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Supply Control, Conservation and Budget Restraint:
Conflicting Instruments in the 1985 Farm Bill

Steve Taff and C. Ford Runge

Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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> Social policy has entered the stage in which the ambitiousness of government must be matched by analytic competence if the nation is to avoid a condition--more common elsewhere in the world than perhaps realized--in which the grandiosity of official pronouncement is equalled only by the absence of result. -- Daniel Patrick Moynihan

Introduction

In the heat of legislative action, compromises are often made the net effect of which is clear only as programs are implemented. The Food Security Act of 1985 (the Farm Bill) is a good example of such unintended side-effects. The cost of the bill was intentionally underestimated to ensure passage. Low market prices and high deficiency payments encouraged high levels of participation, making substantial budget exposure an inevitable outcome. Recently reported cost overruns should therefore come as no surprise (although their size has surprised even the most pessimistic analysts).

Few realized, however, that mandated acreage reductions for program crops (designed in large part to reduce budget exposure) might have other undesired consequences. One of the most important has been to undermine the cost-effectiveness of the Conservation Reserve Program, mandated under a separate title of the Bill. This article analyzes the nature of the conflict between the Acreage Reduction Program and the Conservation Reserve Program in achieving three objectives of agricultural policy: (1) supply control, (2) conservation of marginal agricultural lands, and (3) budget discipline.

First, we demonstrate this conflict using farm-level examples and 1986 program data. Second, we offer an alternative targeting framework within which agricultural objectives and policy instruments can be arrayed. Finally, we propose legislative reforms that would make both the supply control program and the conservation program more effective.

Targets and Instruments in Agricultural Policy

Although a wide variety of objectives are advanced for agricultural policy (the 1985 Farm Bill notes at least seven; the conservation title itself lists another seven), we are concerned with three of principal importance to Congress and the USDA: (1) supply control, (2) conservation of marginal agricultural lands, and (3) budget discipline. The first two are explicit Farm Bill goals; the third was implicit throughout the debate. These program goals were intended to be met by two principal policy instruments (programs): acreage reductions and a conservation reserve. But the links between instruments and objectives were muddled at best.

Supply control was to be achieved in large part by the Acreage Reduction Progam (ARP), whereby eligibility for loan and deficiency payments is made conditional on reductions in acreage planted to program crops.[1] Although the intent is supply control, the main effect of ARPs is to reduce budget exposure by lowering the acreage on which program benefits are to be paid. The reason that ARPs generally fail to control supply--well-known to farmers but apparently not to policymakers--will be explored in greater detail below. Budget savings, however, are more assured. With July 1986 prices, loan rates and deficiency payments, 1985-86 costs for price-support program would be approximately $3-5 billion greater than in the absence of the ARP. Hence, while aimed at both supply control and budget discipline, it is the latter rather than the former objective which ARPs succeed most in addressing.

The second agricultural policy objective, conservation of marginal agricultural lands, was to be achieved by the Conservation Reserve Program (CRP). Under the CRP, landowners agree not to produce on highly erodible cropland [2] for ten years in exchange for an annual CRP rental payment.

Farmers submit sealed bids to the USDA, indicating the acreage and the amount per acre they would be willing to accept annually in compensation for retiring the land. The USDA then announces the maximum accepted bid level for the multi-county pool in which the farm is located. All acres bid at that rate or lower in the pool are enrolled in the CRP.

An axiom in economic policy analysis, due to Tinbergen (1952), holds that for each policy objective, there should be at least one instrument, and that each instrument should be carefully designed to have maximum impact on its primary objective. We have seen that the ARP violates this axiom, insofar as it attempts to accomplish both supply control and budget discipline, with a little conservation thrown in as well. The CRP is also a single instrument with more than one objective. Conservation and supply control are built in, while budget discipline is implicit in the bid procedure. As with the ARP, the fact that a single instrument is intended to meet multiple objectives raises immediate questions of feasibility. None of the objectives may be met. There is already evidence that the CRP is failing to retire as much marginal land as it could, that it does not accomplish a great deal of supply control, and that bids are much higher than anticipated.

The CRP is in trouble not only because of the lack of a clear match between instruments and objectives, but also because of two "program externalities" stemming from the concurrent operation of the CRP and the price support programs. We call these the "crowding out" and the "base bite" effects. Both program externalities raise the costs and reduce the effectiveness of the CRP.

These externalities can be illustrated from the farmer's perspective. First, consider the crowding out effect. Suppose that a farmer signed up

for the price support program, which requires a one-year corn acreage reduction of 20 percent of corn base. A farmer with 120 acres of cropland and 90 acres of assigned corn base could plant 0.8*90=72 acres to corn. The farmer must idle 18 acres in order to receive deficiency and other program payments calculated on the historic yield from 72 acres of permitted corn plantings.[3]

Under these circumstances, it is in the farmer's interest to idle the most marginal acres first, because these acres are least productive. Consequently, the ARP's potential impact on commodity supply is reduced. This "slippage" occurs because total farm income is derived from a combination of government payments and crop marketings. The more bushels that can be produced on the acres actually planted, the higher will be farm revenues. Indeed, in the past many farmers have been inclined to bring marginal acres into production just so that they will be available to set aside at some later date (Christensen and Aines; Heimlich; Berner).

The important consequence of this slippage is that many CRP-eligible acres are idled under the ARP before they are even considered for the CRP. This "crowds out" eligible acres that might otherwise have entered the CRP; it effectively lowers the pool of eligible acres for the conservation reserve and raises the bids received for CRP entry. Slippage thus not only frustrates supply control, but, through the crowding out effect, frustrates conservation objectives as well.

The second program externality, the "base bite effect", is not unintended; it was designed to give the CRP a supply control impact. For each acre entered into the reserve, the aggregate farm acreage base is reduced proportionately for the 10 years of the contract. A 120 acre farm with a 90 acre corn base will have its base reduced by 1/120, or .75 acres,

for each acre entered into the CRP. A 10-acre CRP entry would reduce our farmer's assigned corn base from 90 to 82.5; this new base would then be subject to the 20 percent ARP, resulting in total permitted corn plantings of 66 acres. (The CRP acreage itself is not taken from corn plantings, since the crop acreage base is an accounting, not a geographic entity.)

The result of CRP participation, whether or not marginal ARP acres are actually designated first, is that an additional 6 acres (72-66) of corn land must be idled. This effect, which is distinct from the crowding out effect, we call the "base bite". If the six additional corn acres to be idled are more productive than those which would be idled under the ARP alone, then the opportunity cost of removing them from production will also be higher, and so will CRP bids. In fact, from the farmer's perspective, the one-year marginal opportunity cost of CRP entry is the income foregone from the most productive acres entered into either program. The fact that the CRP is a 10 year contract makes putting productive acres into it even less attractive, further lowering the prospect that they will be retired at any but high bid prices.

The ironic and troubling result of these program interactions is that ARPs fail to control supply due to slippage, which in turn causes the CRP to lose eligible acres due to the crowding out effect. In addition, the base bite effect raises the opportunity cost of CRP participation and, thus, CRP bids. These conflicts frustrate both supply control and conservation objectives at the same time that they make both programs less cost-effective. The evidence from the first two rounds of CRP bidding supports this argument.

The CRP Experience to Date

Congress required that five million acres be enrolled in the CRP in 1986 and that an additional 40 million acres to be added over the succeeding four years. The USDA estimated that annual per-acre CRP rental costs (exclusive of cover-crop establishment) would average $38-$44 (Ogg et al. 1984). In order to meet the 5 million acre goal in 1986, the Department allocated $190 million. When the 1986 bids were examined, however, most were well above initial estimates. Agriculture Secretary Lyng declared the bulk of them "unreasonable" and authorized payment for only 838,000 acres, at an average bid of $41. Enrollments were far from uniformly distributed across states--Minnesota and Colorado alone accounted for 21% of first-round CRP acreage.

Inital 1986 CRP first-round experiences for Minnesota and the nation are shown in Figure 1. The weighted average accepted bid (weighted by acres per bid) is for those bids that fell under the maximum accepted bid in each pool. These were substantially lower, closer to the initial USDA estimates, because the Administration chose to keep program outlays "reasonable." This was accomplished at the expense of a great short-fall in terms of enrolled acreage, however.

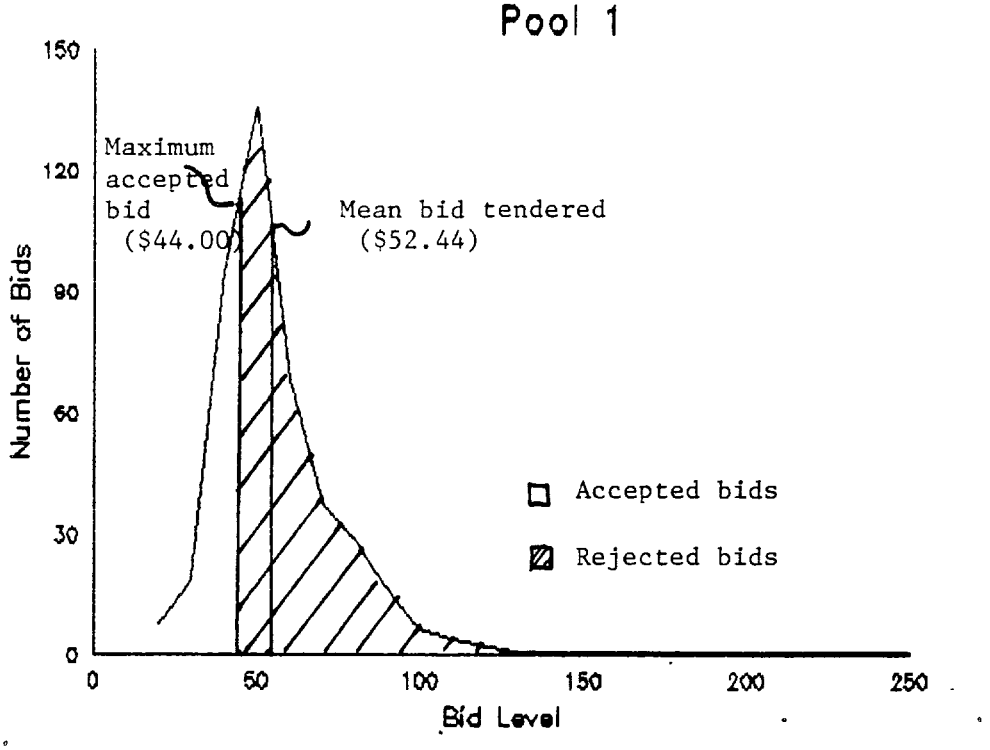
Figure 1: CRP enrollments and bids: United States and Minnesota

	First Round		Second and Third Rounds	
	Enrollment (000 acres)	Weighted Ave. Bid Accepted ($)	Enrollment (000 acres)	Weighted Ave. Bid Accepted ($)
Minnesota	79	48.21	215	49.13
United States	838	41.82	3001	44.23

Figure 2 shows bid distributions for two representative Minnesota multi-county pools. Pool 1 is an irrigated wheat region; Pool 8 is a corn-soybean region. The simple average bid tendered and the maximum accepted bid are shown for comparison. By limiting accepted bids to those essentially at or below prevailing cash rental rates, the USDA denied CRP participation to the bulk of interested landowners. High bids should have come as no surprise, however, given the program externalties discussed above and the fact that local cash rental rates historically fail to reflect farmers' expected incomes from land, particularly in periods of lucrative price support programs.

The 1986 CRP enrollment period was subsequently reopened, and at the same time early 1987 enrollments were accepted. These second and third rounds were much more successful in attracting bids at what USDA considered to be reasonable levels. Nationally, an additional three million acres and, in Minnesota, an additional 215,000 acres were added. (These totals were reported by USDA as "1986 CRP enrollments." Strictly speaking, however, they include a great many acres that will not be idled until the 1987 crop year.) The new CRP bids were still substantially above initial USDA estimates, however, now due not only to the program externalities but also to the learning behavior of farmers in the first bounds. Evidently reflecting the thinking that USDA would stick to its relatively low first-round maximum accepted bid, the distributions of tendered bids narrowed considerably. Many more bids were accepted, but there were fewer bids made at the very low end. Consequently, weighted average accepted bids increased in the second and third rounds (Figure 1). Figure 3 shows the experience over the thr rounds in Minnesota Pools 1 and 8.

Figure 2: Distributions for first-round CRP bids: Minnesota Pools 1 and 8



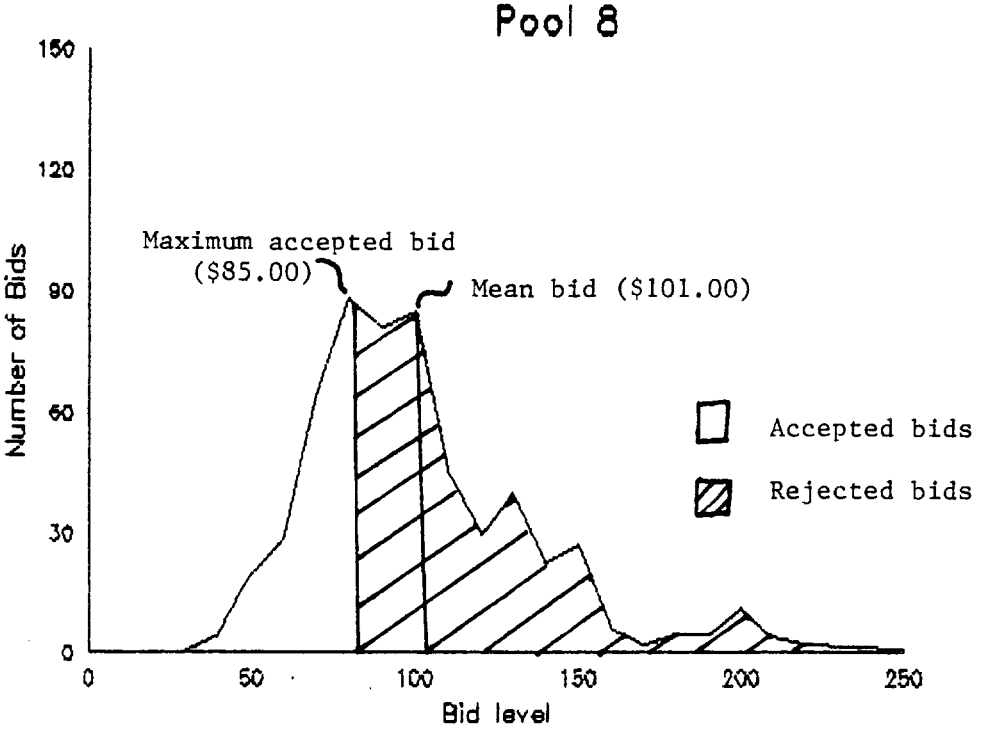


Figure 3: Distributions for three CRP bidding rounds: Minnesota Pools 1 and 8

	Round		
	86-1	86-2	87-1
Pool 1:			
Mean bid tendered	52.44	42.79	44.40
Wt.ave.bid tendered	53.60	44.07	45.87
Std.dev. bid tendered	19.74	8.79	7.83
Max. bid accepted	44.00	44.00	44.00
Mean bid accepted	36.27	39.93	40.54
Wt.ave. bid accepted	37.77	40.46	40.58
Pool 8:			
Mean bid tendered	101.14	82.62	86.65
Wt.ave.bid tendered	84.57	81.76	85.68
Std.dev.mean bid tendered	46.53	17.50	17.48
Max. bid accepted	85.00	85.00	85.00
Mean bid accepted	69.95	77.18	80.03
Wt.ave.bid accepted	69.93	75.66	79.95

Revised Targeting Criteria

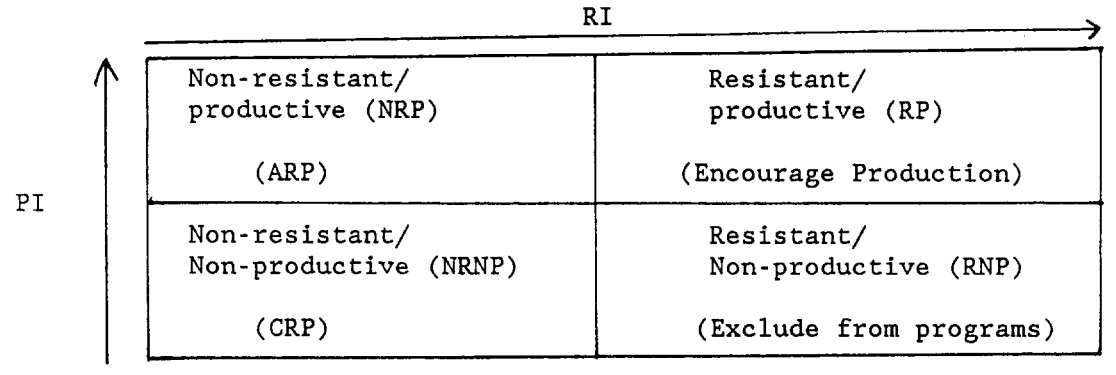
In general the more attractive is the price support program, the more expensive it is for the government to acquire CRP land. This is due both to the crowding out effect, which reduces the supply of CRP-eligible land and forces any CRP acreage onto more productive and more costly land, and to the base bite effect, which shifts the relevant foregone income calculation from the CRP acre to the highest valued land removed from production. If the base bite provision were removed from the CRP legislation, as we propose below, then the individual CRP bids could be determined strictly on the basis of the marginal productivity of alternate crops. Direct competition with the price-support program would vanish, and total CRP acreage would increase under a budget constraint. To remove the pernicious effects of the crowding out externality, one or both programs must be revised to exclude from eligibility those lands targeted for the other program. In this section, we present a targeting scheme to accomplish this reform.

The two program externalities can be eliminated if each program is targeted to maximize its impact upon a single objective---supply control in the case of the ARP and marginal land conservation in the case of the CRP. Such a targeting scheme should employ two basic criteria for the land in question: (1) its inherent agricultural productivity and (2) its inherent capacity to resist soil erosion. Both are quantifiable using data on crop yields and measures of soil erodibility. A variety of such measures are possible, and no specific measure need be used in every case. All are designed to overcome the administrative rigidity and subjective qualities associated with the now-traditional use of soil erosion tolerance levels (T-values) in policy making. For illustration, we here employ the "productivity index" and "resistivity index" approach developed in

Minnesota by Larson and others (See Runge, Larson and Roloff, 1986). The productivity index (PI) indexes soil according to its suitability as an environment for plant roots; it is based on available water capacity, bulk density, and pH. The index ranges from 0.0 to 1.0, where 1.0 is associated with that soil (within a given area of analysis) that has the best rooting environment. The resistivity index (RI) is a measure of a soil's vulnerability to erosion; it is based on topographic factors $(RKLS)^4$ from the Universal Soil Loss Equation and on the degree of potential loss of favorable rooting zone as the soil is eroded. Wind erosion is accommodated by incorporating factors $(ICL)^5$ from the Wind Erosion Equation. All soils are ranked on a 0.0 to 1.0 scale, with 1.0 assigned to soils extremely resistant to erosion-caused losses in production.

Together, PI and RI allow any geographic areas (farm, township, county, state) to be ranked on the basis of their soils' inherent productivity and resistivity characteristics. Land parcels (or soil classes) can be thought of as falling into one of four subsets, according to each parcel's position along PI and RI gradients, as in Figure 4.[6] This categorization permits us to apply particular policy instruments to each of the three agricultural policy objectives--supply control, conservation of marginal agricultural lands, and budget discipline. We argue that the appropriate instruments to achieve each of the policy objectives are, respectively: (1) the ARP, (2) the CRP, and (3) a land classification scheme designating productivity and resistivity criteria for program coverage. This matching permits a fully identified set of three policy instruments with three policy objectives.

Figure 4: Locating soils in productivity/resistivity space



The logic underlying the targeting of these instruments is straightforward. Soils that are resistant to erosion and highly productive (RP), shown in the upper right-hand corner of the diagram, are precisely those on which production should be encouraged. It is on these that the long-run comparative advantage of the United States lies as an exporter and low-cost producer. On less resistant but still productive soils, erosion damage must be compensated for by more costly practices and higher levels of inputs. Lands that are both resistant to erosion damage and non-productive (RNP), shown in the lower right-hand corner, are inappropriate as targets for either supply control or soil conservation, unless they have special features (such as rare wildlife or habitat) in which case a separate objective (such as protected habitat) is appropriate. A strong argument can be made for the development of such additional objectives, especially concerning off-site effects of soil erosion (See Crosson and Stout; McSweeny and Kramer).

In the upper left-hand corner of the diagram are soils that are non-resistant and productive (NRP). It is on these that ARPs should first be applied. There are three reasons for this matching. First, because they are productive, idling of these soils will result in larger and more cost-

effective supply reductions than would idling less productive soils, as is presently permitted. Slippage is thereby reduced. While ARPs on more resistant RP soils may be justified in the name of supply control as well, it makes sense to begin idling the more vulnerable NRP soils first, working into more resistant soils along the RI gradient only as surpluses become intolerable. The second reason to apply the ARP first to NRP lands is that it is cheaper to idle these soils under the ARP than it would be to retire them under the CRP--simply because they are more productive and, hence, more costly. Overall market value increases as one moves up and to the right on the diagram. Budget discipline is possible more by the coercive power of the ARP than by the use of the voluntary CRP process. The third argument in favor of the ARP on NRP soils, as opposed to NRNP soils, is one of management flexibility. In contrast to the 10-year CRP contract, the 1-year ARP requirement allows supply control to ebb and flow on a yearly cycle in response to supply conditions, relaxing in times of relative shortfall and increasing in times of surplus. In particular, in the event of national or international emergencies, it may be justifiable to crop previously idled non-resistant but productive soils.

In the lower left-hand corner of the diagram are lands that are non-resistant and non-productive (NRNP). It is on these lands that the CRP should concentrate. Because they are relatively unproductive but highly vulnerable to erosion, their retirement will be the most cost-effective way to maximize soil conservation for a given amount of retired acreage without reducing the amount of productive lands under cultivation. Also, precisely because they are unproductive, they will cost less to bring into the CRP.

A Proposal for Legislative Reform

The land targeting scheme outlined in the previous section provides a basis for three key reforms in the Farm Bill. These reforms would improve the capacity of federal government to (a) control supply; (b) promote conservation and (c) reduce the costs of current programs. Some of the necessary changes could be effected administratively, without specific Congressional authorization.

First, acreage reduction programs should be restricted to high productivity-low resistivity lands, and the conservation reserve should focus on low productivity-low resistivity lands. If additional supply control is necessary, then ARPs could be extended on a year-to-year basis to more resistant soils, but only after all lower resistance soils are set aside. One option would be to introduce a 3-5 year ARP for lands in the high productivity-low resistivity category, midway between the 10 year CRP and 1 year ARPs on more resistant soils. Such a scheme is outlined by Berner.

Second, those lands eligible for the CRP should be declared ineligible for the ARP. (The converse, however, would not hold. Higher productivity land with low resistivity could still be entered into the 10 year CRP). By de-coupling program eligibility in this manner, the crowding out effect would be eliminated, thereby raising the pool of eligible acres for the CRP, reducing CRP bids, and lowering overall program costs.

Third, current provisions attempting to make the CRP an instrument of supply control (the base bite) should be eliminated. Enrollment in the CRP should not be tied to reductions in farm acreage base.

All three proposals would lower the cost of the CRP and let ARPs more effectively control supply. Contrast this approach [7] and the status quo,

in which slippage brings unproductive soils into the ARP, frustrating supply control and, by the crowding out effect, forcing the CRP to pick up more productive and more costly acres, acres made even more expensive by the base bite. With ARPs targeted directly at productive land, the CRP could be left to focus on its primary objective: conservation.

NOTES

* Assistant Professor and Extension Economist, and Associate Professor, respectively, Department of Agricultural and Applied Economics, University of Minnesota. This study was supported by the Minnesota Agricultural Experiment Station and a grant from the Northwest Area Foundation, St. Paul, Minnesota.

[1] The Farm Bill provides three instruments to control supply--acreage limitations, set-asides, and required diversions. All three, often used interchangeably in the literature, require that the farmer not plant some cropland, in exchange for government subsidies. A "set-aside program" would require that the farmer not plant a particular proportion of "planted acres." An "acreage limitation program" would require that the farmer not plant a particular proportion of the "crop acreage base." "Required diversions" are additional to the other two and might be tied either to base or to planted acres. For 1986, the USDA implemented an acreage limitation program with a small required diversion tied to base. The distinctions are important to the extent that the base--which is the average of several-years of planted and considered-planted acres--differs from planted acres, which is a one-year record only. All three supply-control mechanisms are subsumed under the rubric "Acreage Reduction Program" in this paper.

[2] CRP eligibility is restricted to those lands currently cropped in SCS capability classes VI-VIII, or currently-cropped class II-V lands that are eroding at more than three times the SCS-determined tolerance rate ("3-T" or greater). There are an estimated 60-70 million acres of such land nationwide, 45 million acres of which are mandated by legislation to be retired over a five year period.

NOTES (Con't):

[3] It is important to note that any 72 of the 120 acres of cropland on the farm could be planted to corn, and that any 18 could be idled. Program participants are paid the difference between a crop's target price and the actual price (or loan rate, if higher). A farm's official crop acreage base is an accounting entity used by ASCS to determine the magnitude of the deficiency payments for that commodity, based on historic planting records. The base is not a geographical designation. Hence, a particular acre should not be thought of as a "base acre" or a "non-base acre". Deficiency payments are calculated for output "grown" on the farm's established base at the established base yield. The farmer can plant no more of a program crop than the established base in that crop, less any ARP, although a farm may have bases for more than one crop. There are incentives to plant considerably less than permitted acreage, which is the base less any required acreage reduction, but we ignore these. Here, planted acreage equals permitted acreage.

[4] R=rainfall and runoff; K=soil erodibility; L=slope length; S=slope steepness.

[5] I=soil erodibility; C=climatic factor; L=unsheltered distance.

[6] The RI and PI indexes disentagle two components of the Soil Conservation Service's land capability classification (LCC) system. The bulk of LCC class IV-VIII soils lie in the lower-left quadrant of Figure 5.

NOTES (Con't):

[7] The particular definition of productivity and resistivity need not be confined to the indexes used in Minnesota, nor to any given level of these criteria. Given a particular set of supply control, conservation and budget goals, the level at which PI and RI are "cut" to determine program coverage is flexible. In Minnesota, for example, a state conservation reserve program has been developed which makes eligible only those lands located among the lowest 25 percent of each gradient. (The Minnesota program also sets state payments at 90 percent of the average accepted CRP bid to avoid state revenues being spent when federal revenues would otherwise be committed.) As another example, a CRP might be designed for low RI but mid-range PI lands, on the supposition that market forces will automatically retire the lowest PI lands on their own (low) merits.

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