February 1986 A.E. Res. 86-4

INCOME TAX CONCESSIONS AND INVESTMENTS IN SOIL CONSERVATION PRACTICES

by

Nelson L. Bills

Department of Agricultural Economics
Cornell University Agricultural Experiment Station
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York, 14853

It is the policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

Preface

This research was supported by the Natural Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. William Anderson, Robert Boxley, George Casler, Arthur Daugherty and Ralph Heimlich made helpful comments on an earlier draft of this report. Any remaining errors or omissions, however, are the sole responsibility of the author.

Table of Contents

INCOME TAX CONCESSIONS AND INVESTMENTS IN SOIL CONSERVATION PRACTICES

by

Nelson L. Bills*

Soil erosion on cropland is a perennial public policy issue in the United States because some cropland erodes at rates that appear to jeopardize long-term soil productivity and/or generate important off-site damages. These conditions persist despite a half-century of public policies and programs designed to induce farmland owners to voluntarily take measures to ameliorate soil loss problems on the Nation's agricultural land. The inducements employed take three general forms: (1) educational programs and technical assistance delivered to landowners through local soil and water conservation districts, (2) direct cash subsidy, usually via a cost-sharing payment to a landowner who is willing to install a soil conservation practice, and (3) tax concessions for certain soil and water conservation projects under the Federal Internal Revenue Service Code.

The centerpiece of Federal income tax policy for soil and water conservation is a 1954 amendment (Sec. 175) which allows a taxpayer with farm income to treat a conservation-related land improvement as an ordinary business expense. Deducting the expenditure reduces net farm income and produces tax savings for the current tax year. Prior to this change, soil and water conservation expenditures had been treated as a nondepreciable capital improvement. A nondepreciable capital item increases the basis for calculating capital gain and produces a tax saving when the property is liquidated. It has been shown that the tax saving from the deduction is superior to the saving via capital gain (Boxley and Anderson; Collins).

Popular opinion is that deducting a conservation outlay as an ordinary business expense under Sec. 175 tends to make the Internal Revenue Code pro-conservation. That is, the expensing option creates an economic incentive to undertake soil conservation practices on the Nation's farmland. However, two factors weigh against such opinions. The first traces to confusion over definitions. The Internal Revenue Code treats conservation expense generically. Deductible expenses to improve land under Sec. 175 include commonly accepted erosion control practices but also encompass expenditures needed to improve drainage, eradicate brush, or provide supplemental irrigation water. Such land improvements often set the stage for more intensive crop production. More intensive production can lead to more, rather than less, soil erosion. On the other hand, Sec. 175 is by definition limited to

*Associate professor, Department of Agricultural Economics, Cornell University.

erosion control expenditures which involve improvements to land. In contrast, many widely accepted techniques for erosion control--such as cover crops, conservation tillage, strip-cropping and contour farming--do not require expenditures to improve land. Landowners who employ these measures do not explicitly receive differential treatment when computing their income tax liability.

Second, the conservation incentive argument is based on a simple comparison of the option to deduct rather than capitalize the cost of improving land for conservation purposes. This narrow context for evaluating conservation management decisions lacks precision because it ignores broad classes of on-farm expenditures which are depreciable under the Code. Investments in depreciable capital items may be equally, or even more, advantageous from an income tax point of view. A necessary condition for tax-induced conservation investment under Sec. 175 is that the owner-investor cannot generate greater tax savings with a depreciable expenditure. Depreciable expenditures include a few well-recognized erosion control measures such as implements needed to practice reduced or no-tillage, but extend to a variety of productivity-increasing land improvements. Examples are installation of field drainage tile, fencing, and construction of structures for feed, livestock, or machinery storage.

Both definitional problems and the tax advantages available to those who make expenditures which are capitalized, deducted, or depreciated are addressed in this report. Practices eligible for a conservation deduction are discussed and compared with conservation treatment needs and the land treatment measures actually used by landowners to control soil erosion, as reported in the USDA's 1982 National Resource Inventory. Then, Code provisions for depreciable and nondepreciable improvements to land are described and analyzed within the framework of a simple investment model for the farm firm. This approach allows internally consistent comparisons of the tax treatment afforded all land improvements. Calculations derived from this model shed new light on tax incentives for conservation-related land improvements under current tax law. A concluding section of the report outlines the study's implications for public soil erosion policy.

Soil Erosion and Erosion Control on U.S. Cropland

Soil erosion from rainfall or wind is predicated upon physical features of land used for crop production but also depends upon crop rotations, tillage operations, and conservation support practices selected by the farm operator. These management practices, in particular overt efforts to reduce soil loss through reduced tillage or conservation support practices, are the point of departure for an analysis of tax provisions for soil and water conservation expenditures and erosion control.

Erosion Control Practices and Deductible Conservation Expenses

The USDA collected comprehensive information on soil loss for cropland in the 1982 National Resource Inventory (NRI). The inventory shows that 36 percent of U.S. cropland is treated with one or more practices which reduce erosion due to rainfall or wind (table 1). The predominant practice is conservation tillage, a cultural practice involving reduced or no tillage and utilization of crop residues to reduce erosion. When combinations with other practices are taken into account, 24 percent of all cropland--about 100 million acres--has the benefit of this practice. Roughly two-thirds of all treated acreage involves the use of conservation tillage. Terracing--a land improvement which reduces rainfall erosion by reducing slope length--is used on about 7 percent of the Nation's cropland. Other practices, such as contour farming and diversions, can materially reduce soil loss but are used on only a small fraction of the total cropland base.

Table 1--Status of conservation treatment for wind, sheet, and rill erosion on U.S. cropland, 1982

Conservation practice	Acres (1,000)	Percent
None	269,135.3	63.9
Contour farming	8,771.0	2.1
Diversions	1,066.9	0.3
Windbreaks	3,359.7	0.8
Grade stabilization	1,168.0	0.3
Grassed waterway	7,136.8	1.7
Contour stripcropping	1,810.7	0.4
Wind stripcropping	6,877.7	1.6
Terrace	3,450.7	0.8
Conservation tillage	76,036.6	18.0
Combinations of practices:		
Terrace/conservation tillage	11,799.0	2.8
Terrace/other	13,483.7	3.2
Conservation tillage/other	11,798.3	2.8
All other	5,471.8	1.3
Total	421,366.2	100.0

Source: Unpublished data from the 1982 National Resource Inventory.

The control measures currently used by farmers to curb soil loss on cropland contrast sharply with the land management practices which fall under the purview of Sec. 175 of the IRS Code. For tax purposes, a far wider range of land improvements are treated as a deductible soil and water conservation expense, but only a few are necessarily related to erosion control (table 2). Aside from windbreaks (tree plantings to reduce wind erosion), the Code focuses only on soil erosion measures which alter cropland topography by reducing slope length (diversions and terraces) or control gullying in areas with concentrated overland flow (grassed waterways). Code Sec. 175 otherwise focuses on land improvements oriented toward waste treatment, drainage works, irrigation improvements, and brush control.

Table 2--Deductible soil and water conservation expenditures by type of conservation improvement

Deductible expenditure	Erosion control measure	
	Yes	No
Leveling and grading		X
Soil conditioning		X
Terracing	X	
Restoration of fertility		X
Diversion channels	X	
Drainage ditches		X
Irrigation ditches		X
Earthen dams		X
Watercourses and outlets	X	
Ponds		X
Eradication of brush		X
Windbreaks	X	
Assessments for improvements made by conservation or drainage districts		X

Source: Adapted from U.S. Department of the Treasury, 1984.

While all of these land improvements fall within the general rubric of soil and water conservation, it is clear that Code provisions for a conservation deduction cannot be used interchangeably with expenditures to control soil erosion. At present, less than 10 percent of all U.S. cropland is treated with measures (terraces, diversions, grassed waterways, and windbreaks) which fall under Sec. 175 of the Code because they entail enduring capital improvements to land. Under current technology, efforts to control soil erosion do not principally involve investments in land improvements. Conservation tillage, now used on nearly a quarter of the Nation's cropland, involves adjustments in machinery complements on farms, changes in production inputs, and different timing for field tillage operations. Similarly, a number of more traditional erosion control practices--such as contour farming--entail adjustments in crop production practices but do not generally require permanent improvements to the land.

Erosion Treatment Needs

The importance of improving land for erosion control purposes in the future will depend on the vulnerability of the cropland base to soil loss in crop production and the cost effectiveness of alternate erosion control practices. To gain perspective on these conditions, data on erosion treatment needs were summarized from the 1982 NRI. This information was combined with a classification of land based on its physical erosion potential (Bills and Heimlich). In reference to a 5 ton per acre per year (TAY) soil loss tolerance, nearly 40 percent of the U.S. cropland base is nonerodible (table 3). This land can be used at varying intensity in crop production without appreciable loss of productivity or off-site damage due to rainfall erosion. Nonerodible cropland, by definition, does not require additional treatment to control rainfall erosion.

Table 3--Status of erosion control treatment on U.S. cropland, 1982

Erosion potential	Erosion treatment needed		
	Total	Yes	No
		Acres	
Moderately erosive:			
Managed below tolerance	164,872.1	59,041.8	105,830.3
Managed above tolerance	60,930.4	57,399.6	3,530.8
Highly erosive	29,858.1	29,561.6	296.5
Nonerosive	165,705.6	--	165,705.6
Total	421,366.2	146,003.0	275,363.2
		Percent	
Moderately erosive:			
Managed below tolerance	39.1	14.0	25.1
Managed above tolerance	14.5	13.6	0.9
Highly erosive	7.1	7.0	0.1
Nonerosive	39.3	--	39.3
Total	100.0	34.6	65.4

-- = Not applicable.
Source: 1982 National Resource Inventory.

Nearly 55 percent of all cropland has the requisite physical properties to erode above or below a 5 TAY tolerance, depending on the management applied by farm operators. This land is rated moderately erosive. According to on-site assessments by SCS technicians, the 1982 NRI indicates that about half (109.4 million acres) of this land now receives adequate erosion control treatment while 116.4 million acres requires further treatment (table 3). However, almost three-fourths of this moderately erodible land is currently managed within a 5 TAY soil loss tolerance.

At the other extreme, 7 percent of all cropland is highly erodible. Virtually all of this highly erodible cropland requires treatment for erosion control. This land cannot be managed to erode below a 5 TAY tolerance except under the most restricted farming methods (such as permanent vegetative cover).

Investment in Land Improvements Under Alternate Tax Rules

One can hypothesize that some decisions to improve farmland, for conservation purposes or for other reasons, are tax-induced. However, it is difficult to assemble the evidence needed to determine just how influential expected tax liabilities are in the investment decision (Sisson). Proving that a certain investment has advantageous tax treatment hardly proves that the investor will decide to undertake it. The best that can be done is accumulate circumstantial evidence showing the ramifications of a tax rule for an investment's economic feasibility.

Such evidence was developed in this study, based on calculations derived from a simple investment model. The model mirrors the economic considerations thought to be involved with an on-farm investment. When altered to reflect provisions of the Internal Revenue Code, it provides information on the impact tax rules have on the economic feasibility of a capital expenditure to improve land for farming purposes.

Alternate Tax Rules

As a point of departure, the Code was reviewed to determine the options available for computing tax liabilities incurred when improving farmland. For this purpose, a distinction must be made between depreciable and nondepreciable land improvements. Nondepreciable improvements are those defined as a soil and water conservation expense--see table 2. These outlays can be capitalized (added to the basis for calculating capital gain or loss when the land is liquidated) or deducted as an ordinary business expense. Public subsidy in the form of cost sharing is sometimes available for such improvements; for some public subsidy programs, the investor can elect to exclude the cost-share amount from calculations of taxable income.

This treatment of a conservation investment contrasts sharply with that afforded a land improvement defined as depreciable under the Code. A land improvement is depreciable if it (1) is used in the farm business, (2) has a determinant useful life of more than one year, and (3) is subject to wear, obsolescence, or a loss in value from natural causes (U.S. Dept. of the Treasury, 1984). The investor can recover the costs of such improvements under the Accelerated Cost Recovery System (ACRS). Alternatively, the item can be depreciated over a 5-, 12-, or 25-year span. Within dollar limits, an election can be made to deduct (expense) the cost of a depreciable asset, rather than recover its cost via ACRS or alternate ACRS. Finally, broad classes of depreciable land improvements are also eligible for an investment tax credit.

Some tax options can be used in combinations. Thus, the farm investor who contemplates a farmland improvement has a somewhat bewildering array of 31 tax avenues available for consideration (table 4). Six have to do with soil and water conservation outlays which are nondepreciable and fall under Sec. 175 of the Code; four of these are contingent upon the availability of a public cost-share subsidy. The remaining 25 options relate to depreciable capital items. Most depreciable improvements to farmland fall under Sec. 1245 of the IRS Code and qualify as five-year property for cost recovery purposes (Casler and Smith). Examples of such land improvements are single purpose livestock and horticultural structures, silos, grain storage bins, fences, paved barnyards, water wells and drainage tiles.[1] Such property is subject to cost recovery under the Accelerated Cost Recovery System (ACRS) or straight-line depreciation--referred to as Alternate ACRS. The investor has the option of depreciating over 5, 12 or 25 years. Regardless of the cost recovery method selected, the investor can obtain an 8 or 10 percent investment credit on these depreciable expenditures to improve land.

Within dollar limits, the investor can make an election to treat an outlay for a depreciable capital item as an ordinary business expense (Sec. 179). Investment tax credit is not allowed when an outlay for a depreciable capital item is treated as an ordinary business expense. Finally, options for depreciable capital items can be combined in any given tax year, but the combinations are limited under current law. Investors must use the same method and recovery period for all property in the same cost recovery class. However, one can combine a selected method and recovery period with an election to expense under Sec. 179 (table 4).

An Investment Model

The implications of tax liabilities accruing under each tax option can be illustrated by incorporating them into a simple investment model for the farm firm. Consider first the rule that might be applied to a landowner's decision to undertake an investment in a land improvement in the absence of an income tax liability (Boxley and Anderson):

---

[1] All farm machinery and equipment, except light trucks, is also five-year property under Sec. 1245 (U.S. Dept. of the Treasury, 1984).

Table 4--Land improvements: Tax options available to sole proprietors with farm income

Type of improvement	Cost-sharing: None	Cost-sharing: Declared as income	Cost-sharing: Excluded[1] from income	Investment credit (IC): None	Investment credit (IC): 10%	Investment credit (IC): 8%
Nondepreciable						
Capitalize	X	X	X			
Expense[2]	X	X	X			
Depreciable						
Cost recovery						
ACRS				X	X	X
Alternate ACRS						
5 years				X	X	X
12 years				X	X	X
25 years				X	X	X
First year election to expense[3]				X		
Cost recovery and first year election to expense						
Alternate ACRS						
5 years				X	X	X
12 years				X	X	X
25 years				X	X	X

[1] Federal or state programs must be certified by the Secretary of Agriculture to be eligible. Certified Federal programs include the rural clean water program and certain programs falling under the (1) Surface Mining and Control Act of 1977, (2) Water Bank Act, (3) Agricultural Credit Act of 1978, (4) Soil Conservation and Domestic Allotment Act, (5) Cooperative Forestry Assistance Act of 1978, and (6) Watershed Protection and Flood Protection Act.

[2] Expensing of a soil and water conservation project is limited to 25 percent of gross farm income during the tax year; unused deductions can be carried over to succeeding tax years.

[3] Deduction cannot exceed $5,000 for the 1984-87 tax years. The limit increases to $7,500 in 1988 and 1989, and to $10,000 for 1990 and thereafter.

Source: Adapted from U.S. Department of the Treasury, 1984.

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)}{(1+i)^t} + \frac{E_o\ (M_k)}{(1+i)^k} \qquad (1)$$

where:
- I = the investment cost;
- V_o = the value of the investment to the landowner at t_o;
- $E_o(Y_t)$ = the expected net income to be generated by the investment in t;
- $E_o(M_k)$ = the expected salvage value of the improvement at the end of year k;
- i = the opportunity cost of the landowner's capital;
- t = unit of time (year);
- k = the number of years the investment is held.

The decision rule in (1) makes a land improvement attractive from an economic point of view if the present value of the returns expected from the outlay are greater than the expense incurred when the improvement is made; both annual accruals of income and the expected salvage value of the improvement are taken into account.

Federal income tax liabilities are easily introduced into the model:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + \frac{E_o\ (M_k) - T_c\ [E_o\ (M_k)]}{(1+i)^k} \qquad (2)$$

where:
- T_r = a marginal tax rate on annual income;
- T_c = the marginal tax rate on capital gains.

Here a tax is levied on income expected to be generated by the land improvement on a yearly basis. The reduction in income is a function of the tax rate (T_r); income remaining after taxes is $1-T_r$. Changes stemming from gains (or losses) in the capital value of an asset--the second component of (1) above--are also taxed. Any gain on the capital value of the investment (M_k) is subject to tax at the effective tax rate, T_c. Under the current law, 40 percent of the gain on an asset held more than six months must be declared as ordinary income at the marginal rate (T_r).

Conservation Improvements: To fashion contrasts between a conservation outlay and other kinds of land improvements, consider the effect of capitalizing a conservation expenditure on the investment decision rule:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + \frac{E_o\ (M_k) - T_c\ [E_o\ (M_k) - I]}{(1+i)^k} . \tag{3}$$

Adding a conservation expenditure (I) to the basis for capital gains sets the stage for a tax reduction when the land is liquidated. If E_o $(M_k) \geq I$, i.e., the conservation improvement does not depreciate, taxes on gain are reduced by T_c (I); the present value of the tax reduction is $T_c\ (I)/(1+i)^k$.

This treatment under the law can be contrasted with the option of deducting the conservation outlay during the tax year (Code Sec. 175). If recapture is ignored, the decision then becomes:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + T_r\ (I) + \frac{E_o\ (M_k) - T_c\ [E_o\ (M_k)]}{(1+i)^k} . \tag{4}$$

The effect of the deduction, compared with capitalization, on tax liabilities is twofold. First, the deduction produces an immediate tax benefit--T_r (I). Second, tax savings generated by an increase in the basis for calculating capital gain are forgone--see equation (3).

A 1969 amendment provides for recapture of all or a fraction of previously deducted conservation expense as ordinary income if the improved farmland is disposed of in nine or fewer years after it was acquired (Code Sec. 1252).[2] The decision rule is modified accordingly:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + T_r\ (I) + \frac{E_o\ (M_k) - \left\{T_c\ [E_o\ (M_k)] + T_r\ [RC_k]\right\}}{(1+i)^k} \tag{5}$$

where RC_k = recapture of conservation expense in year k.

---

[2] If the land is held for 5 years or less, the recapture percentage is 100; recapture declines in 20 percent increments for years 6-9 and is zero thereafter.

The recapture provision reduces the taxes saved by the conservation deduction, but the impact of the law's recapture provision is dampened by the discount rate except in the unlikely case where land is improved and liquidated during the same tax year.

Some landowners undertake conservation projects with public cost sharing assistance. If the public subsidy is declared as income and the expenditure is capitalized, the decision rule becomes:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + (1-T_r)\ (S)\ (I) + \frac{E_o\ M_k - \{T_c\ [E_o\ M_k - I\ (1-S)]\}}{(1+i)^k} \tag{6}$$

where S = Federal cost share ($0 \leq S \leq 1.0$).

With cost sharing, profitability of the investment increases because $(1-T_r)$ (S) (I) is available to offset the outlay after taxes. An offsetting effect is that only the owner's share of the project expense can be used to adjust the basis for calculating gain at the time of liquidation.

If the conservation project is expensed with cost-sharing assistance, the rule is:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + T_r\ (1-S)\ I + (1-T_r)\ (S)\ (I) + \frac{E_o\ M_k - \{T_c\ [E_o\ (M_k)] + T_r\ [RC_k]\}}{(1+i)^k}. \tag{7}$$

A 1978 Code amendment (Code Sec. 126) gives landowners the option of receiving cost sharing but making a one-time election to exclude these funds from calculations of taxable income. Further, no adjustment to the basis of the property is to be made. If the property improved with such payments is disposed of within 20 years, all or a portion of the payments are recaptured as ordinary income during the year of disposition (Code Sec. 1255).[3]

The decision rule, with a conservation project capitalized but with a Federal cost share excluded from income, becomes:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + S\ (I) + \frac{E_o\ (M_k - \{T_c\ [E_o\ (M_k) - I] + T_r\ [RCS_k]\}}{(1+i)^k} \tag{8}$$

where RCS_k = recapture of excluded Federal cost share in year k.

If the project is expensed:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + T_r\ (1-S)\ I + S\ (I) + \frac{E_o\ M_k - \{T_c\ [E_o\ (M_k) - I] + T_r\ [RC_r + RCS_k]\}}{(1+i)^k}. \tag{9}$$

Depreciable Land Improvements: Tax treatment accorded depreciable land improvements was substantially modified by the 1981 Economic Recovery Tax Act. This legislation makes farmland improvements eligible for accelerated cost recovery (ACRS). Under ACRS, depreciable assets are placed into one of four cost recovery classes, regardless of the expected useful life of the asset to the farm business (Code Sec. 168). Any expected salvage value of the asset is ignored in the cost recovery calculations; all cost recovery under ACRS or an alternate straight-line depreciation method is taxable as ordinary income in the year of disposition. Under ACRS, the decision rule is:

---

[3] A 100 percent recapture rate applies if disposition occurs within the first 10 years, with an annual decrease of 10 percent thereafter.

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o (Y_t)(1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r (CR_a)}{(1+i)^a} + \frac{E_o (M_k) - \left\{T_c [E_o (M_k)] + T_r [\sum_{t=1}^{a} CR_a]\right\}}{(1+i)^k} \quad (10)$$

where CR_a = cost recovery in year a.

Finally, one can elect to schedule straight-line depreciation for an eligible land improvement. When depreciated, the decision rule is:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o (Y_t)(1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r (D_a)}{(1+i)^a} + \frac{E_o (M_k) - \left\{T_c [E_o (M_k)] + T_r [\sum_{t=1}^{a} D_a]\right\}}{(1+i)^k} \quad (11)$$

where D_a = depreciation in year a.

Whether cost recovery or depreciation is taken on the acquired asset, the Code allows for an investment tax credit. The credit is subtracted directly from the investor's tax liability; there are provisions for carry-over of credits to succeeding tax years. One has the option of obtaining a 10 percent investment credit (C) and reducing the basis for cost recovery or depreciation by 5 percent.

If property is liquidated before the credit claimed is fully earned, a portion is subject to recapture. If the property is disposed of after one full year, the full credit amount is subject to recapture. The fraction recaptured is reduced by one-fifth for each full year increase in the holding period; recapture is zero if the property is held for five or more years.

If C = .1 and ACRS applies, then .95 (I) is available for cost recovery. If the land is held for the full recovery period or longer ($k \geq 5$), the decision rule is:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r\ (.95CR_a)}{(1+i)^a} + C\ (I) + \frac{E_o\ (M_k) - \left\{T_c\ [E_o\ (M_k)] + T_r\ [\sum_{t=1}^{a} .95CR_a]\right\}}{(1+i)^k} . \quad (12)$$

The provision for adjusting the basis can be circumvented with an election to take an 8 percent investment credit. If C = .08 (I) and ACRS applies, then the full outlay is available for cost recovery. If $k \geq 5$, then the decision rule becomes:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r\ (CR_a)}{(1+i)^a} + C\ (I) + \frac{E_o\ (M_k) - \left\{T_c\ [E_o\ (M_k)] + T_r\ [\sum_{t=1}^{a} CR_a]\right\}}{(1+i)^k} . \quad (13)$$

Investment credit with straight-line depreciation has an identical effect on the decision rule. If C = .1, then .95 (I) is available for cost recovery. The decision rule is:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o\ (Y_t)\ (1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r\ (.95D_a)}{(1+i)^a} + C\ (I) + \frac{E_o\ (M_k) - \left\{T_c\ [E_o(M_k)] + T_r\ [\sum_{t=1}^{a} .95D_a]\right\}}{(1+i)^k} . \quad (14)$$

If C = .08 (I) and straight-line depreciation applies:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o (Y_t) (1-T_r)}{(1+i)^t} + \sum_{t=1}^{a} \frac{T_r (D_a)}{(1+i)^a} + C (I) + \frac{E_o (M_k) - \left\{T_c [E_o (M_k)] + T_r [\sum_{t=1}^{a} D_a]\right\}}{(1+i)^k} . \quad (15)$$

Finally, an investor can elect to treat the cost of a land improvement as an expense rather than a capital expenditure (Code Sec. 179). Investment credit is not allowed on any portion of the cost which is expensed. All gain stemming from the liquidation of the asset is treated as ordinary income. The maximum deduction allowed is $5,000 for 1984-87, $7,500 for 1988-89, and $10,000 for 1990 and thereafter.

If an expenditure on a depreciable item is expensed, the decision rule becomes:

$$I \leq V_o = \sum_{t=1}^{k} \frac{E_o (Y_t) (1-T_r)}{(1+i)^t} + \frac{E_o (M_k) - T_r [E_o (M_k)]}{(1+i)^k} . \quad (16)$$

Impact of Tax Rules on Investment Feasibility

Unfortunately, the parameters needed to empirically validate the proposed model are not available. Reliable information about landowner's planning horizon, discount rate and expectations about future income, expenses, and terminal asset value is difficult to acquire. The validation problem is particularly severe when conservation investments are involved because little information exists on relationships between reduced soil erosion and net income. However, it is informative to simulate the impact of each tax option on net income using consistent assumptions about investor behavior. This can be accomplished by calculating the present value of pretax net income required to just offset the cost incurred in improving land.

For the purposes of this study, the calculations were referenced to a $100 cash outlay and the present value of pretax income needed to "break even" on the improvement was expressed on an annualized basis. The effect of each tax option is to increase or decrease the pretax net income needed to make the improvement economically feasible. The model was solved for marginal tax rates applicable to married individuals who file a tax return jointly with their spouses; tax rates for this group range from 11 to 50 percent for the 1984 tax year. When applicable, a 50 percent cost-share rate on conservation improvements was incorporated into the analysis.

To illustrate, the present value of after-tax net income required to break even on a $100 expenditure in the context of equation (2) is:

$$\sum_{t=1}^{k} \frac{E_o (Y_t) (1-T_r)}{(1+i)^t} = 100 - \frac{E_o (M_k) - T_c [E_o (M_k)]}{(1+i)^k} .$$

The annual equivalent of this income stream can be calculated as (Herfindahl and Kneese):

$$E_o (Y_t) (1-T_r) (1+ (1+i)^{-k}/i) .$$

Substituting and solving for $E_o(Y_t)$:

$$\frac{E_o (Y_t)}{1 - T_r} = \frac{\dfrac{100 - E_o (M_k) - T_c [E_o (M_k)]}{(1+i)^k}}{1 - (1+i)^{-k}/i} .$$

This approach requires the assumption that the pretax net income increment $E_o(Y_t)$ is received in level amounts at the end of each year in the planning period. Its value can be calculated for all marginal tax rates (T_r). To further simplify the analysis, it was assumed that the investor's marginal tax rate is constant during the holding period. Alternate tax rules can be sequentially introduced into the investment model, using $E_o(Y_t)$ as a point of reference for gauging the impact of the rule on the profitability of an incremental $100 investment in a land improvement.

Conservation Improvements: Results for a conservation improvement under a 20-year planning horizon, a 10 percent discount rate, a 100 percent salvage value, and a 50 percent cost-share rate are shown in table 5. As expected, capitalizing the improvement (see equation 3) requires the largest pretax net income to insure project feasibility. When capitalized, the improvement expense is added to the basis for computing gain income in the year the land is liquidated. Since it is assumed for purposes here that the improvement does not deteriorate in value (salvage value equals investment cost), the basis for calculating tax on capital gain is zero and tax on gain income is avoided; the annual income stream required to justify the outlay is only offset by the present value of the investment at liquidation.

Under these circumstances, the pretax income required to justify the outlay increases sharply as marginal tax rate increases. Taxes on

Table 5--Annualized present value of pretax income required to break even on a $100 conservation land improvement by tax option[1]

Marginal tax rate (percent)	Capitalized			Expensed		
		50% cost-share			50% cost-share	
	No cost-share	Declared as income	Excluded from income	No cost-share	Declared as income	Excluded from income
			Dollars			
11	11.24	5.41	4.64	9.87	4.72	4.00
12	11.36	5.54	4.69	9.86	4.79	3.98
14	11.63	5.81	4.80	9.83	4.91	3.96
16	11.91	6.10	4.91	9.80	5.05	3.93
18	12.20	6.40	5.03	9.77	5.19	3.90
22	12.82	7.05	5.29	9.71	5.49	3.83
25	13.33	7.58	5.50	9.65	5.74	3.78
28	13.89	8.15	5.73	9.59	6.00	3.72
33	14.93	9.22	6.16	9.48	6.50	3.61
38	16.13	10.47	6.66	9.36	7.09	3.49
42	17.24	11.62	7.12	9.24	7.62	3.37
45	18.18	12.60	7.50	9.14	8.08	3.27
49	19.61	14.07	8.09	8.99	8.76	3.12
50	20.00	14.48	8.25	8.95	8.95	3.08

1 Twenty-year holding period, 10 percent discount rate, 100 percent salvage value.

gain are avoided and the improvement's salvage value receives the same discount penalty, regardless of income level. Thus, variation in pretax income needed to justify (break even on) the outlay is due solely to the tax liability incurred on ordinary (current) income.

As mentioned previously, incentives to invest in a conservation improvement are altered by an election to expense rather than capitalize the outlay. Under assumptions used here--20-year holding period, 10 percent discount rate, and 100 percent salvage value--the annualized present value of break-even net income before taxes ranges from $9.87 to $8.95 per $100 expended (table 5). Furthermore, the effect of the deduction is perverse in the sense that high-income investors who utilize the deduction need less net income before taxes to break even than do investors in lower tax brackets. This holds because the deduction offsets tax liability for the current tax year and is more valuable to the high income investor; this benefit more than offsets the relatively higher tax liability incurred by the high income investor on gain income at liquidation (see equation 5). Tax liabilities generated by gain income are heavily penalized by discounting, regardless of one's taxable income.

Public subsidy in the form of cost sharing, as expected, has a dramatic effect on the feasibility of a conservation project, and any opportunities to exclude a cost-share increment from taxable income accentuate these effects. The interaction of discounting, alterations of the basis for calculation of capital gain, and reductions in current tax liabilities produces a number of contrasts for high and low income investors (table 5). Expensing and excluding a cost share from income has the most positive effect on project feasibility; these effects are nearly neutral to tax rate. However, cost sharing without exclusions from income tilts project feasibility toward investors with lower taxable income. At the maximum marginal rate, the benefits of a 50 percent cost share are completely dissipated in present value terms when compared to expensing without public assistance.

Depreciable Improvements: To fashion contrasts between conservation improvements and depreciable capital items, the model was solved for a set of tax rules involving ACRS, alternate 5-year (straight-line) depreciation, elections to expense and investment credit (table 6). Provisions for 12-year and 25-year depreciation were ignored since, by definition, they would increase the break-even net income required to justify the improvement. This holds because the depreciation allowance is released over a longer time frame and is more heavily penalized by discounting.

Model results clearly demonstrate the impact of accelerated depreciation and the availability of investment tax credits on project feasibility. Under accelerated cost recovery, annualized present value of pretax net income required to service a $100 outlay ranges from $10.36 to $12.94. A 10 percent investment credit reduces these values to a range of $9.11-$11.12. The analysis also shows that an 8

Table 6--Annualized present value of pretax net income required to break even on a $100 depreciable land improvement by tax option[1]

Marginal tax rate (percent)	Accelerated cost recovery system: No investment credit	Accelerated cost recovery system: 10% investment credit	Accelerated cost recovery system: 8% investment credit	Straight line depreciation: No investment credit	Straight line depreciation: 10% investment credit	Straight line depreciation: 8% investment credit	Election to expense a depreciable asset
				Dollars			
11	10.36	9.11	9.31	10.40	9.16	9.34	10.00
12	10.40	9.14	9.33	10.44	9.20	9.37	10.00
14	10.48	9.20	9.39	10.52	9.27	9.44	10.00
16	10.56	9.27	9.44	10.62	9.35	9.50	10.00
18	10.65	9.34	9.50	10.71	9.42	9.57	10.00
22	10.83	9.49	9.62	10.92	9.60	9.71	10.00
25	10.98	9.62	9.73	11.08	9.74	9.83	10.00
28	11.14	9.75	9.84	11.26	9.89	9.96	10.00
33	11.45	10.00	10.05	11.60	10.17	10.20	10.00
38	11.80	10.29	10.29	11.99	10.50	10.47	10.00
42	12.13	10.56	10.51	12.35	10.80	10.73	10.00
45	12.41	10.79	10.70	12.66	11.06	10.95	10.00
49	12.82	11.14	10.98	13.12	11.45	11.28	10.00
50	12.94	11.23	11.06	13.25	11.56	11.37	10.00

[1] Twenty-year holding period, 10 percent discount rate, 100 percent salvage value.

percent investment credit is inferior to a 10 percent investment credit in most cases; recall that investors who take a 10 percent credit receive a 5 percent penalty on cost recovery and must add 50 percent of the credit to the basis for calculating gain income when the asset is liquidated. As expected, alternate straight-line depreciation is inferior to ACRS because the depreciation allowance is released at a slower rate and over a longer time frame due to a half-year convention on depreciation.

Perhaps the most striking aspect of the results obtained for depreciable land improvements is that many of the provisions now embedded in the Code take on very little economic significance. The law's provisions for selecting an 8 or 10 percent investment tax credit result in only trivial differences in the economic feasibility of a land-related investment. Similarly, the five-year depreciation alternate to ACRS appears to be of little importance from an economic perspective.

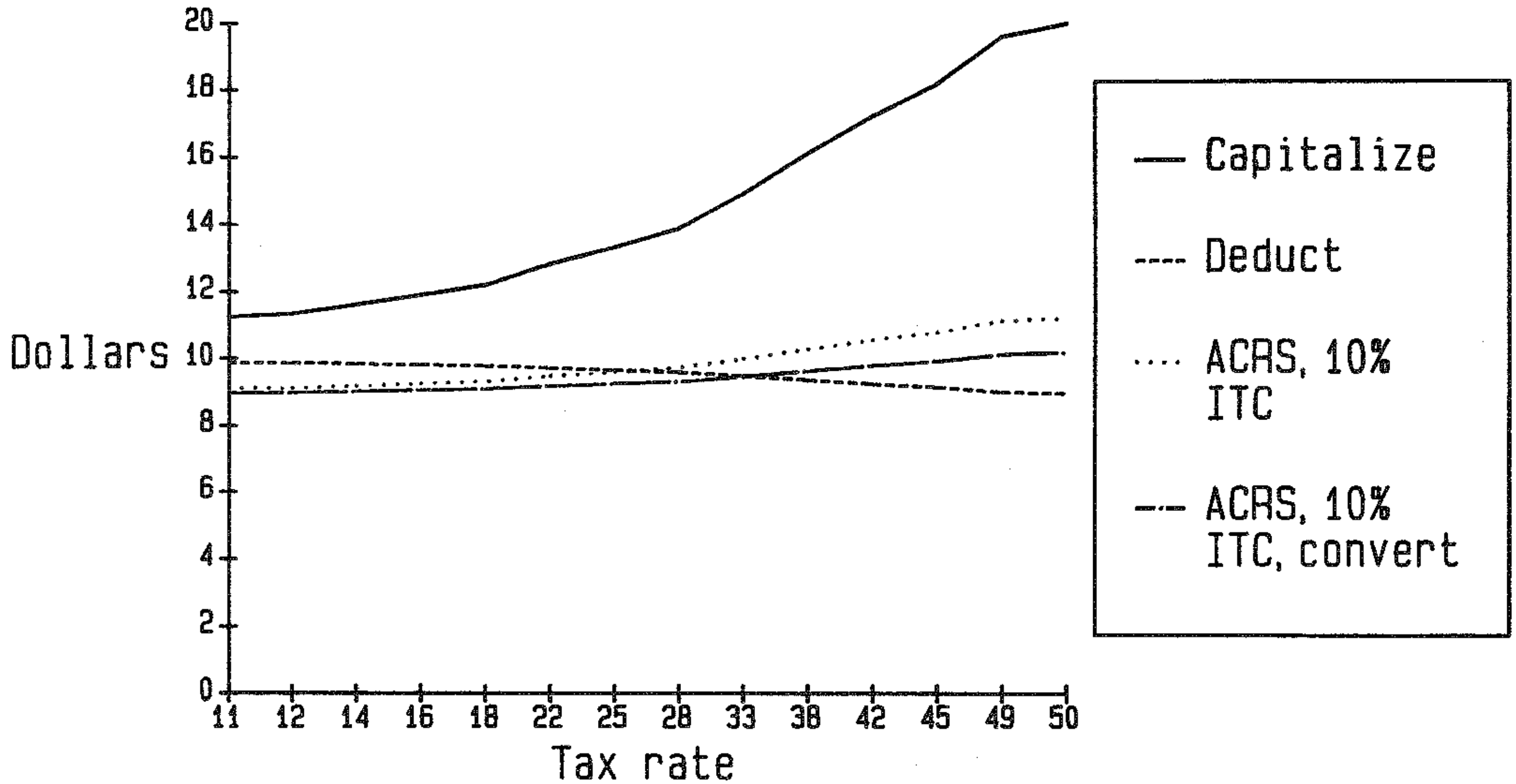
Comparisons of Tax Rules

Under the assumptions used in this analysis, one cannot necessarily conclude that the conservation deduction advantages a conservation expenditure relative to a depreciable expenditure. In the absence of cost sharing, a depreciable improvement under ACRS and a 10 percent investment credit is superior to the conservation deduction for investors with marginal tax rates below 25 percent (figure 1). Other things being equal, relatively more net income is required to justify a conservation outlay for investors in these lower tax brackets. This is due to the availability of an investment tax credit on the depreciable improvement in the sense that ACRS alone generates less tax savings than the conservation deduction.

It should be noted that the Code's provisions for cost recovery probably help set the stage for converting ordinary income to capital gain. Recall that any gain to the extent of cost recovery, either via ACRS or alternate straight-line depreciation, is ordinary income at liquidation. However, allocating the value of real estate to land and land improvements is an inherently arbitrary exercise. The investor who is adroit in tax management should be in a position to argue, for tax purposes, that the improvement has a zero salvage value. In effect, this tactic shifts any salvage value of the improvement to the land asset and increases the basis for calculating capital gain. Gain on land receives a tax preference. Doing so, under the assumptions used in this analysis, further advantages an expenditure on a depreciable improvement compared to a conservation outlay (see "ACRS/IC Convert" in figure 1). Investors who might use this tactic would find the depreciable improvement superior to a conservation improvement unless their marginal tax rate exceeds 33 percent.

To put this result in some perspective, married taxpayers filing jointly with a spouse must have taxable income (gross income less

Figure 1. Annualized present value of pretax income needed to break-even on a $100 land improvement: 20 years, 10% interest, 100% salvage value



adjustments, deductions and exemptions) above $35,000 to incur marginal rates above 30 percent. About 12 percent of all returns filed by sole proprietors with farm income (or loss) had adjusted gross incomes above $50,000 in 1979 (U.S. Department of the Treasury, 1982). Since exemptions and deductions are subtracted from income when computing one's taxable income, adjusted incomes in this range are probably needed to make a conservation improvement preferable to a depreciable improvement. Thus, for the overriding majority of all farmland owners, tax rules applicable to depreciable land improvements are more liberal than those available for a conservation project which involves an enduring improvement to land.

The results reflect assumptions about the investor's planning horizon (20 years), discount rate (10 percent) and expected salvage value of the improvement (100 percent). Alterations in these assumptions produce a different result. For example, reduction in planning horizon for an investor with a 25 percent marginal tax rate has little impact on the relative portions of annual income streams required to justify investing in a land improvement (figure 2). Namely, the depreciable improvement maintains its superiority until the marginal tax rate ranges in the vicinity of 30 percent. Regardless of planning horizon, only those investors with the highest marginal tax rates will find the conservation deduction attractive when compared to improvements eligible for accelerated cost recovery and investment tax credits.

A lower discount rate, other things equal, reduces the present value of income needed for project feasibility--see figure 3. The impact of a reduced discount rate on the relative position of the conservation deduction via the treatment afforded a depreciable improvement turns on assumptions made about capital gain. If the improvement is expected to maintain its value over the planning horizon and the investor converts this value to gain income, then the depreciable improvement is superior at all marginal tax rates. This stems from the tax preferences on gain income and the low discount penalty on its receipt. In fact, high income investors can realize net operating losses over a short holding period if they successfully allocate the improvement's value to the land at liquidation.

Considering the polar, and somewhat unlikely, case where the expected salvage value of an improvement is zero produces even more noticeable similarities between the conservation deduction and ACRS/investment tax credits. With a marginal tax rate of 25 percent and a planning horizon of 20 years, break-even incomes for the deduction and ACRS/investment tax credit are quite similar (figure 4). This occurs because liquidation with no capital gain eliminates the tax preference on gain income. These preferences generate higher benefits for high income investors than for low income investors. But once again, marginal tax rates in the vicinity of 30 percent are needed to make the conservation deduction more attractive than ACRS/investment tax credits.

Figure 2. Annualized present value of pretax income needed to break-even on a $100 land improvement: 25% tax rate, 10% interest, 100% salvage value

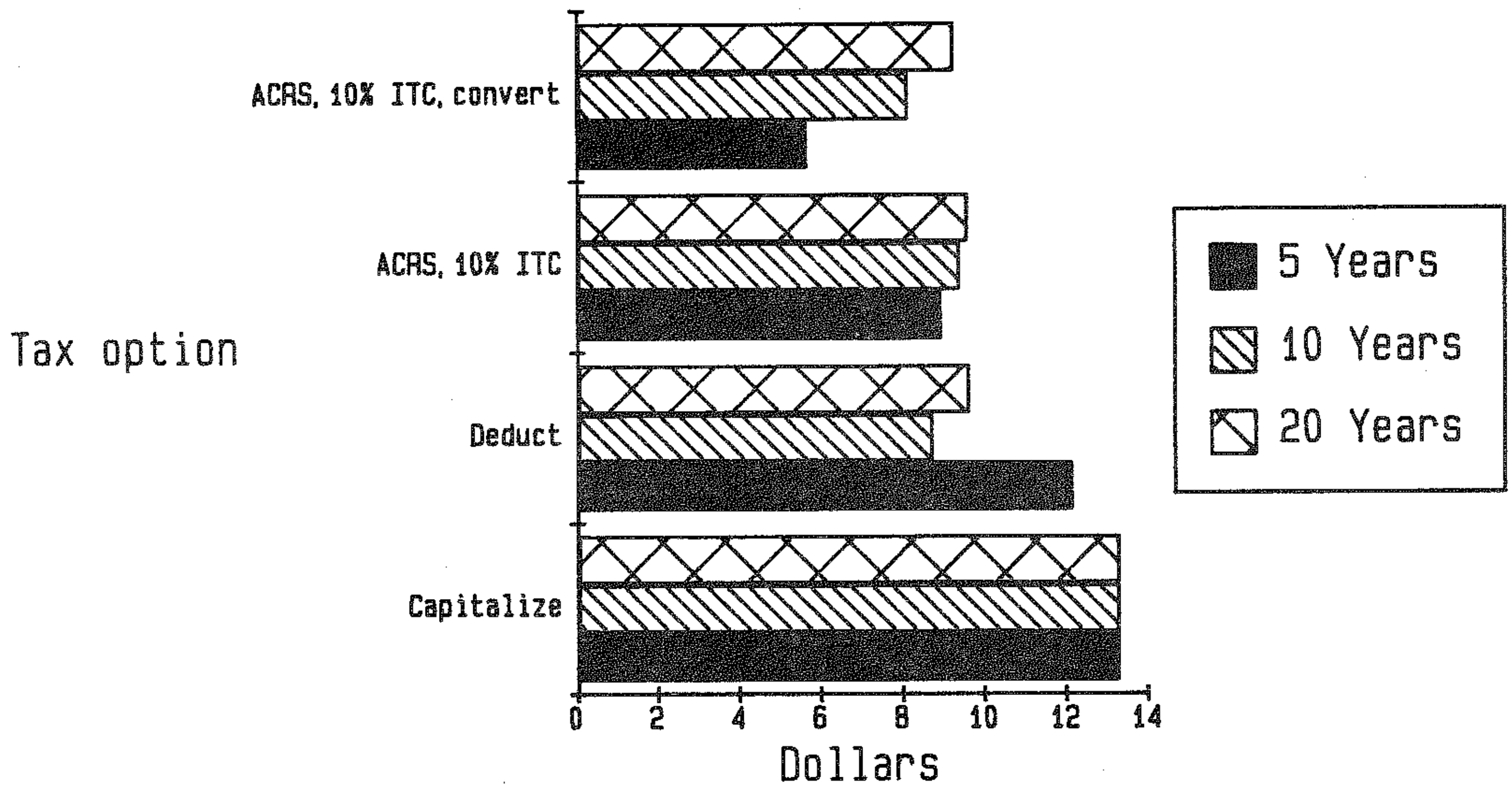


Figure 3. Annualized present value of pretax income needed to break-even on a $100 land improvement: 20 years, 25% tax rate, 100% salvage value

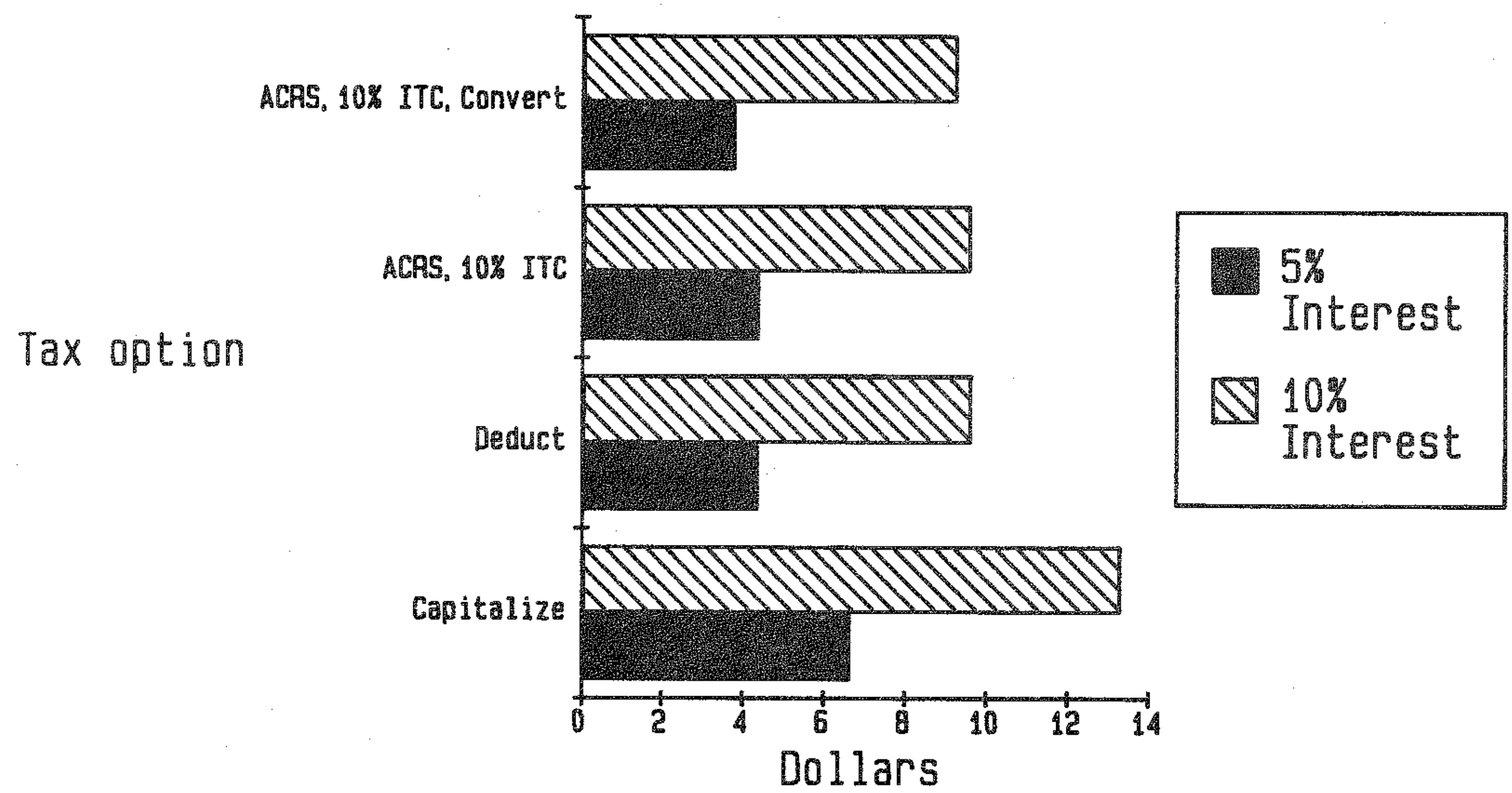
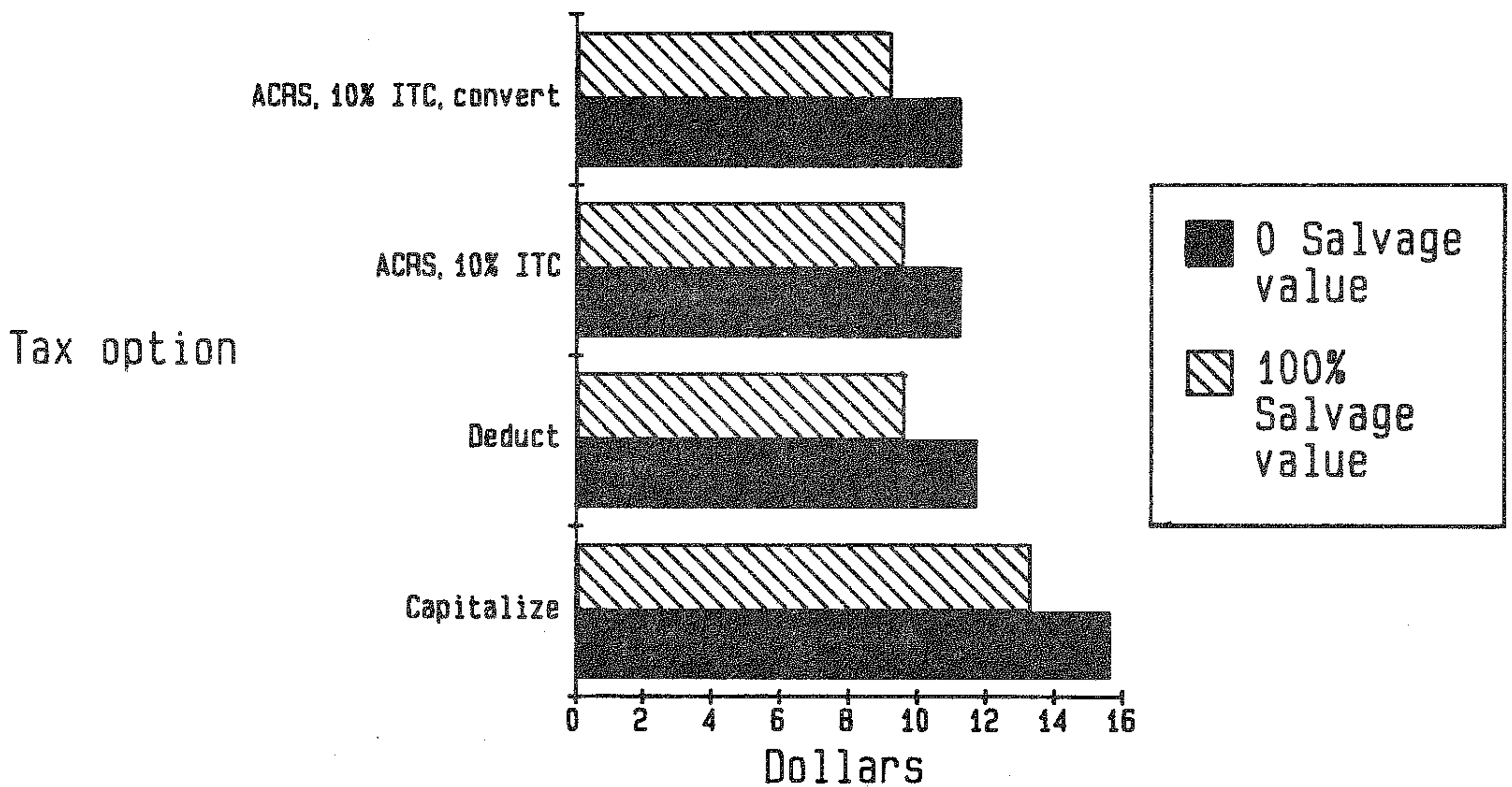


Figure 4. Annualized present value of pretax income needed to break-even on a $100 land improvement: 20 years, 25% tax rate, 10% interest



Policy Implications

For more than thirty years, the Congress has sought to promote soil and water conservation improvements on U.S. cropland with Sec. 175 of the Internal Revenue Code. Sec. 175 allows the farm taxpayer to deduct rather than capitalize a conservation-related improvement to land. This study investigated two issues that bear directly upon the efficacy of such policies in relation to efforts to curb soil erosion on U.S. cropland:

- What is the role of land improvements in erosion control?

- Does a conservation deduction give tax advantages to investments in conservation-related land improvements, compared to depreciable land improvements?

The findings are that land improvements have something to do with erosion control--but not much. Similarly, the calculations devised in this study show that deduction can tilt decisions to improve land toward soil-conserving expenditures in some cases. However, the liberal tax treatment now accorded depreciable capital improvements to land has greatly diminished the attractiveness of the conservation deduction for broad classes of taxpayers. Taken together, these results support the argument that the public interest in reduced soil erosion is not always well served by Sec. 175 of the IRS Code.

The scope of the conservation expensing provision is far too narrow when applied in the context of soil erosion. Only erosion control practices involving windbreaks, diversions, terraces, and grassed waterways fall within the purview of Sec. 175. These practices are important elements in erosion control programs, but they are used on less than 10 percent of U.S. cropland. For these reasons, one can argue that Sec. 175 is largely outside the mainstream of current efforts to curb soil erosion on the Nation's cropland. Indeed, the provision allows deductions for a variety of land improvements--such as drainage and supplemental irrigation--which are precursors to more intensive cropping and, hence, more soil-losing uses of the American cropland base.

Even if soil erosion control measures are involved, computations developed for this study indicate that Sec. 175 does not necessarily tilt investment incentives toward conservation improvement. The deduction produces an immediate reduction in taxable income, but alternative expenditures which are depreciable under current law are eligible for an investment tax credit and cost recovery in only five years. Such liberal treatment of depreciable capital items, according to the results of this study, means that deducting a conservation improvement is not advantageous relative to a depreciable improvement unless one's marginal tax rate is greater than 30 percent. Only a small fraction of farm taxpayers have taxable incomes which are large enough to place them in the 30 percent tax bracket.

These findings help focus current discussions dealing with Federal tax reform. A recent proposal by the Reagan Administration would repeal Sec. 175 and require any qualifying conservation expenditures to be treated as a nondepreciable capital item. As shown in this study, this initiative would increase the pretax income required to make the investment economically feasible. However, repeal of Sec. 175 would not necessarily detract from efforts to ameliorate soil erosion problems on American farmland for two principal reasons.

First, a farm taxpayer disposed toward controlling soil erosion often has the option to choose between nondepreciable and depreciable conservation investments. Current provisions for investment tax credits and rapid cost recovery appear to provide tax incentives which advantage depreciable investments, compared with nondepreciable ones. This relationship may well be reflected in current erosion control efforts. A principal development in recent years has been very large increases in the use of conservation tillage (Magleby, Gadsby, Colacicco and Thigpen). The adoption of reduced tillage techniques, among other things, involves the use of new tillage implements. Tillage implements are advantaged under current law because they are treated as depreciable capital items. President Reagan's tax reform plan, however, would eliminate the investment tax credit, lengthen the tax write-off period for depreciable items, and index depreciation deductions for inflation. The net effect would be a small increase in the after-tax cost of depreciable capital items, whether improvements to land or investments in new farm machinery (U.S. Department of Agriculture, 1985).

Finally, the available evidence today suggests that publicly sponsored conservation efforts must be more closely targeted to land resources most in need of erosion control measures. Sec. 175, on the other hand, is an exceedingly blunt policy instrument. There is no explicit targeting under the expensing provision under current law except to the extent that it might be used in conjunction with public cost sharing programs which might be directed toward farmland with substantial soil loss problems.

The efficacy of the conservation expense deduction as a tool to direct erosion control effort toward land most in need of treatment is constrained in several ways. A farm investor must have taxable income to derive a benefit from the deduction. It has also been shown that the economic attractiveness of conservation deductions increases with increases in taxable income. The available data on elections to deduct conservation expenditures support this relationship; in addition, elections to expense the cost of a conservation project tend to be associated with investments on larger farms (Anderson and Bills). However, the available empirical evidence does not suggest that the Nation's more pressing soil loss problems are strongly correlated with farm size or net farm income. For example, recent analysis has shown that there is no convincing relationship between farm size and cropland erosion potential or annual soil loss from erosion; similarly, there is little empirical support for an association between net farm income and the presence of a soil erosion problem (Bills and Heimlich). Precision in targeting tax-related investments in soil and water conservation is lacking because the underlying physical and economic relationships to make it work do not exist.

As long as erosion problems persist on U.S. farmland, policymakers will undoubtedly give attention to remedies which involve the Federal income tax. The public interest is best served with initiatives which direct tax-induced conservation effort toward the application of cost-effective practices on land most vulnerable to soil erosion. The explicit tax treatment now afforded conservation projects under Sec. 175 does not necessarily accomplish these social objectives.

References

Anderson, William D. and Nelson L. Bills. "Soil Conservation and Tax Policy." Forthcoming article in the Journal of Soil and Water Conservation, Spring 1986.

Bills, Nelson L. and Ralph E. Heimlich. Assessing Erosion on U.S. Cropland: Land Management and Physical Features. AER-513, U.S. Department of Agriculture, Economic Research Service, June 1984.

Boxley, Robert F. and William D. Anderson. "An Evaluation of Subsidy Forms for Soil and Water Conservation." in The Economics of Federal Subsidy Programs, Joint Committee Print, 93rd Congress, 1st Session, Pt. 7--Agricultural Subsidies, U.S. Government Printing Office, Washington, D.C., April 1973.

Casler, George L. and Stuart F. Smith. Farm Income Tax Management and Reporting--A Reference Manual. A.E. Ext. 84-29, Department of Agricultural Economics, Cornell University, November 1984.

Collins, Robert A. "Federal Tax Laws and Soil and Water Conservation." Journal of Soil and Water Conservation, Vol. 37, No. 6, November-December 1982, pp. 319-322.

Commerce Clearing House, Inc. 1985 U.S. Master Tax Guide. Chicago, Illinois, November 1984.

Herfindahl, Orris C. and Allen V. Kneese. Economic Theory of Natural Resources. Charles E. Merrill Publishing Co.: Columbus, Ohio, 1974.

Magleby, Richard, Dwight Gadsby, Daniel Colacicco, and Jack Thigpen. "Trends in Conservation Tillage Use." Journal of Soil and Water Conservation, Vol. 40, September-October 1985, pp. 274-276.

Sisson, Charles A. Tax Burdens in American Agriculture--An Intersectoral Comparison. The Iowa State University Press: Ames, 1982.

The President's Tax Proposal to the Congress for Fairness, Growth and Simplicity. May 1985.

U.S. Department of Agriculture, Soil Conservation Service. Preliminary Data, 1982 National Resource Inventory (mimeo). Washington, D.C., April 1984.

U.S. Department of Agriculture. Special Reprint: Tax Reform. Agricultural Outlook, Economic Research Service, Washington, D.C., August 1985.

U.S. Department of the Treasury. Farmer's Tax Guide. Publication 225 (Rev. Oct. 84), Internal Revenue Service, U.S. Government Printing Office, Washington, D.C., 1984.

U.S. Department of the Treasury. 1979-80 Statistics of Income--Sole Proprietorship Returns. Publication 1131 (7-82), Internal Revenue Service, U.S. Government Printing Office, Washington, D.C., 1982.