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Crop Production Demands and the Conservation of Soil Resources in Ohio

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OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
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Crop Production Demands and the Conservation of Soil Resources in Ohio

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INTRODUCTION

The United States has become the major grain exporter of the world. As a nation, we currently provide 80%, 66%, and 40% of the world's exports for soybeans, coarse grains (mostly corn), and wheat, respectively. The foreign exchange generated by the spectacular rise in farm exports represents one of the bright spots in an otherwise dismal balance of payments picture.

To achieve such a prodigious supply, most acreage held in the conservation reserve during the 1960's has been brought into production. Farmers have also been abandoning traditional cropping practices and planting a higher proportion of their land in row crops at the expense of acreage in meadow and small grains. In some cases, pasture land is also being converted to row crop production.

Demand for agricultural products is likely to remain strong in the future. A continued expansion of exports seems to be a firmly defined policy of several national administrations, including the current one. We have been actively seeking—and finding—new markets for agricultural products. Increasing incomes and rising expectations of populations in countries around the world help to increase the demand for our agricultural products by our traditional trading partners as well as by other nations. Current laws provide strong incentives through tax credits to increase the use of liquid fuels produced from agricultural products. Continued development in this area will further increase the demand for grain production.

This boon in grain production is not without its drawbacks. Soil erosion is emerging as a major problem associated with the increased production of row crops. In addition to the siltation of reservoirs and waterways associated with soil erosion, nutrients moving with soil particles and dissolved in runoff water contribute to the eutrophication of lakes. Soil loss also affects the long-term productivity of the land. As long as soil formation rates exceed erosion rates, there should be no effect on productivity. Tolerable soil losses (T) range from 2 to 5 tons per acre per year depending on soil characteristics, including depth of

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soil profile. Recently, some soil scientists have suggested that currently used T values may be several times greater than the rate of soil formation.[2]

Soil erosion has been increasing for several reasons. Land held in the conservation reserve was often on relatively steep slopes and subject to a greater degree of erosion than other farmland. Bringing this land into production increased the average soil erosion potential for cropland. Traditional methods of erosion control such as rotations containing sod crops, contour farming, and strip cropping are not especially compatible with large equipment and the cropping practices containing a predominance of intertilled crops used by modern farmers. While tillage systems which leave the soil surface rough and/or covered with residues are capable of substantially reducing erosion and are compatible with other current production practices, they have not been sufficiently adopted so as to reduce overall soil erosion from cropland.

Ohio occupies an ideal position to participate in both the benefits and in the deleterious aspects of increased demand for agricultural products. Ohio has good transportation facilities with ready access to both Great Lakes and Gulf ports. Ohio is near population centers so that shipping costs for agricultural products are minimized, increasing the potential return to farmers. Further, acceptable yields of most crops are possible in Ohio without irrigation because of the amount and distribution of natural rainfall. However, erosion potential of much of the land is moderate to high due to slope steepness.

Because of the environmental effects of erosion, there is some interest in establishing mandatory limits on soil loss amounts which, if exceeded, would presumably result in some sort of penalty. Such limits, if sufficiently restrictive, could also limit the amount of land available for row crop production during a given season. The objective of this publication is to illustrate the potential row crop production capacity in Ohio as influenced by selected soil conservation technologies and a range of soil loss limits.

MATERIALS AND METHODS

Soil loss from farm fields in Ohio is caused primarily by rainfall or snowmelt followed by runoff. Soil particles, dislodged through raindrop impact or by other natural forces, can be moved around within the field or can be transported off the field by running water. The Universal Soil Loss Equation (USLE) can be used to calculate expected annual soil losses (5). This equation considers climatic, topographic, soil, and

[2]Personal communication with Dr. George F. Hall, The Ohio State University, Columbus, Ohio 43210.

management factors in estimating the erosion potential of cropland. The USLE [equation 1] was used to calculate expected annual soil losses for this study:

$$A = R*K*S*L*C*P \qquad [1]$$

where:

A = average annual soil loss (tons/acre)
R = relative erosion potential of rainfall
K = soil erodibility potential
S*L = slope-length factor
C = cropping-management factor
P = erosion control practice factor

The primary data base was the USDA land use inventory for 1967 (7) which included land area, land use, and slope steepness within soil series within counties. Only land used for crops, pasture, or idled as of 1967 having slopes of 18% or less was considered (woodlands were excluded). Values for R and K as well as the maximum soil loss that will not reduce soil productivity (T) were obtained from references (3) and (4) for each soil series. Length of slope was estimated by the authors from a limited inventory of data[3] and liberal extrapolation in a

[3]L. M. Feusner, Agronomist, Soil Conservation Service, U. S. Dept. of Agriculture, Columbus, Ohio, private communication.

TABLE 1.—Slope Lengths Used for Computing Expected Average Annual Soil Losses.

		Drainage Rating†				
	Slope	0	1, 7-9	2	3	4-6
Regolith*	%			ft		
1	0-2	300	220	220	170	100
2,3	0-2	300	220	150	130	130
	2-6			180	200	130
	6-12			200	200	200
	12-18			100	200	200
4,5	0-2	300	220	150	140	130
	2-6			200	200	150
	6-12			200	200	250
	12-18			100	100	250
6-9	0-2	300	220	200	140	130
	2-6			250	200	200
	6-12			200	200	220
	12-18			100	100	100

*Regolith is the first digit of the Ohio soil identification code.
†Drainage rating is the third digit of the Ohio soil identification code.

pattern of regolith, slope, and drainage (Table 1). The S*L factor (5) was calculated using equation [2]:

$$S*L = \left[\frac{\gamma}{72.6}\right]^{m} * \left[\frac{430 \sin^2 \theta + 30 \sin \theta + 0.43}{6.574}\right] \qquad [2]$$

where:

γ = slope length in feet

θ = slope angle

m = 0.5 if slope >4%; =0.4 if slope =4%; =0.3 if slope <4%

Equation [1] was rearranged:

$$C*P = A/R*K*S*L \qquad [3]$$

For each site entry in the data base, equation [3] was solved for C*P by substituting allowable limits of A. The allowable limits selected were 4*T, 2*T, T, 0.5*T and 0.25*T, providing a range from severe erosion (maximum of 20 Tons/A/Yr for T=5) to a very low erosion rate (<1 Ton/A/Yr for T=2). Eight management systems containing an array

TABLE 2.—C'*P' Value of Various Combinations of Tillage, Residue Management, Contouring, and Slope. Residues Left Were Assumed Equivalent to 100 bu/A Corn Crop, All Buried by Moldboard Plowing, 50% Buried by Disking, 25% Buried by Chisel Plowing, and None Buried by No-tillage.

Management Level	Tillage	Contour	Residues*	Slope	C'*P'
1	Moldboard plow	No	Removed	0-18%	0.520
2	Moldboard plow	No	Left on	0-18%	0.392
	Moldboard plow	Yes	Removed	12-18%	
3	Moldboard plow	Yes	Removed	2-12%	0.309
	Moldboard plow	Yes	Left on	12-18%	
4	Moldboard plow	Yes	Left on	2-12%	0.222
	Disk	No	Left on	0-18%	
5	Disk	Yes	Left on	12-18%	0.158
	Chisel plow	No	Left on	0-18%	
6	Disk	Yes	Left on	2-12%	0.123
	Chisel plow	Yes	Left on	12-18%	
7	Chisel plow	Yes	Left on	2-12%	0.089
	No-tillage	Either	Left on	0-18%	
8	No-tillage†	Either	Left on	0-18%	0.026

*Removed (as in harvest for silage) or left on to be distributed by tillage.

†Hypothetical performance of no-tillage based on unpublished data or assuming the history of the field was several years of meadow prior to start of no-tillage corn planting.

of tillage intensities from moldboard plowing to no-tillage were selected and C'*P' values were calculated for the residue management, slope, and contour farming combinations shown in Table 2. Equation [4], developed by the authors to approximate the percentage of land in row crops associated with rotations that might be used in Ohio as listed by Nolte, *et al* (4), was then solved for AREA'.

$$\text{AREA}' = 0.6415 * \text{AREA} * (C*P/C'*P') \qquad [4]$$

where AREA = the area of the particular site entry (acres)

The smaller of AREA or AREA' was used as the maximum acreage permitted for row crops that would satisfy the soil loss limit imposed on the site when farmed by the chosen management level. The remaining acre-

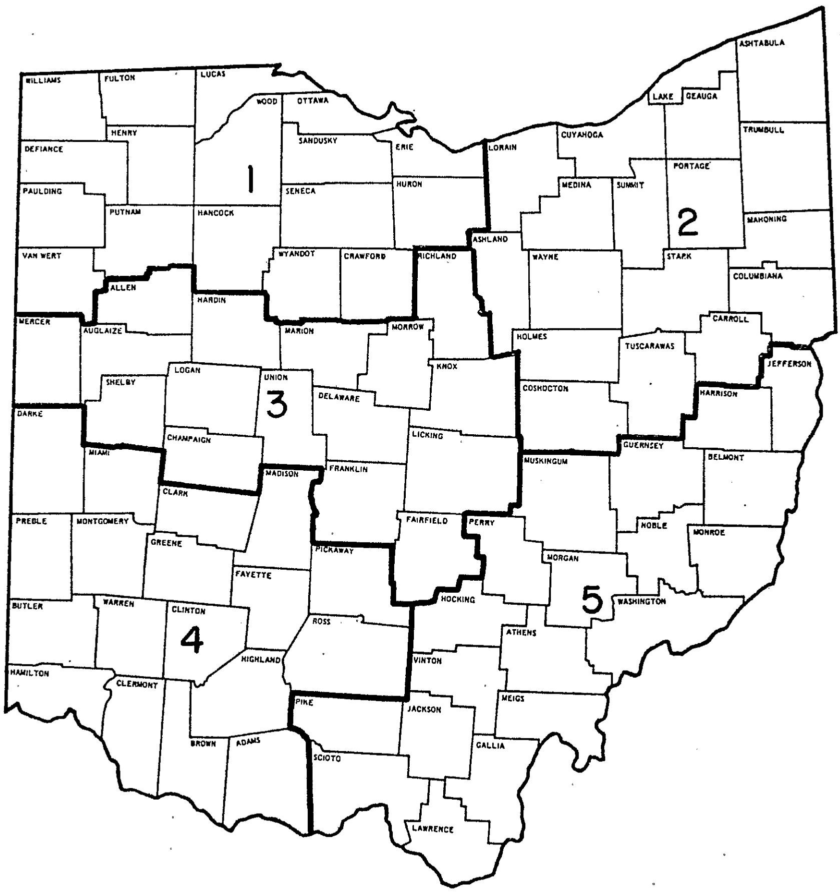

FIG. 1.—Regions of Ohio used in Tables 4-6.

age in the site entry was considered as being planted to small grains or meadow. With the exceptions listed below, all row crop land was considered farmed by the selected management level regardless of the erosion potential of the particular site.

There were two exceptions to this procedure for computing acreage. While research results indicate some yield differences can be expected among tillage practices on certain soils (1), for the purposes of this illustration, all practices were assumed to produce equal yields except repeated use of no-tillage for continuous corn on soils rated in tillage class 4 (6). These are generally very poorly drained soils with silty clay loam or finer texture. Because rotating tillage ameliorates the yield reductions associated with no-tillage, half of such site entry areas were permitted to use the C'*P' values for no-tillage while the other half used the C'*P' values of 0.158 (value for management level 5) in solving equation [3]. Such an alteration in solving equation [3] might result in less permitted acreage than if the whole site entry area was placed in no-tillage. Similarly, no-tillage is not recommended for tillage class 3 or 5 soils. Therefore, when considering management levels 7 or 8 for such soils, the C'*P' value used in solving equation [3] was 0.158. These alterations in acreage will also influence row crop production totals and soil loss totals. The total permitted acreage is listed in Tables 3 and 4.

The bases for row crop production estimates were the corn yield values (PROD) published for each soil series (3). These are yields expected with good management and median weather conditions. These values were modified to account for differences, if any, in climate and general management by counties for the period 1975-1979 [equation 5]:

$$POT = AVG*(\Sigma\ Acres)/\Sigma(AREA''*PROD) \qquad [5]$$

where:

POT = adjusted county productivity factor (dimensionless)
AVG = 1975-1979 county corn yield average (bu/A)
Σ ACRES = average acres harvested for corn in 1975-1979 in the county
AREA" = lesser of AREA or AREA' for the individual site entry

Row crop production as listed in Tables 3 and 5 was then the sum of POT*AREA"*PROD for all site entries within each of the five areas in Ohio shown in Figure 1. The assumption is that all row crops would respond to management as does corn.

Expected average annual soil loss per site entry was computed by first solving equation [1] for A using C'*P' value for the management level being considered. The smaller of the resulting A value or the allowable soil loss limit being considered was then multiplied by the total area of the site entry. The products were totaled within each of the five areas in Ohio (Tables 3 and 6).

RESULTS AND DISCUSSION

Values generated for the entire state of Ohio through application of the several equations to soil and yield data are shown in Table 3. In order to illustrate potential trends in land use, soil loss, and crop production, all values have been converted to percentages. This makes comparisons of trends among different types of data (acreages vs. yield or vs. soil loss) much easier. Also, since the slope length values used to calculate average annual soil loss are estimates, computations using these numbers will probably contain some errors in absolute estimates of soil loss. However, comparisons within the tables should be reasonably accurate on a relative basis.

For all management levels, decreasing the soil loss limit decreases the percent of land area that can be devoted to row crops and decreases row crop production (Table 3). The land area permitted in row crops at 1.0*T soil loss limit and management level 1 would allow row crop

TABLE 3.—Land Area Permitted in Row Crops for Five Different Soil Loss Limits, Potential Row Crop Production from that Area, and Expected Average Annual Soil Loss from the 1967 Inventory of Cropland, Pasture, and Idle Land Having Slopes Equal to or Less Than 18% for Ohio.

Loss Limit	Management Levels							
	1	2	3	4	5	6	7	8
				Land Area (%)*				
0.25T	35.0	37.8	40.6	45.1	50.2	53.3	56.8	73.5
0.5 T	44.3	48.4	51.9	56.0	60.7	64.5	69.0	84.4
1.0 T	54.1	57.8	61.2	66.2	72.0	75.4	79.5	91.0
2.0 T	63.9	68.4	72.5	76.9	81.4	84.6	87.9	95.5
4.0 T	75.1	78.8	81.9	86.0	89.3	91.0	93.0	98.1
				Row Crop Production (%)†				
0.25T	38.2	41.2	44.0	48.7	53.8	56.7	60.1	76.1
0.5 T	47.9	52.2	55.6	59.6	64.1	67.7	72.1	86.5
1.0 T	57.7	61.3	64.5	69.4	74.9	78.2	81.9	92.3
2.0 T	67.2	71.5	75.3	79.5	83.7	86.6	89.6	96.1
4.0 T	77.8	81.3	84.2	87.9	90.9	92.4	94.1	98.4
				Soil Loss (%)‡				
0.25T	13.3	13.3	12.7	11.5	10.3	9.6	8.9	5.8
0.5 T	24.1	22.0	20.5	18.7	17.1	15.7	14.1	8.0
1.0 T	39.1	36.3	33.9	30.4	27.0	24.4	21.0	10.7
2.0 T	64.1	58.2	53.5	46.7	39.4	34.1	28.8	12.6
4.0 T	100.0	88.2	77.7	64.5	54.0	46.5	37.5	13.2

*100% of land area = 13.6×16^6 acres; 1975-1979 row crop area = 52%.

†100% of row crop production = 13.5×10^8 bushels corn equivalent; 1975-1979 row crop production = 7.0×10^8 bushels corn equivalent.

‡100% of soil loss = 9.8×10^7 tons (soil loss as if there was a soil loss limit of 4T and all permissible land in row crops was managed by level 1).

production on more than half of the crop land area. This would be increased to almost 80% by management level 7. Since 52% of 1975-1979 crop land was planted to row crops (2), there is a large potential for increased row crop acreage, if the demand should develop, while still maintaining reasonable control over soil loss. This is especially true if soil loss control ascribed to management level 8 proves to be accurate and economically achievable.

TABLE 4.—Land Area Permitted in Row Crops for Five Different Soil Loss Limits from the 1967 Inventory of Cropland, Pasture, and Idle Land Having Slopes Equal to or Less Than 18% for Five Areas Within Ohio.

Region*	Loss Limit	Management Levels 1	2	3	4	5	6	7	8	Total†
					%‡					
5	0.25T	2.4	2.5	2.6	2.8	3.0	3.2	3.4	4.7	
	0.5 T	2.9	3.1	3.2	3.5	3.8	4.0	4.3	6.0	
	1.0 T	3.4	3.6	3.8	4.1	4.5	4.8	5.3	7.2	
	2.0 T	4.0	4.3	4.6	5.0	5.5	5.9	6.4	8.7	
	4.0 T	4.8	5.2	5.5	6.1	6.6	7.0	7.7	9.9	10.4
2	0.25T	**3.4****	**3.8**	4.2	4.8	5.6	6.2	6.8	10.2	
	0.5 T	4.6	5.2	5.7	6.6	7.6	8.4	9.2	12.6	
	1.0 T	6.2	7.0	7.7	8.8	9.9	10.7	11.6	14.2	
	2.0 T	8.3	9.2	10.0	11.0	12.1	12.9	13.5	15.5	
	4.0 T	10.5	11.4	12.2	13.2	13.9	14.3	14.9	16.1	16.3
3	0.25T	**8.6**	**9.1**	**9.5**	**10.2**	**11.1**	**11.9**	**12.9**	17.6	
	0.5 T	**10.3**	**11.0**	**11.6**	**12.6**	**13.7**	14.7	16.0	20.6	
	1.0 T	**12.1**	**13.0**	**13.8**	15.1	16.6	17.7	18.9	22.3	
	2.0 T	14.5	15.7	16.8	18.1	19.3	20.2	21.3	23.0	
	4.0 T	17.5	18.5	19.5	20.6	21.8	22.2	22.6	23.2	23.6
4	0.25T	**9.0**	**9.5**	**10.1**	**10.9**	**12.0**	**12.9**	**13.8**	18.4	
	0.5 T	**11.0**	**11.8**	**12.6**	**13.8**	15.1	16.1	17.4	21.4	
	1.0 T	**13.2**	**14.3**	15.2	16.6	18.2	19.1	20.2	22.7	
	2.0 T	16.0	17.3	18.4	19.6	20.7	21.5	22.1	23.6	
	4.0 T	19.2	20.0	20.9	21.9	22.4	22.8	23.2	24.1	24.7
1	0.25T	**11.5**	**12.9**	**14.2**	**16.4**	18.5	19.1	19.8	22.5	
	0.5 T	**15.5**	17.4	18.7	19.5	20.5	21.2	22.0	23.8	
	1.0 T	19.2	19.9	20.6	21.6	22.7	23.1	23.5	24.5	
	2.0 T	21.1	22.0	22.8	23.3	23.7	24.1	24.5	24.7	
	4.0 T	23.1	23.5	23.8	24.3	24.6	24.7	24.7	24.8	25.0

*See Figure 1 for locations within Ohio.
†Total available land area for row crops.
‡100% land area = 13.6×10^6 acres.
**Percentages in bold face were exceeded by the actual 1975-1979 average percentages in row crops: 17.4% for region 1, 4.1% for region 2, 14.3% for region 3, 15.0% for region 4, and 1.3% for region 5.

Row crop production values closely parallel the land area values. However, some of the soils on steeper slopes do not have productive capacity as high as soils on less rolling terrain. Imposing a soil loss limit at a given management level tends to selectively eliminate such steeper land from production and causes a slightly greater average per acre yield for the land remaining in production. Assuming that improved management is applied more or less uniformly in all parts of the state, the percentage values should remain close to values in Table 3 as crop yields increase in the future.

The soil losses projected for uniform application of the various management levels differ dramatically. With higher numbered management levels, acreage and crop production are increased while decreasing the total amount of erosion. Soil loss differences within a given soil loss limit in actual practice would not be as great. Land not requiring higher numbered management levels might be handled with a lower numbered management level, keeping soil losses below the imposed limits but greater than the management level under consideration. Also, it should be remembered that soil losses calculated here do not represent soil moved to streams and other waterways. An undetermined amount may be left in a field at the bottom of a slope, while some may be deposited *en route* to the waterway.

The topography of farmland in Ohio is quite variable, ranging from the almost flat lake plains areas of northwestern Ohio to the rolling Appalachian plateau areas of the eastern and southern parts of the state. Some areas of the state are currently devoted to intensive row crop production, while other areas contain only a small proportion of row crops. To determine regional patterns for potential row crop production and soil loss, the state was divided into five regions (Fig. 1). Information contained in Table 3 was calculated for each of the five regions and is shown in Tables 4, 5, and 6.

Total available land area is greatest in regions 1, 3, and 4 with less land available in regions 2 and 5 (Table 4). Each region could increase area planted to row crops by 4 to 7% of the total state row crop land area and still maintain 1.0*T soil limit by shifting to management level 7. Another 1-2% per region is possible if management level 8 is reached. Row crop production could be increased by 6-8% of the state production in each of regions 1-4 and by less than 3% in region 5 with the above shift to management level 7.

Estimates of soil losses for different management practices and soil loss limits are lowest in regions 1 and 5 and higher in regions 2, 3, and 4 (Table 6). These losses reflect the total land area available for crop production and overall erosion potential in the different regions, with region 1 having a much lower erosion potential than any other region because of generally level topography.

There is no intent to imply that all cropland and pasture should be planted to corn or to row crops. Rather, corn represents annual row crops of sorghum, soybeans, and sunflowers which more or less subject the land to erosion to the same extent as does corn. Also, some choice of land base needed to be made, and using the total land base where corn or other annual row crops *could* be grown seemed a logical choice.

Market forces and farmer preference will continue to play major roles in the choice of crop grown in any given field. However, the per-

TABLE 5.—Potential Row Crop Production for Five Different Soil Loss Limits from the 1967 Inventory of Cropland, Pasture, and Idle Land Having Slopes Equal to or Less Than 18% for Five Areas Within Ohio.

		Management Levels								
Region*	Loss Limit	1	2	3	4	5	6	7	8	Total†
					%‡					
5	0.25T	2.3	2.4	2.4	2.6	2.7	2.9	3.1	4.2	
	0.5 T	2.7	2.9	3.0	3.2	3.4	3.6	3.9	5.3	
	1.0 T	3.1	3.3	3.5	3.7	4.1	4.3	4.7	6.2	
	2.0 T	3.6	3.9	4.1	4.4	4.8	5.2	5.6	7.4	
	4.0 T	4.2	4.6	4.9	5.3	5.8	6.1	6.6	8.3	8.7
2	0.25T	3.5	3.9	4.2	4.8	5.6	6.2	6.8	10.1	
	0.5 T	4.7	5.2	5.8	6.6	7.6	8.4	9.1	12.5	
	1.0 T	6.2	6.9	7.6	8.7	9.8	10.5	11.4	13.9	
	2.0 T	8.2	9.1	9.9	10.8	11.9	12.7	13.2	15.0	
	4.0 T	10.4	11.2	12.0	12.9	13.6	13.9	14.5	15.5	15.7
3	0.25T	9.6	10.1	10.5	11.3	12.2	12.9	13.7	18.5	
	0.5 T	11.3	12.0	12.7	13.7	14.8	15.7	17.1	21.4	
	1.0 T	13.2	14.1	14.9	16.1	17.6	18.6	19.8	23.0	
	2.0 T	15.5	16.7	17.7	19.0	20.2	21.1	22.1	23.6	
	4.0 T	18.5	19.5	20.3	21.4	22.5	22.9	23.3	23.9	24.2
4	0.25T	10.2	10.7	11.2	12.0	13.0	13.9	14.7	19.1	
	0.5 T	12.2	12.9	13.6	14.8	16.0	17.0	18.2	21.9	
	1.0 T	14.3	15.3	16.2	17.5	18.9	19.8	20.8	23.0	
	2.0 T	16.9	18.1	19.1	20.2	21.2	21.9	22.5	23.8	
	4.0 T	19.8	20.7	21.4	22.3	22.8	23.1	23.4	24.2	24.7
1	0.25T	12.6	14.2	15.6	17.9	20.2	20.9	21.6	24.2	
	0.5 T	17.0	19.1	20.5	21.3	22.2	23.0	23.8	25.5	
	1.0 T	20.9	21.7	22.4	23.3	24.5	24.8	25.2	26.2	
	2.0 T	22.9	23.8	24.5	25.0	25.4	25.7	26.1	26.3	
	4.0 T	24.8	25.2	25.5	25.9	26.2	26.3	26.3	26.5	26.6

*See Figure 1 for locations within Ohio.
†Total expected production if total available land area for row crops was planted to row crops.
‡100% row crop production = 13.5×10^8 bushels corn equivalent.

turbation of possible soil loss limit mandates may infringe on these historic factors, upsetting not only the individual farmer's traditional mode of decision making, but also affecting the ability of farmers in aggregate to supply row crops desired by the market place. For example, in order to grow row crops on some of the more sloping areas and comply with a given soil loss limit, a farmer may be required to introduce close growing crops into his system—crops he may not want or need. On the other hand, multiple cropping systems involving small grains followed by row crops are emerging as quite profitable practices. Thus, the po-

TABLE 6.—Expected Average Annual Soil Loss for Five Different Soil Loss Limits from the 1967 Inventory of Cropland, Pasture, and Idle Land Having Slopes Equal to or Less Than 18% for Five Areas Within Ohio.

		Management Levels							
Region*	Loss Limit	1	2	3	4	5	6	7	8
					%†				
5	0.25T	1.1	1.1	1.1	1.1	1.0	0.9	0.9	0.8
	0.5 T	2.2	2.1	2.0	1.8	1.8	1.7	1.6	1.4
	1.0 T	3.8	3.6	3.5	3.4	3.2	3.1	2.9	2.4
	2.0 T	6.8	6.6	6.4	6.1	5.8	5.5	5.3	3.4
	4.0 T	12.5	12.0	11.5	10.9	10.4	9.8	8.8	3.8
2	0.25T	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.2
	0.5 T	3.8	3.7	3.6	3.5	3.2	3.1	2.9	1.7
	1.0 T	7.1	6.8	6.5	6.0	5.6	5.1	4.4	2.4
	2.0 T	12.5	11.8	11.1	9.8	8.3	7.3	6.3	2.7
	4.0 T	20.9	18.5	16.3	14.0	12.0	10.3	8.3	2.8
3	0.25T	3.0	3.0	3.0	2.7	2.5	2.3	2.2	1.5
	0.5 T	5.7	5.2	4.9	4.5	4.2	3.9	3.6	2.0
	1.0 T	9.4	8.9	8.4	7.6	6.9	6.2	5.5	2.4
	2.0 T	16.0	14.7	13.6	12.0	10.3	8.7	7.0	2.5
	4.0 T	25.5	22.8	20.3	16.2	12.9	10.6	8.0	2.5
4	0.25T	3.5	3.5	3.5	3.2	2.9	2.7	2.5	1.6
	0.5 T	6.6	6.1	5.7	5.3	4.8	4.4	3.9	2.0
	1.0 T	11.0	10.2	9.6	8.5	7.4	6.7	5.5	2.7
	2.0 T	18.1	16.2	14.8	12.6	10.3	8.8	7.3	3.0
	4.0 T	27.4	23.5	20.3	16.6	13.7	11.8	9.4	3.2
1	0.25T	3.6	3.6	3.2	2.6	2.2	1.9	1.6	0.8
	0.5 T	5.7	4.9	4.3	3.6	3.0	2.6	2.1	0.8
	1.0 T	7.9	6.9	6.0	4.8	3.9	3.3	2.6	0.9
	2.0 T	10.7	8.9	7.6	6.2	4.7	3.8	2.8	1.0
	4.0 T	13.7	11.5	9.3	6.9	5.1	4.1	3.0	1.0

*See Figure 1 for locations within Ohio.

†100% soil loss = 9.8×10^7 tons (soil loss as if there was a 4.0*T soil loss limit and all permissible land in corn was managed at level 1).

tential exists to introduce a close growing crop for erosion control while increasing overall profits.

Based on the results of this exercise, a large potential exists for increasing row crop acreage in Ohio while at the same time decreasing erosion to acceptable levels. To accomplish this will require effort for farmers to learn new (to them) management skills, and possibly to invest in new equipment. It will also require effort for research and extension personnel to improve reliability of these technologies and to provide the best available information to the farmers.

REFERENCES

1. Bone, Samuel W., D. M. Van Doren, Jr., and G. B. Triplett, Jr. 1977. Tillage research in Ohio. Ohio Coop. Ext. Serv., Bull. 620, pp. 3-12.
2. Carter, H. L. 1976, 1978, 1979. Ohio Agricultural Statistics. Ohio Crop Reporting Service, U. S. Dept. of Agr., Annual Reports May 1977, May 1979, May 1980.
3. National Cooperative Soil Survey, U. S. Dept. of Agriculture. Form 5 reports on established series.
4. Nolte, B. H., S. W. Bone, R. Christman, L. M. Feusner, and R. L. Goettemoeller. 1979. Ohio erosion control and sediment pollution abatement guide. Ohio Coop. Ext. Serv., Bull. 694, pp. 2-24.
5. Stewart, B. A., D. A. Woolhiser, W. H. Wischmeier, J. H. Caro, and M. H. Frere. 1976. Control of water pollution from cropland, Vol. III—an overview. U. S. Dept. of Agr., Report No. ARS-H-5-2, pp. 31-57.
6. Triplett, G. B., Jr., D. M. Van Doren, Jr., and Samuel W. Bone. 1973. An evaluation of Ohio soils in relation to no-tillage corn production. Ohio Agri. Res. and Dev. Center, Res. Bull. 1068, pp. 3-20.
7. U.S.D.A. Conservation Needs Inventory Committee. 1967. The 1967 land use inventory. Iowa State Univ., Ames.

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Southern Branch, Ripley, Brown County: 275 acres

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