the economic effects of the CRP would have been quite different from those presented in this report.

Diversion of 45 million acres from crop production under the CRP will produce a wide range of economic effects. The major effects include decreased total crop production and associated increases in commodity prices, decreased environmental and soil productivity damages caused by soil erosion, and reduced government costs for commodity programs. Because net adjustments in agricultural production determine the magnitude of price adjustments, changes in Federal government program expenditures, and changes in natural resource use, agricultural effects of the CRP are presented first.

Agricultural Sector Effects

Assuming that the land enrolled in the CRP would have been in crop production without the CRP, total production declines, thus reducing commodity stocks. As the supply of commodities available for use declines, commodity prices tend to rise. The magnitude of the adjustment in production and prices is dependent upon several factors. First, farmers electing to retire land via the CRP will tend to enroll their least productive HEL cropland. Therefore, the percentage reduction in the total production of commodities will be less than the percentage reduction in acres. Second, since farmers must also retire a portion of their crop base as a condition of CRP participation, some of the land that is enrolled would have otherwise been idle under the Acreage Reduction Program (ARP) and Paid Land Diversion (PLD) program. Third, as total production declines, the prices of agricultural commodities will rise. Commodities with a inelastic demands (quantity demanded being minimally affected by changes in price) will experience larger price increases. As commodity prices rise, farmers in general will tend to expand production within the limits of existing commodity programs. To the extent that production or supply expands, the net increase in commodity prices will be moderated.

The net returns to agricultural production change as total production declines, prices rise, farmers receive CRP rental payments and incur CRP establishment costs. In the case of CRP land planted to trees, the future value of the land increases. With the inelastic demand for agricultural commodities, constraining production can cause an increase in total revenue as prices rise.

Under normally assumed conditions, total production costs will likely fall because less land is used for agricultural production. Thus the CRP would be expected to increase agricultural net returns. In addition to these market changes, CRP rental payments will also increase net farm income, which will be offset partially by the farmer's share of establishment

costs. When land enrolled in the CRP is planted to trees, the net future harvest value of the trees increases the net wealth of the landowner.

Considering the above, the present value of net farm income, excluding direct rental payments and establishment costs shares paid to farmers, is estimated to increase by $20.3 billion as a result of the CRP. (Note that this estimated change is only a rough approximation of the change in producers surplus.) Approximately 85 percent of this increase occurs after 1992 when commodity prices rise rapidly. After 1995, as some of the land initially enrolled in the CRP comes back into production, net income begins to decline due to declines in crop prices. Alternatively, under a more conservative assumption that market prices do not increase over projected 1992 levels, the present value of net farm income increases by only $9.2 billion.

Timber Production

Cropland planted to trees under the CRP provides a potential future increase in income to landowners when those trees are harvested. For this analysis, it was assumed that between 2.7 million and 3.5 million acres of land enrolled in the CRP would be planted to trees with the majority located in the Southeast and Delta regions. Assuming that 85 percent of the 2.7 - 3.5 million acres of CRP trees will be maintained until mature harvest, the net present value of CRP trees is estimated to range from $4.1 to $5.4 billion. This is an upper-bound estimate since it was assumed that all tree acres would be carried through a 45-year production period and that owners would harvest (including pulpwood thinning) only during scheduled years.

Consumer Costs

Programs which restrict agricultural production and thus raise prices of agricultural commodities, as does the CRP, result in consumer food cost increases. However, a one cent increase in crop prices does not result in a one cent increase in consumer food costs since farm

prices comprise less than 30 percent of the average retail price of food. It was estimated that consumer food costs will increase by less than one percent in any year as a result of 45 million acre CRP. Peaking around 1995, the present value of CRP related increases in consumer costs were estimated to be $25.2 billion over the program's life. (Again, note that this is only a rough approximation of the change in consumers surplus.) If USDA policymakers acted to prevent the large CRP-induced price increases projected to begin around 1992, the rise in consumer food costs would be less. Under this assumption the net present value of the increase in food expenditures was estimated to be $12.7 billion.

Natural Resource Effects

Five of the seven goals of the CRP seek to protect natural resources and environmental quality, with reduction of wind and water erosion identified as the primary goal. Estimates of natural resource effects vary regionally and depend on estimates of the regional distribution of cropland retired and reductions in erosion levels.

Effect on Erosion

Implementation of the CRP emphasized removing the most erosive cultivated cropland from production. As stated earlier, the long-run average annual erosion reduction rate for all land enrolled in the first six signups was approximately 21 tons per acre. Newly cultivated land (slippage), resulting from CRP-induced increases in commodity prices, produces little new erosion due to the "sodbuster" provision of the FSA. Sodbuster denies commodity program benefits to farmers who break new ground that is highly erodible unless they implement soil conservation practices approved in a conservation plan.

As the CRP enrolls more acres, the average erosion reduction rate will decline slightly as additional land will tend to be less erosive. Land enrolled in the first two signups averaged 26-

27 tons per acre of erosion reduction. This fell to an average of 17-18 tons per acre for land enrolled in the fifth and sixth signups. It was estimated that the entire 45-million acre CRP will result in average erosion reductions of approximately 17 tons per acre per year, for a total annual erosion reduction of about 800 million tons (Ribaudo).

Effect on Soil Productivity

Since the CRP is targeted to the most erodible soils, and because under current demand conditions the crop production from these lands is not required, retiring these lands preserves their future productive capacity. Over time, excessive erosion reduces crop yields by diminishing water-holding capacity and water infiltration rates and by increasing nutrient losses. Increased fertilizer application rates may mitigate nutrient losses but will not restore potentially permanent yield loss associated with lost water-holding capacity. Conserving soil reduces long-run yield loss and fertilizer cost increases. It was estimated that soil productivity benefits for the 45-million-acre CRP would range from $ 0.8 to $2.4 billion, with $1.6 billion as most likely. Higher soil productivity in the Corn Belt and the Lake states gives these regions greater productivity benefits under the current enrollment than the Mountain and Northern Plains regions, which have more acres enrolled.

Effect on Water Quality

Agricultural activities generate a number of residuals which can be carried by runoff into waterways. Once there, these residuals can have detrimental effects on water uses. Major residuals include nutrients from chemical fertilizers and animal manure (primarily nitrogen and phosphorus), pesticides, and sediment. Sediment washing off cropland and into waterways can fill reservoirs, block navigation channels, interfere with water conveyance systems, affect aquatic plant life, and degrade recreational resources. Excessive amounts of nutrients in surface waters

can accelerate the growth of aquatic vegetation, leading to declines in fish populations and degradation of recreational resources. Nutrients that leach into groundwater can contaminate drinking water supplies. Pesticides in sufficient quantities can be harmful if consumed by humans or aquatic organisms.

The CRP will influence both surface and ground water quality. Offsite surface water quality benefits from reduced erosion and nutrient use on cropland due to the CRP were estimated to range from $1.9 billion to $5.3 billion (Ribaudo).

CRP eligibility was expanded beginning with the February 1988 signup to include filter strips adjacent (within about 100 feet) to streams. Trees or grass planted on these areas filter sediment and nutrients from runoff water, thus substantially contributing to improved water quality. Of the 3.4 million acres enrolled during the sixth signup over 16,000 acres were in filter strips. Assuming that the proportion of land in filter strips remains constant for the remainder of the signups about .9 million acres of filter strips would be established in the CRP. Converting .9 million acres to filter strips would add up to an estimated $1.0 billion of surface water quality benefits, with $0.7 billion estimated as most likely.

Retiring cropland through the CRP may also lead to improved ground water quality. Since CRP land is retired from crop production, applications of agrichemicals to the soil are restricted. Consequently, lesser amounts of these materials are available for leaching into ground water. However, the economic benefits of the CRP for ground water protection will probably be small. Highly erodible cropland, by definition, exhibits high runoff of water and soil particles which tend to transport many of the excess agrichemicals that degrade ground water quality. Also, due to increases in commodity prices caused by the CRP, use of fertilizer and pesticides may intensify on lands remaining in production. Quantification of the economic benefits of groundwater improvement attributable to the CRP was not possible due to the absence of procedures to value changes in ground water quality.

Effect on Wildlife

Acres enrolled in the CRP can provide high-quality wildlife habitat for species associated with agricultural land. Grassy areas in close proximity to cropland are often used by wildlife for nesting cover, food, winter cover, and corridors for movement. The creation of new grassland habitat by the CRP should increase farmland wildlife populations. People who engage in wildlife-related recreational activities, such as hunting, benefit most from these population increases. The net present value of wildlife hunting benefits produced by the CRP were estimated at $3.0 to $4.7 billion.

Effect on Wind Erosion

Many areas of the Western United States experience low average rainfall, frequent drought, and relatively high wind velocities. These conditions combined with fine soils, sparse vegetative cover, and agricultural activity make some western regions susceptible to wind erosion. Wind erosion contributes significantly to particulate air pollution in some regions of the arid Southwest and Great Plains. In rural areas, it can also produce short-term particulate loads in excess of urban levels, resulting in increased maintenance and cleaning costs for households and businesses, damages to nonfarm machinery, and harmful health effects. Reliable estimates of the economic benefits from reductions in wind erosion are difficult to develop from available information. However, it was estimated that wind erosion reduction benefits attributable to a 45 million acre CRP could range from $0.4 - $1.1 billion.

CONCLUSIONS

While it was not possible to estimate values for every potential real resource benefit and cost of the CRP (e.g. underemployment of production resources), estimates were made of the

primary effects including changes in farm income, timber production, consumer costs, soil productivity, surface water quality including filter strips, wildlife habitat, wind erosion, administrative costs, cost sharing of vegetative cover, and technical assistance costs. Based upon these estimates, the present value of net benefits for a 45 million acre CRP could range from $3.4 - 11.0 billion. The estimated effects on farm income, consumer costs, and sharing of establishment costs, do not exclusively reflect changes in economic welfare. Moreover, this estimated net benefit is dependent upon the without-CRP baseline scenario used to estimate the various effects of the CRP. As stated previously, the without-CRP baseline was assumed to be comprised of ARP and PLD requirements identical to those required by current legislation. Had an alternative baseline been adopted, resulting estimates of the economic effects of the CRP would have been quite different, leading to a different net benefit of the Program.

The manner in which other government programs would operate if the CRP did not exist plays a significant role in determining the magnitude of the estimated economic effects of the CRP. For example, in the absence of the CRP the annual acreage reduction program (ARP) could be expanded to retire an equivalent amount of land as the CRP will retire. Expanding the ARP would affect commodity prices in a manner similar to the CRP, so that negligible price effects would be estimated when compared to this baseline. Of course government program costs would also change with an expanded ARP. But perhaps most importantly, because the CRP targets highly erodible cropland, greater environmental benefits are generated than under an otherwise equivalent level of ARP cropland retirement.

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