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The Defiance County Lost Creek Demonstration Project

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THE DEFIANCE COUNTY LOST CREEK DEMONSTRATION PROJECT

by

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DEFIANCE, OHIO 43512
(GRANT S005553)

FOR

U.S. ENVIRONMENTAL PROTECTION AGENCY
CHICAGO, ILLINOIS

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I. EXECUTIVE SUMMARY

Early in 1980, the Defiance Soil and Water Conservation District applied for a grant from the U.S Environmental Protection Agency to demonstrate methods of improving water quality flowing from non-point sources, specifically agricultural land. The grant was awarded in August 1980 and extensions of the grant were awarded in February 1981 and June 1984. Federal funding terminated July 31, 1985.

The Project proposed to demonstrate and measure the effectiveness of Best Management Practices in reducing sediment and nutrient loss from agricultural land. Best Management Practices are soil conservation practices which are expected to have a beneficial impact on water quality.

Several unique and innovative practices were to be demonstrated on the fine textured lake plain soils and the suitability of these practices as they relate to crop production was also to be evaluated. An effective information and education program was to be designed and carried out to gain acceptance of the conservation program in the Defiance County Project.

The goals of the Project were two-fold:

1) To introduce, through demonstration, the effectiveness of Best Management Practices in reducing sediment loss from agricultural land while maintaining acceptable economic returns.

2) To gain farmers' acceptance of the Best Management practices and unique and innovative practices that are effective in reducing sediment and phosphorus transport.

LOST CREEK SUBWATERSHED

It was a goal to attain full conservation treatment on cropland in the Upper Lost Creek subwatershed. This area has rolling topography and includes soils considered to be better adapted to conservation tillage than the flat lake plain soils in the county. A stream monitoring station was installed at the outlet of the watershed. Heidelberg College, Tiffin, Ohio, was awarded a contract to collect and analyze the samples taken.

LAKE PLAIN SOILS

1. Ridge Tillage

On the Defiance County lake plain soils, primarily the Paulding and Latty clays, one of the unique and innovative practices demonstrated was the ridge-till method of crop

production. This system involves the permanent establishment of ridges in which each year's crop is either no-tilled into the ridge, or the top inch or two of the ridge is removed and the crop planted into the uncovered ridge.

To date, it is not known if ridge-till is a useable system on the high clay content soils due to the lack of conclusive results. Some reasons why farmers of these soils are reluctant to adopt the system are:

1) Reduction of soybean yield compared to narrow row (7 inches) soybeans[1].

2) Need for extensive change or additions to existing equipment.

3) Results comparable to those of ridge-till can be attained with no-till at a lower cost for equipment modifications.

4) The farmer is financially unable to give the system the necessary three to five years reportedly needed to improve yields.

5) Managerial ability appears to be beyond the scope of a majority of the farmers.

2. Shallow Tile

Another unique and innovative practice demonstrated was the installation of shallow tile systems at close spacings on Paulding clay soils. Drainage of excess water from these soils is necessary for successful conservation tillage. While the installation of drainage tile at normal depths and spacings is not a recommended practice on these soils, installation at shallow depths has not been tested. Shallow, closely spaced tile appear to be a feasible means of improving drainage thereby increasing the likelihood of successful conservation tillage on fine textured soils.

EXECUTIVE SUMMARY CONCLUSION

Considerable progress has been made in the adoption of conservation tillage in Defiance County. Practices such as no-till on fine textured clay soils that were traditionally not expected to be successful appear to have a place in Defiance County agriculture, and to the contrary, the adoption of practices such as ridge-till on Lake Plain soils have not proven to be as successful as anticipated.

[1]See Ohio 1983-84 Agronomy Guide, pg. 49

II. INTRODUCTION

The Defiance County Lost Creek Demonstration Project was undertaken by the Defiance Soil and Water Conservation District in August, 1980, under a grant provided by the Great Lakes National Program Office of the United States Environmental Protection Agency.

The program was developed to demonstrate and evaluate methods for the reduction of sediment and related agricultural pollutants, primarily phosphorus, in the Maumee River and Lake Erie. The approach taken in Defiance County was to provide monetary incentives, equipment, and technical assistance to gain the acceptance of Best Management Practices by landowners. The demonstration of the effectiveness of several unique and innovative practices on reducing sediment and nutrient losses on lake plain soils was also a Project objective. To evaluate the effectiveness of these practices, water quality monitoring and a rainfall simulator study were used.

While conservation tillage was promoted throughout the county, areas receiving special attention were a subwatershed on the west side of the county and also the fine textured lake plain soils. Farmers in the subwatershed were provided special financial incentives for the adoption of conservation practices. Monitoring and evaluation of both water quality data and tillage practices employed by these farmers were used to measure the effectiveness of these practices.

The lake plain soils, traditionally being problem soils with low crop productivity and as sources of sediment and nutrient transport, were given special emphasis. Ridge-tillage practices were demonstrated and evaluated both in terms of water quality impacts and economic feasibility. Since drainage of excess water from these soils appears to be the limiting factor for the successful adoption of conservation tillage, various means of removing the excess water from the land without degrading water quality were demonstrated.

The information and education program was an important phase of the Project. This program was the key to educating participants in the Project on the proper techniques used in conservation tillage. A major thrust of the education program was to get media coverage of the Project and to disseminate information gained from the various programs in the Project.

III. BACKGROUND

Defiance County is situated in northwestern Ohio bordering the Indiana state line and approximately 20 miles south of the Michigan state line. It is located at 40 degrees, 17 minutes north latitude and 84 degrees, 21 minutes west longitude. Adjacent counties in Ohio include Williams, Henry, Putnam, and Paulding. Defiance County has an area of 412 square miles or 263,680 acres and in 1982 had a population of 39,127.

The city of Defiance is the county seat with a population in 1982 of 16,418. Major industries in the city include General Motors, three Manville plants, Zeller Corporation, and Dinner Bell. The per capita income in Defiance County for 1981 was $7,743.

AGRICULTURAL ACTIVITY

There are approximately 1,100 farms comprising the 217,000 acres of farmland in Defiance County with the average size farm being 197 acres. A farm is defined as having annual sales of agricultural products of $1,000 or more.

TABLE 1

MAJOR DEFIANCE COUNTY CROPS AND YIELDS*[2]

	1983		1982		1981	
CROP	ACRES	AVERAGE YIELD	ACRES	AVERAGE YIELD	ACRES	AVERAGE YIELD
Corn	21,500	80.7	40,000	119.3	38,100	95.3
Soybeans	77,800	28.1	94,000	32.0	71,400	20.0
Wheat	29,900	41.8	23,000	32.0	45,000	44.4
Oats	3,000	62.3	10,700	73.0	6,100	72.0
Hay	6,900	2.0	6,700	3.2	8,000	2.3
Tomatoes	220	19.1	170	20.6	130	16.2

*All yields expressed in bu/ac. except hay and tomatoes which are in tons/ac.

[2]Ohio Agricultural Statistics 1982, 1983

TABLE 2

CASH RECEIPTS FROM FARM MARKETINGS, BY COMMODITIES[3] AND COMMODITY GROUPS, BY COUNTY, OHIO 1983

EXTENSION DISTRICT	CASH RECEIPTS FROM CROPS					
	TOTAL	CORN	SOYBEANS	WHEAT	OATS AND HAY	OTHER CROPS*
			- THOUSAND DOLLARS -			
ALLEN	35,674	10,784	15,912	4,763	1,110	3,105
CRAWFORD	40,695	12,190	20,442	5,178	976	1,909
DEFIANCE	30,844	6,915	17,108	4,202	1,106	1,513
FULTON	49,643	17,956	18,164	3,886	684	8,953
HANCOCK	56,826	14,310	29,118	8,929	988	3,481
HARDIN	40,636	13,100	18,422	6,608	631	1,875
HENRY	53,822	16,045	24,820	6,586	1,018	5,353
LUCAS	32,679	6,428	9,426	1,724	231	14,870
MARION	37,346	13,006	17,934	4,782	316	1,308
MORROW	22,785	9,204	9,961	1,864	744	1,012
OTTAWA	23,844	3,381	11,989	2,239	701	5,534
PAULDING	40,738	10,636	21,410	6,445	1,071	1,176
PUTNAM	58,692	13,427	26,221	7,901	1,734	9,409
SANDUSKY	55,326	10,737	19,938	3,053	789	20,809
SENECA	53,101	13,780	24,961	5,921	1,425	7,014
VAN WERT	52,203	16,179	26,349	7,223	722	1,730
WILLIAMS	33,932	11,106	14,709	4,599	1,488	2,030
WOOD	66,533	19,097	28,254	11,161	1,192	6,829
WYANDOT	39,143	9,123	19,628	6,610	549	3,233
NORTHWEST	824,462	227,404	374,766	103,674	17,475	101,143
District Avg:	43,392	11,968	19,724	5,456	919	5,323

*Includes greenhouse and nursery, fresh market, processing and greenhouse vegetables, potatoes, nuts, berries, rye, tobacco, maple products, seed crops, mushrooms, popcorn, forest products and miscellaneous crops.

(3) 1983 Ohio Farm Income

TABLE 3

CASH RECEIPTS FROM FARM MARKETINGS, AND THE RANK OF THE EIGHT MAJOR COMMODITIES BY RELATIVE IMPORTANCE, BY COUNTIES, OHIO 1983 (3)

EXTENSION DISTRICT	CASH RECEIPTS FROM SALES (THOUS. $)	EIGHT MAJOR COMMODITIES FIRST COM- MODITY	PER- CENT	SECOND COM- MODITY	PER- CENT	THIRD COM- MODITY	PER- CENT	FOURTH COM- MODITY	PER- CENT
ALLEN	50,432	SOYBEANS	32	CORN	21	WHEAT	9	HOGS	9
CRAWFORD	54,900	SOYBEANS	37	CORN	22	WHEAT	9	HOGS	8
DEFIANCE	42,963	SOYBEANS	40	CORN	16	HOGS	10	WHEAT	10
FULTON	83,136	SOYBEANS	22	CORN	22	HOGS	19	CATTLE	12
HANCOCK	67,139	SOYBEANS	43	CORN	21	WHEAT	13	HOGS	9
HARDIN	57,226	SOYBEANS	32	CORN	23	HOGS	12	WHEAT	12
HENRY	68,410	SOYBEANS	36	CORN	24	WHEAT	10	OTHER CROPS	8
LUCAS	37,203	OTHER CROPS	40	SOYBEANS	25	CORN	17	HOGS	5
MARION	48,186	SOYBEANS	37	CORN	27	HOGS	10	WHEAT	10
MORROW	34,034	SOYBEANS	29	CORN	27	DAIRY	12	CATTLE	11
OTTAWA	26,330	SOYBEANS	46	OTHER CROPS	21	CORN	13	WHEAT	9
PAULDING	46,980	SOYBEANS	46	CORN	23	WHEAT	14	OTHER LVSTK	4
PUTNAM	85,665	SOYBEANS	31	CORN	16	HOGS	13	OTHER CROPS	11
SANDUSKY	64,518	OTHER CROPS	32	SOYBEANS	31	CORN	17	DAIRY	6
SENECA	68,422	SOYBEANS	37	CORN	20	OTHER CROPS	10	DAIRY	9
VAN WERT	62,218	SOYBEANS	42	CORN	26	WHEAT	12	HOGS	7
WILLIAMS	54,224	SOYBEANS	27	CORN	21	HOGS	12	CATTLE	11
WOOD	74,329	SOYBEANS	38	CORN	26	WHEAT	15	OTHER CROPS	9
WYANDOT	48,672	SOYBEANS	40	CORN	19	WHEAT	14	HOGS	9
NORTHWEST	1,074,987	SOYBEANS	35	CORN	21	WHEAT	10	OTHER CROPS	9

EXTENSION DISTRICT	FIFTH COM- MODITY	PER- CENT	SIXTH COM- MODITY	PER- CENT	SEVENTH COM- MODITY	PER- CENT	EIGHTH COM- MODITY	PER- CENT
ALLEN	OTHER LVSTK	8	OTHER CROPS	6	DAIRY	6	CATTLE	6
CRAWFORD	DAIRY	8	CATTLE	8	OTHER CROPS	4	OTHER LVSTK	2
DEFIANCE	DAIRY	9	CATTLE	7	OTHER CROPS	4	HAY & OATS	3
FULTON	OTHER CROPS	11	DAIRY	7	WHEAT	5	OTHER LVSTK	3
HANCOCK	OTHER CROPS	5	CATTLE	3	DAIRY	2	OTHER LVSTK	2
HARDIN	DAIRY	8	CATTLE	8	OTHER CROPS	3	OTHER LVSTK	1
HENRY	HOGS	8	OTHER LVSTK	5	CATTLE	5	DAIRY	4
LUCAS	OTHER LVSTK	5	WHEAT	5	CATTLE	1	DAIRY	1
MARION	CATTLE	6	DAIRY	4	OTHER CROPS	3	OTHER LVSTK	2
MORROW	HOGS	8	WHEAT	6	OTHER CROPS	3	HAY & OATS	2
OTTAWA	DAIRY	4	HAY & OATS	3	CATTLE	3	HOGS	2
PAULDING	HOGS	4	CATTLE	3	OTHER CROPS	3	HAY & OATS	2
PUTNAM	WHEAT	9	OTHER LVSTK	8	DAIRY	7	CATTLE	4
SANDUSKY	WHEAT	5	CATTLE	5	HOGS	3	HAY & OATS	1
SENECA	WHEAT	9	HOGS	7	CATTLE	5	HAY & OATS	2
VAN WERT	DAIRY	5	OTHER CROPS	3	CATTLE	2	OTHER LVSTK	2
WILLIAMS	DAIRY	11	WHEAT	9	OTHER CROPS	4	OTHER LVSTK	3
WOOD	CATTLE	4	HOGS	3	DAIRY	2	HAY & OATS	2
WYANDOT	OTHER CROPS	7	DAIRY	5	CATTLE	4	OTHER LVSTK	2
NORTHWEST	HOGS	9	DAIRY	6	CATTLE	6	OTHER LVSTK	3

(3) 1983 Ohio Farm Income

As shown in Table 2, the total cash receipts for crops marketed in 1983 in Defiance County were $30,844,000 which was less than the average for the 19 counties in the Northwest Ohio Extension District. From Tables 1, 2, and 3, it is also quite evident that soybeans are the most important commodity in the agricultural economy of Defiance County.

TOPOGRAPHY

The highest elevation in the county is 874 feet above sea level while the lowest is 645 feet above sea level. The northwestern part of the county shows stronger relief with Blount-Glynwood and Pewamo soils being predominant on the rolling topography. Several broad flats are representative of much of the county. Hoytville and Nappanee soils are representative of the flat lake plains in the eastern portion of the county and were formed in glacial till. In the central section, where clayey sediment was deposited in glacial lakes, Paulding, Roselms, Latty, and Fulton soils are dominant.

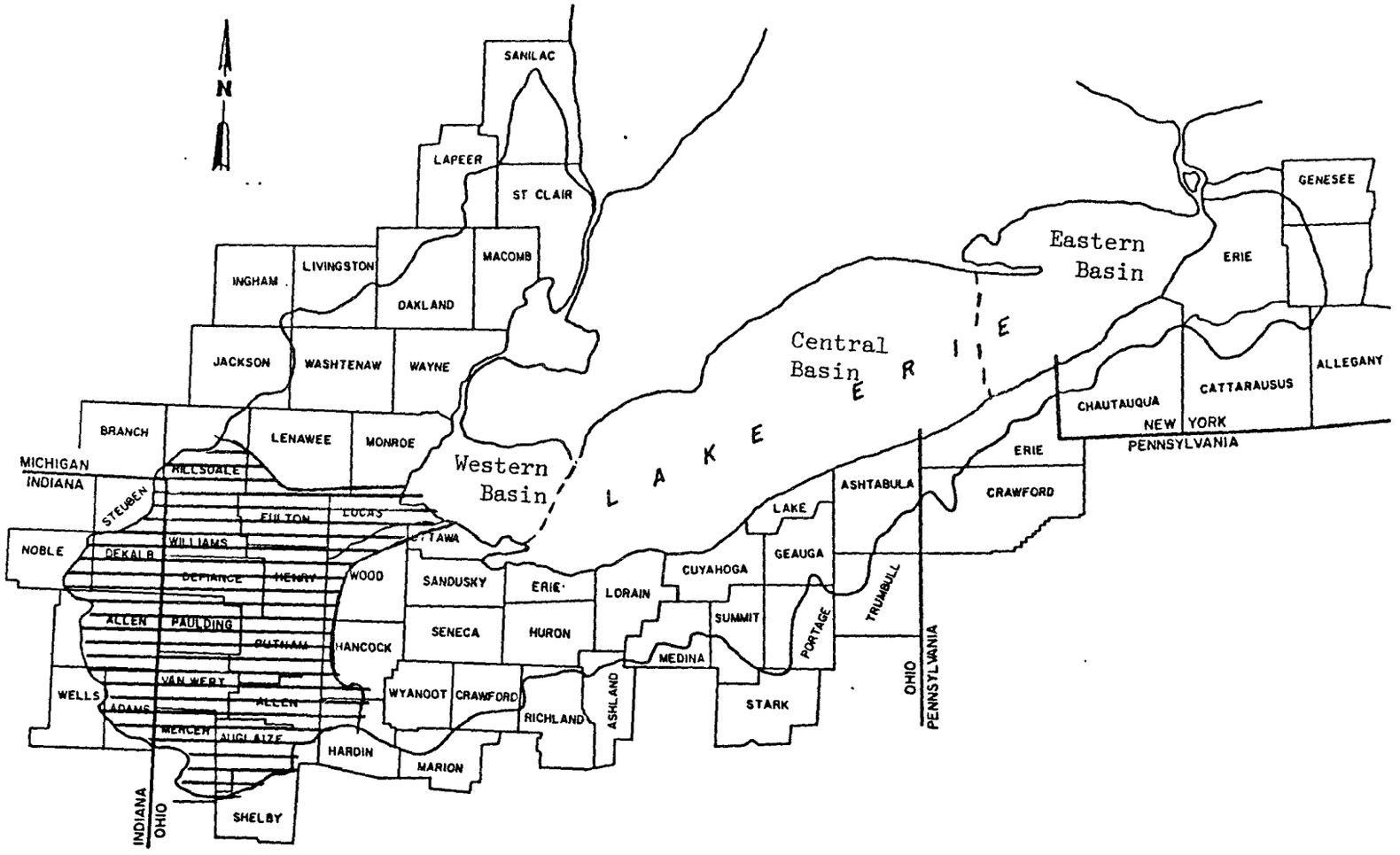
STREAM CHARACTERISTICS

Defiance County is centrally located in the Maumee River Basin which drains into the western basin of Lake Erie. Land in the county drains into three major tributaries which all eventually outlet into the Maumee River.

The high point of the Ft. Wayne moraine separates drainage in the northwestern section of the county from the rest of the county. The St. Joseph River drains the northwestern area and flows southwesterly into Ft. Wayne, Indiana, where it joins the St. Mary's River to form the Maumee River.

Most of the north central portion of the county drains southeasterly into the Tiffin River which joins the Maumee at Defiance. Also, flowing northeasterly into the Maumee River at Defiance is the Auglaize River which drains the southeastern part of the county.

Aside from the natural drainageways, many miles of man-made channels have been constructed over the years to drain land that was once swampland. During the late 1800's, people began to realize the agricultural value of the soil, and as a result, extensive earthwork and drainage construction was initiated. Maintenance and enlargement or extension of these drainageways continues through the present day as excessive water can severely limit agricultural productivity on most of these soils.



U.S. COUNTIES IN LAKE ERIE BASIN

Maumee River Basin

SOILS

The soils present in the county are largely the result of the county being covered by glaciers and post-glacial lakes. The glaciers were responsible either directly or indirectly for the deposition of glacial till, outwash, and alluvium washed from these materials. Lacustrine or clayey and silty-water deposited material were laid down in a series of large shallow lakes that covered much of the county after the glacier retreated.

Two end moraines developed as the last glacier began to melt and recede. The Ft. Wayne moraine located in northwestern Defiance County is the older of the two. The Defiance end moraine, eroded by the action of lake water and streams, is nearly level.

The ten most common soils in Defiance County listed in Table 4 comprise 76 percent of the land in the county. The soils in this group are considered medium to fine textured soils and the drainage ranges from somewhat poorly to very poorly drained with most of the land falling in the latter category.

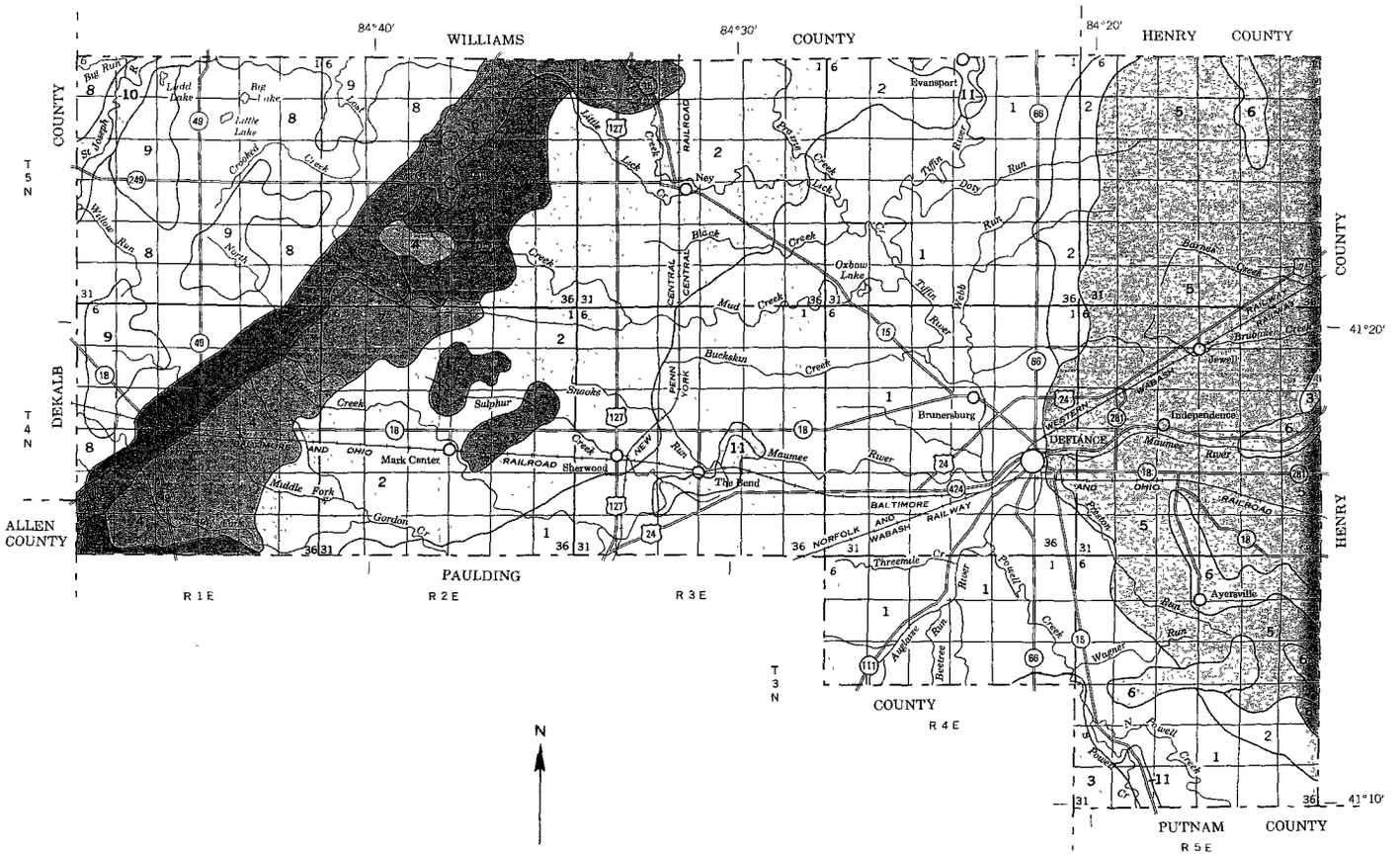
TABLE 4

MOST COMMON DEFIANCE COUNTY SOILS

NAME	TEXTURE(1)	DRAINAGE(2)	AREA(Ac)	% of County
HOYTVILLE	MF & F	VP	43,386	16.5
LATTY	F & MF	VP	36,663	14.0
PAULDING	F	VP	32,470	12.5
ROSELMS	F	SP	26,886	10.0
FULTON	F & MF	SP	13,052	5.0
GLYNWOOD	MF	MW	11,444	4.5
BLOUNT	MF	SP	11,148	4.0
NAPPANEE	MF & F	SP	9,216	3.5
LENAWEE	MF & M	VP	8,330	3.0
HASKINS	M & MF	SP	8,081	3.0
		Total	200,676	76.0

(1) Texture Classification
- M - Medium
- MF - Moderately Fine
- F - Fine

(2) Drainage Classification
- VP - Very Poorly
- SP - Somewhat Poorly
- MW - Moderately Well



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts

LEGEND*

FINE TO MEDIUM TEXTURED SOILS ON LAKE PLAINS

1 — Paulding-Roselms Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in fine textured lacustrine sediment

2 — Latty-Fulton Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in fine textured and moderately fine textured lacustrine sediment

3 — Toledo-Fulton Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in fine textured and moderately fine textured lacustrine sediment

4 — Lenawee-Del Rey Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in medium textured to fine textured lacustrine sediment

5 — Hoytville-Nappanee Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in moderately fine textured and fine textured glacial till modified by water action

MEDIUM TEXTURED SOILS ON BEACH RIDGES, LAKE PLAINS, DELTAS, STREAM TERRACES, OUTWASH PLAINS, AND MORAINES

6 — Marmill-Haskins-Millgrove Association — Level and nearly level, very poorly drained and somewhat poorly drained soils formed in moderately coarse textured to moderately fine textured glacial outwash and the underlying glacial till, lacustrine sediment, or glacial outwash

7 — Kibbie-Colwood Association — Nearly level and level, somewhat poorly drained and very poorly drained soils formed in moderately fine textured to coarse textured glaciofluvial deposits

MEDIUM TEXTURED AND MODERATELY FINE TEXTURED SOILS ON MORAINES

8 — Blount-Glynwood-Pewamo Association — Level to sloping, somewhat poorly drained, moderately well drained, and very poorly drained soils formed in moderately fine textured glacial till

9 — Glynwood-Blount Association — Sloping to nearly level, moderately well drained and somewhat poorly drained soils formed in moderately fine textured glacial till

MODERATELY FINE TO MODERATELY COARSE TEXTURED SOILS MAINLY ON FLOOD PLAINS, STREAM TERRACES, AND MORAINES

10 — Blount-Genesee-Oshtemo Association — Level to gently sloping, somewhat poorly drained and well drained soils formed in moderately fine textured to coarse textured glacial till, recent alluvium, and glacial outwash

11 — Genesee-Sloan Association — Level and nearly level, well drained and very poorly drained soils formed in medium textured and moderately fine textured recent alluvium

*Texture terms refer only to the surface layer of the major soils

Compiled 1983

U. S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OHIO DEPARTMENT OF NATURAL RESOURCES,
DIVISION OF SOIL AND WATER CONSERVATION
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

GENERAL SOIL MAP

DEFIANCE COUNTY, OHIO

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

UNIQUE CHARACTERISTICS

Due to the texture and poor drainage characteristics of the Paulding and Latty soils, corn production is limited in the central portion of the county where these soils occur. Therefore, many farmers in this area are in a wheat, clover for hay and seed, and soybean rotation. Often at the optimum corn planting time, these soils are too wet for planting. Also, nitrogen application and harvesting can sometimes be difficult due to wet soil conditions.

CLIMATE AND WEATHER

The climate and weather in Defiance County is cold in winter and warm and occasionally hot in summer. In the winter, the average temperature is 25 degrees F. and the average daily minimum temperature is 17 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperture is 83 degrees.

Of the 30.08 total inches of average annual precipitation, 19 inches or 60 percent falls in April through September. Thunderstorms occur on about 40 days per year and are most frequent during the summer. The average seasonal snowfall is 27 inches and on an average of 27 days, at least one inch of snow is on the ground.

The average relative humidity at midafternoon is about 60 percent. Humidity is higher at night with the average at dawn being 85 percent.

The prevailing wind is from the west-southwest, and the average highest windspeed is in the spring at 11 miles per hour.

DEVIATIONS FROM NORMAL WEATHER

Variations in year-to-year weather patterns affect crop yields tremendously. The weather during 1981 deviated from normal patterns with more than 20 inches of rainfall during the planting months of April, May, and June. The months of July and August were abnormally hot and dry, thus compounding the problem of the already stressed crops.

In terms of Project operation, the wet spring not only delayed planting, but planting oftentimes occurred on soils too wet for ideal planter operation. Since soil moisture conditions were usually too wet for conventional tillage, few plots had adequate tillage comparisons.

The 1982 growing season was more normal. Although the planting season extended from April 24 to July 1, most

TABLE 5 --TEMPERATURE AND PRECIPITATION (4)

[Recorded in the period 1951-78 at Defiance, Ohio. Summaries are based on incomplete records]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	31.3	14.0	22.7	58	-13	0	2.04	.94	2.98	6	6.9
February---	34.8	16.2	25.5	62	-9	0	1.77	.82	2.58	5	5.6
March------	44.5	24.9	34.7	75	4	11	2.64	1.51	3.63	7	4.6
April------	59.1	36.3	47.8	84	19	64	3.47	2.13	4.67	8	.9
May--------	71.0	46.6	58.8	91	29	298	3.48	2.18	4.64	8	.0
June-------	81.0	56.7	68.8	95	41	564	3.42	2.03	4.64	7	.0
July-------	84.6	60.4	72.6	98	48	701	3.40	2.21	4.48	7	.0
August-----	82.9	58.2	70.6	95	44	639	2.90	1.48	4.13	5	.0
September--	76.4	51.1	63.7	94	33	411	2.71	1.42	3.84	6	.0
October----	64.6	39.5	52.0	85	22	149	2.26	.83	3.47	5	.1
November---	48.9	30.1	39.5	74	9	9	2.61	1.40	3.66	7	2.3
December---	36.4	19.7	28.1	63	-7	0	2.38	.86	3.64	7	6.2
Yearly:											
Average--	59.6	37.8	48.7	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-13	---	---	---	---	---	---
Total----	---	---	---	---	---	2,846	33.08	28.35	37.63	78	26.6

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

(4) Soil Survey of Defiance County, Ohio, p. 132

TABLE 6.--FREEZE DATES IN SPRING AND FALL (4)

[Recorded in the period 1951-78 at Defiance, Ohio]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 21	May 6	May 18
2 years in 10 later than--	April 16	May 1	May 13
5 years in 10 later than--	April 7	April 21	May 4
First freezing temperature in fall:			
1 year in 10 earlier than--	October 17	October 10	September 24
2 years in 10 earlier than--	October 22	October 15	September 29
5 years in 10 earlier than--	October 31	October 24	October 9

TABLE 7.--GROWING SEASON (4)

[Recorded in the period 1951-78 at Defiance, Ohio]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	185	164	140
8 years in 10	192	172	146
5 years in 10	206	186	157
2 years in 10	220	200	169
1 year in 10	227	207	175

(4) Soil Survey of Defiance County, Ohio, p. 133

crops were planted during the three dry weeks from late April to mid-May. No-till equipment worked well during these dry weeks with the only major problem being insufficient rainfall to activate residual herbicides applied during that time. Several of the fields planted during this time had to be cultivated or sprayed with post-emergent herbicides to control escaped weeds. Overall, 1982 was a good year for crop production.

Although the total rainfall for the 1983 growing season was close to normal, rainfall during the months of April, May, and June was above normal. This delayed planting and often caused planting in less than ideal soil moisture conditions. Accompanying cool temperatures in May slowed crop emergence. Similar to 1981, the wet spring was followed by a dry and extremely hot summer. Rainfall during July, August, and September was 2.5 inches below normal and there were many consecutive days when temperatures were over 90 degrees F. Consequently, yields were reduced, especially for corn.

Rainfall patterns in 1984 were again far from normal. April and May were wet months while June and July were extremely dry. During May, temperatures were low while near normal temperatures were experienced during the remainder of the growing season. The cold wet weather during May provided less than ideal planting conditions. It reduced germination and plant emergence making it necessary to replant several fields. However, replanting was to no avail as many of the replants did not germinate due to the lack of moisture during June. With the reduction of stands, yields were less than normal in 1984.

TABLE 8

GROWING SEASON RAINFALL FOR DEFIANCE COUNTY
(Inches)

1981 - 1984

	Normal	1981	1982	1983	1984
April	3.47	4.86	2.14	5.08	5.22
May	3.48	4.28	4.40	4.21	4.22
June	3.42	12.13	4.05	4.95	0.71
July	3.40	2.19	4.92	2.91	2.57
August	2.90	1.64	1.63	1.21	2.21
September	2.71	7.43	1.87	2.23	4.30
October	2.26	3.82	0.99	4.00	2.97
Total	21.64	36.35	20.00	24.59	22.00

EFFECTS ON ATTAINMENT OF PROJECT GOALS

Three out of the four years of the Project were less than ideal for spring planting. However, this did not seem to detract from meeting the goals of the Project. The District supervisors and staff decided early in the Project to establish the number of cooperators and/or acres that could be serviced during the planting season taking into account that ideal seasons do not seem to occur frequently. When 40 to 45 applications were received, applications were still taken, but no promises were made concerning equipment availability. This action was deemed necessary to prevent signing up more participants than could be serviced.

In some instances, the poor planting season helped reach new cooperators. Where tillage conditions were marginal, occasionally a new cooperator would request use of a no-till planter to get a crop planted. Even though this was often a last minute request and pre-planning did not occur, the request was often honored if the field met the requirements for a no-till demonstration plot.

Signs such as these were posted at most of the conservation tillage demonstration plots soon after planting each year of the Project.

IV. PROJECT PURPOSE

The purpose of the Defiance County Lost Creek Demonstration Project was to demonstrate and evaluate methods to reduce the transport of sediment and related pollutants, primarily phosphorus, from agricultural land to the Maumee River and Lake Erie. In Defiance County and throughout most of the Maumee Basin, reducing soil loss to just the soil tolerance ("T") level, the level at which long-term productivity is maintained, will not reduce phosphorus levels sufficiently to reverse the process of eutrophication of Lake Erie. The high clay content of the area's soils and the buildup of phosphorus from fertilizer application have resulted in high levels of soil absorbed phosphorus. Therefore, water quality programs and measures need to attain a higher level of erosion and sediment control than that required to sustain a high level of crop productivity.

SELECTION AS A PROJECT AREA

The selection of the Defiance County Lost Creek Demonstration Project was based upon two important areas located in Defiance County, the Upper Lost Creek Subwatershed and the lake plain soils which are high in clay content. Geographically, the Upper Lost Creek Subwatershed is approximately four square miles in area and was thought to be of manageable size. The topography and soils are adapted to conservation tillage. With about sixty landowners and/or farmers, the number of cooperators was also manageable. Thus,this watershed had the characteristics of being a good watershed to promote conservation practices and measure to their effect on water quality.

The lake plain soils which comprise a large portion of central Defiance County have been regarded as problem soils in terms of conservation tillage and water quality. No-tillage on many of these soils was not considered to be economically feasible for the farmer. Although these soils are not highly erosive, their high clay content makes them readily transportable once detached. The detached clay particle also carries with it the phosphorus ion, recognized as a major contributor to water quality degradation. Thus, a number of unique and innovative practices were to be demonstrated on these soils to prove their effectiveness in improving water quality and maintaining crop yields. Research in this area by universities and research stations is rather limited or nonexistent. Therefore, it was important to involve these people in the monitoring of water quality on fields where these practices were installed.

There were two phases of monitoring on the lake plain soils. Water quality was monitored at nine locations, plus

crop yields and production practices were monitored on many sites.

GOALS

The goals of the Project were two-fold:

1) To introduce, through demonstration, the effectiveness of Best Management Practices in reducing sediment loss from agricultural land while maintaining acceptable economic returns.

2) To gain farmers acceptance of the Best Management Practices and unique and innovative practices that are effective in reducing sediment and phosphorus transport.

ACCOMPLISHMENT OF GOALS

Instrumental in the attainment of these goals was a comprehensive monitoring program. One phase of that program was the installation of a stream monitoring station in a tributary of Lost Creek (morainal soils).

The station was installed in August 1981 in cooperation with Dr. David Baker of Heidelberg College to monitor the effects of conservation treatment on runoff from the land in the Upper Lost Creek Watershed. It was the intent to collect one year of base data before attempting to attain full conservation treatment of this 2,400-acre watershed. During the succeeding two years, efforts were made to attain high levels of conservation treatment, primarily conservation tillage, in this watershed. Tillage practices and crop rotations were also monitored during 1982, 1983, and 1984. In 1983, the Defiance SWCD contracted with the Ohio Department of Natural Resources, Division of Soil and Water Conservation, to provide aerial photographs and interpretations of the residue cover and tillage performed at three specified times during the year. Details and results of this study are explained in a report prepared by Dr. Baker. Copies of this report are on file at the Great Lakes National Program Office (GLNPO), U.S. EPA Region V, Chicago, Illinois, or at the Water Quality Laboratory, Heidelberg College, Tiffin, Ohio(10).

On the lake plain soils, unique and innovative practices were demonstrated and monitored. These practices included ridges and ridge-till systems, no- till planting under various residue situations, and shallow subsurface tile drainage. A rainfall simulator was also brought to Defiance County to measure runoff and nutrients under specific tillage, residue, and rainfall conditions.

The monitoring of the lake plain soils was under the direction of Dr. Terry Logan of Ohio State University (OSU). Several field size plots have been monitored by OSU since 1974, and upon initiation of the Defiance County Lost Creek Demonstration Project, these sites became a part of the Project. Also during the fall and winter of 1980, three new sites were established to monitor the effects of ridge tillage on water quality. Some of Dr. Logan's work also included the rainulator study which is discussed next. Some of Dr. Logan's conclusions are as follows(5):

1) Runoff from Maumee River Basin soils was highest in the early spring and late fall as was tile flow.

2) Sediment losses were highest from the Paulding and Roselms soils compared to the Blount and losses were generally correlated with runoff.

3) Dissolved and total phosphorus (P) losses were generally low because of the low use of P fertilizer on these soils and total P losses were correlated with sediment loads.

4) No-till generally reduced sediment concentrations and sediment and total P loads but had little effect on dissolved inorganic phosphorus (DIP) losses and runoff.

5) Monitored watersheds gave lower runoff and loads than the smaller plot for Paulding soil.

6) Nitrogen losses were very low except for NO3-N on Blount soil in 1981 when corn was grown. Other crops grown, soybeans and wheat, had little or no N fertilizer additions.

7) Residue cover had no significant effect on runoff during the combined dry, wet and very wet runs and total runoff was 60-90 percent of applied rainfall.

8) Sediment loss on the rainulator study was inversely correlated with percent cover.

9) Total P losses were highly correlated with sediment loss and were lowest on the old ridges with residue on the ridge and in the furrow.

10) Residue in the furrow alone was more effective at reducing soil and total P losses than residue on the ridge alone.

11) DIP loss was highest on the old ridges and this effect was due to the higher Bray P1 extractable P in the surface 5 cm of soil in the old ridges.

A more detailed explanation of these sites and the monitoring results are included in a report prepared by Dr. Logan. This report is available from Dr. Logan at OSU in Columbus, Ohio, or the GLNPO of U.S. EPA in Chicago, Illinois(5).

Through a joint effort of the Soil and Water Conservation District, OSU, Purdue University, and the U.S.D.A. National Soil Erosion Laboratory, a rainfall simulator was brought to Defiance County during the summer of 1983. This study was conducted to supplement the monitoring done by Dr. Logan and to study some variables that could not be evaluated in the monitoring program. Primarily concerned with ridge till systems on high clay content soils having less than one percent slope, this study indicated that:(6)

1) for all the tillage treatments compared, ridge sideslope erosion was three to four times greater than total soil loss, suggesting that transport capacity was the limiting factor.

2) the age of the ridges has little bearing on the amount of soil loss.

3) presence of residue on older ridge decreased soil loss six to sevenfold and on new ridges twofold.

4) Residues placed only on the furrow bottom was as effective in reducing soil loss as residue placed over the entire ridge and furrow.

5) Residue placed only on ridge sideslopes did not reduce soil loss significantly from treatments without residue.

The technical report for this study is on file at the National Soil Erosion Laboratory, U.S.D.A.-ARS, in West Lafayette, Indiana, and at the GLNPO of the U.S. EPA in Chicago, Illinois(6).

The ridge-till and no-till on ridge systems were promoted by the District primarily on the soils high in clay content, i.e. Fulton, Latty, and Paulding. These soils were targeted as heavy contributors to water quality problems. Also previous research had identified these soils as having a low yield potential under conservation tillage due to poor drainage. Ridge-tillage was promoted as a form of conservation tillage that could overcome the drainage limitations and improve water quality.

Another unique and innovative practice demonstrated in the Project was the installation of shallow, closely-spaced,

subsurface tile drainage systems on two sites. The reason for installing these systems was to try and improve the internal drainage of the field, thereby improving the success rate of conservation tillage on high clay content soils.

Probably the most important phase of the Defiance County Lost Creek Demonstration Project was the demonstration of no-till crop production on Defiance County farms. The Project was aimed at showing farmers that under proper management, no-till can produce equal or better yields than conventional tillage on the better drained soils and that no-tillage on the poorly drained soils can be competitive with conventional methods, although management becomes more critical.

Also very important to the goals of the Project was an effective information and education program. Not only was this program designed to work with landowners on a "one on one" basis in developing their conservation programs but also to effectively use mass media and printed materials. Public relations were important to the ultimate goal of getting conservation tillage practices adopted by Defiance County farmers.

GRANT APPLICATION

During the late 1970's, several Defiance County farmers were involved with a multi-county conservation tillage Project sponsored by Maumee Valley Resource Conservation and Development and Planning Organization. This Project had stimulated some interest in the county, but was of short duration and not designed to serve a large number of cooperators in any one county. Being aware of this, the Defiance Soil and Water Conservation District Board of Supervisors began to seek means of establishing a Project to promote the conservation of natural resources in Defiance County and the improvement of water quality in the Maumee River Basin. Several meetings and tours were held in Defiance County involving personnel from the Ohio Department of Natural Resources (ODNR), the Soil Conservation Service (SCS), Heidelberg College, The Ohio State University (OSU), Cooperative Extension Service (CES), and the U. S. Environmental Protection Agency (U.S.EPA).

Early in 1980, the Board of Supervisors submitted a proposal including a detailed plan of work and a budget to U. S. EPA. After some modification of the proposal, in August, 1980, the District was awarded a grant of $303,179 from U. S. EPA to be matched with $101,060 of local funds for a two-year Project. Realizing that the plan of work was designed for a Project of more than two years duration, and that a two-year Project would have no significant impact on the improvement of water quality, the District submitted a request for a budget and time revision to the original grant

late in 1980. In February 1981, the District was notified that the amount of the grant was increased by $342,875 and the termination date was extended to July 31, 1984. The non-federal monies were increased by $114,292. The total grant was then $646,054 to be matched by $215,352 of non-federal funds.

In early 1984, the Board of Supervisors realized that the work could continue through July 31, 1985, without additional funding from U. S. EPA. They, therefore, requested and received an extension of the Project to July 31, 1985, with no increase in funding.

AGENCY ROLES AND RESPONSIBILTIES

The agencies and groups most directly involved with the Project are the Defiance Soil and Water Conservation District, the Soil Conservation Service, Agricultural Stabilization and Conservation Service (ASCS), The Cooperaative Extension Service, The Ohio State University, and Heidelberg College.

The Defiance SWCD, being the grantee and one of the local agencies involved, was responsible for the overall administration and daily operation of the Project. To assist the District in these responsibilities, a Project Administrator, Robert Rettig, was employed starting in November 1980.

Working very closely with the District was the Soil Conservation Service. SCS personnel were instrumental in getting the Project initiated and in serving in an advisory capacity to the District. During the life of the Project, three individuals served as district conservationist and two persons served in the capacity of soil conservationist in Defiance County. They were responsible for the conservation planning and provided guidance in the location and engineering of the monitoring sites. They also assisted farmers with the use of equipment during the busy planting season. At harvest, SCS personnel also assisted in the collection of yield data.

The information and education arm of the Defiance SWCD in this Project was the CES. They were contracted to provide a person, Dennis Flanagan, to direct these activities. It was necessary that this person work closely with the District to attain maximum results from the education program. A contractual agreement was necessary due to the scope of the Project and the shortage of personnel and funds in the Cooperative Extension Service.

The Agricultural Stabilization and Conservation Service was involved by providing $32,000 of special cost-sharing

funds during the five years of the Project to accelerate the adoption of erosion control measures. Agricultural Conservation Program (ACP) payments were also made to cooperators qualifying for such payments when applying conservation practices to the land.

As mentioned earlier, The Ohio State University and Heidelberg College were involved with the monitoring of water quality. Both institutions were under contract to the District through grant funds to provide their services.

FUNDING MECHANISMS

With the Defiance SWCD being the grantee, all funding for the Project was administered by the District. All institutions under contract to the District, except the Cooperative Extension Service, were required to provide the 25 percent local matching monies as required of the District in the grant agreement with U. S. EPA. Matching monies for all other costs incurred in the Project came from in-kind services. In-kind services are services performed by individuals or local units of government as contributions to the attainment of Project goals at no direct cost to the Project. An example would be a cooperator planting a no-till demonstration plot with his own equipment.

Those agencies, under contract to the District, submitted a monthly or semi-annual statement of expenses incurred as well as documentation of the amount being cost-shared or matched by the agency. Statements were referred to the Board of Supervisors for approval before payments were made.

LAKE ERIE TILLAGE TASK FORCE

The Lake Erie Tillage Task Force was developed as a means of providing some continuity among the many conservation tillage demonstration projects initiated in the Maumee Basin. The meetings served to coordinate both agency heads and staff persons working on the projects and provided for the interchange of ideas in achieving the ultimate goal of improving water quality in Lake Erie.

Since the Defiance County Project was one of the earlier projects, the meetings provided a limited amount of direction. Some of the ideas presented could be incorporated into the Project, but in many cases, Project goals and objectives were previously established and were difficult to change without causing problems with cooperators already on board. Also, the relationships between the staff and cooperators were different for each county; therefore, making it difficult to adopt a universal set of guidelines for the entire Basin.

Adopting a common data sheet for each plot was an excellent means of obtaining a broad data base for the Project. Even though every item on the sheet did not apply to every plot, it gave a uniform means of reporting and comparing data.

Field days and tours were a major part of the information and education program. Approximately 90 people observed this no-till nitrogen application in action in 1983.

V. OPERATING PROCEDURES

The Project permitted some activities to continue that otherwise would have ended. Small watershed monitoring by Dr. Terry Logan, OSU, and the conservation tillage program administered by The Maumee Valley Resource Conservation Development and Planning Organization (MVRCD&PO) were both about to cease activities due to lack of funding. The awarding of the grant to Defiance SWCD permitted the continuation and the expansion of both of these programs.

The Project filled a void in the overall SWCD program and complemented other District activities. It came at a time when there was a demand in the county for conservation tillage equipment and demonstrations. Project personnel and recordkeeping were an addition to the ongoing District program and Project records were kept separate from other district activities.

PROJECT PERSONNEL

As part of the plan of work, a person was to be employed by the District to manage the Project. The person filling this position was to have responsibility for the administration of the Project including recordkeeping, coordinating the contracts with the various agencies, procurement and disposal of equipment, assisting with the information and education program as well as providing technical assistance to cooperating farmers.

Soon after the awarding of the grant to the SWCD, a vacancy announcement was prepared for the Project Administrator position. Copies of this announcement were distributed to The Ohio State University, College of Natural Resources, five neighboring SWCDs, Agricultural Technical Institute of OSU, Northwest Technical College, and the vocational instructors at each of the Defiance County high schools. A copy of the announcement is included as Appendix A to this report.

Several applicants responded to the announcement. One was interviewed by the Board of Supervisors and subsequently hired to fill the position. Robert Rettig, who had worked with the MVRCD&PO Project in Defiance and the surrounding counties, was selected.

From May 1 through mid-October in 1983 and 1984, intern students from Clark Technical College, Springfield, Ohio, were hired by the District to assist with the Project. These students were invaluable to the program since they were involved with nearly all the planting season and most of the

harvest. A pest scout was employed during the summers of 1982, 1983, and 1984 to identify potential insect, weed, and stand problems. In June of 1984, the person employed as an intern in 1983 was hired as a Project Technician. This person was employed to fill the vacancy which would occur at the end of July 1984 when the contract with the Cooperative Extension Service ended. At various times during the Project, other District staff assisted in various capacities on an "as needed" basis.

ACCOUNTING

The Project Administrator was responsible for managing the funding of the Project under guidelines established by the grant proposal and the Board of Supervisors. Monies for the Project were handled by the county auditor's office. A separate account was established. Funds received from the U. S. EPA were deposited into this account and expenses were paid by checks issued by the auditor. Vouchers were prepared by the District secretary and submitted to the auditor for bills approved for payment by the Board of Supervisors.

On a quarterly basis, the Project Administrator prepared a Standard Form 270, Request for Advance or Reimbursement, received approval of the Board of Supervisors, and submitted the form to U. S. EPA This form included total program outlays to date, estimated outlays for the next quarter, funds already requested, and funds requested for the next quarter. Monthly payments from U. S. EPA were based on the information on this form.

EQUIPMENT

At various times during the life of the Project, various pieces of equipment were purchased and sold. The procedure followed in the procurement of equipment was according to guidelines set by the State of Ohio. For any purchase or lease that was expected to exceed $2,000 in value, it was necessary to advertise for sealed bids. Two legal notices appeared in the local newspapers at least fifteen days apart prior to the opening of bids. Invitations to bid, specifications and bid sheets were sent to firms in the area who might be able to supply the needed equipment. At the date specified in the legal notice, the bids were publicly opened and read aloud by the chairman of the Board of Supervisors. In the purchase of equipment, generally the lowest bid submitted was awarded the sale. However, in some cases, proximity of the dealership to the Project area, specifications for the equipment, and farmers acceptance were considered. The successful bidder was notified in writing within fifteen days of the opening of the bids and usually was given six to eight weeks for delivery. When submitting a

bid, each bidder was required to accompany the bid with a certified check or bid bond in the amount of five percent of the bid so that a contract could be entered into and performance thereof secured.

The disposal of equipment followed the same basic procedure. Legal notices and classified ads were published in periodicals covering the tri-state area. Sealed bids were received and opened on the specified date and the item was sold to the highest bidder.

Leasing of equipment was done on a very limited basis. Early in the Project, several pieces of equipment were leased to determine how well adapted they would be to the demonstration Project and whether cooperating farmers would accept the equipment in their farm operation.

During two planting seasons, a planter and tractor were leased as a unit at a very reduced price. However, at other times when bids for leases were requested, it was usually more economical to own equipment rather than lease it.

PROJECT COOPERATOR GUIDELINES

Since 1980, with some changes, the basic guidelines requested of the cooperators were: to apply early for participation, demonstrate two or more tillage practices in the same field, keep accurate records, take yield checks, permit tours of fields, and permit publication of data and yields collected on fields in the Project. A cooperator who did not comply with the requirements risked being ineligible for future participation in the Project. A complete copy of the 1985 guidelines can be found in Appendix B.

At the start of the conservation tillage demonstrations, the requirements for a cooperator were liberal because it was unknown how much participation could be expected. It was a goal to attain maximum cooperation. However, problems were encountered such as using no-till equipment on conventionally-tilled soil, and it was necessary to become more specific in what was expected of a cooperator. In succeeding years, the District realized that much more could be accomplished with the demonstrations if cooperators were required to provide comparison tillage plots and cultural data. Another reason for making the guidelines more stringent was to avoid a few cooperators imposing upon the Project at the expense of other potential cooperators by using equipment on more acres than originally requested.

One requirement that was difficult to enforce, but was necessary for efficient management and improving the likelihood of success, was that of having cooperators apply

for participation in the Project prior to the planting season. Frequently, farmers attempted to use the Project as a last resort. If they could not accomplish their normal tillage practices, they would request the use of a no-till planter. Occasionally, these farmers were permitted the use of Project equipment if their fields met the qualifications for demonstration sites and the work load on the equipment and staff permitted additional plots. These late applications were discouraged as much as possible.

Site selection processes were also modified over the life of the Project. Initially, not enough emphasis was placed on the amount of residue left on the field at planting. Several fields had some fall tillage performed on them and were planted with no spring tillage. The justification was to get cooperators accustomed to doing no spring tillage, then gradually move them into situations with more protective cover on the fields. By the spring of 1983, the guidelines were modified to not allow any tillage on a field between the harvesting of the previous year's crop and the no-till planting of the demonstration plot.

A basic concept of the Project was that the information and education program could be much more effective if the farmer's conventional tillage was performed in a side-by-side comparison with conservation tillage and all data and yields recorded. This became a requirement of cooperators and established a basis for comparing conservation tillage crop production to the common conventional methods.

As some cooperators became comfortable with conservation tillage, they requested the use of no-till equipment on more acres than would be considered as a demonstration plot. This prompted the need to limit the acres on which each cooperator could use the equipment. Considering the available manpower and equipment, the supervisors elected to limit each cooperator to one day's use of the equipment. This usually meant the limit was thirty to forty acres, but the recommended plot size was five to twenty acres.

It also became necessary to establish geographical boundaries where the equipment was to be used. Those farming across county lines sometimes requested to use equipment in other counties. Even though it is a goal to get conservation tillage widely adopted, it was necessary to restrict useage to Defiance County to facilitate Project management.

A number of farmers requested the use of Project equipment to replant conventionally-planted fields where crop emergence was poor. This is a good justification for owning a no-till planter and was a means of getting more cooperators involved but proved to be unmanageable.

INFORMATION AND EDUCATION

The Defiance County Lost Creek Demonstration Project was designed with a strong information and education system in mind. The Cooperative Extension Service of The Ohio State University was given major responsibility for the educational aspects of the program through the Defiance County Extension Office. An assistant county extension agent was employed to handle this responsibility. Dennis Flanagan, a 1980 graduate of The Ohio State University with a B.S. in Agricultural Engineering, started work on November 17, 1980.

The County Extension Agent, SCS District Conservationist, SWCD Project Administrator, and the SWCD Board of Supervisors assisted the Assistant County Agent with the planning of educational activities. The Area Extension Agronomist also served as an important resource for information and assistance.

The program itself consisted of contacts on three levels: individual, small group, and mass media. Individuals were contacted within the county to explain the Project, plan demonstration plots, and discuss crop progress. Small groups of farmers and other interested persons learned of the Project and conservation tillage through meetings, tours, field days, workshops, and Project newsletters. The mass media was used to inform and educate people throughout the Maumee Basin about the Project and related topics. Newspaper articles were frequently used, as well as a limited number of television and radio programs. Brochures and annual reports were also printed to inform county residents and others of the Project.

REPORTING SYSTEM - DATA COLLECTION

Probably one of the more burdensome tasks of the Project was obtaining plot data from cooperators. For many of them, the data requested was more specific than was normally kept in their records. Forms were developed for their use, but during the rush of the planting season, they were often not completed. Repeated visits or phone calls by staff personnel were often necessary to get needed information. Occasionally, plots had to be deleted from the data base because of insufficient information.

Quarterly progress reports were prepared and submitted to Mr. Ralph Christensen, Project Officer, USEPA Region V, the Defiance County commissioners, and Mr. James Lake of the Conservation Tillage Information Center (CTIC). The purpose of this report was to give an account of Project activities during the preceding three-month period. Included in these narratives were such things as: number of cooperators participating for the year, planting accomplishments,

planting data, tours, field days, and promotional activities. Not only did these reports serve to inform the above-named people of progress in the Project, but they also forced the Project staff to keep abreast of the progress toward achieving Project objectives.

Annual reports were prepared in the form of a public report and included all activities occurring during the year with special emphasis on conservation tillage plot data. This collection of information proved to be very useful to the farmer contemplating conservation tillage.

Generally prepared and printed during the winter months for the preceding year, the annual report presented the findings of the water quality monitoring program each year. These summaries were submitted by Dr. Terry Logan, OSU; Dr. David Baker, Heidelberg College; and Howard Neibling, USDA-ARS, Purdue University. Requests from throughout the United States and the world were made for these reports, particularly the one on the rainfall simulator study. Also included in the annual report were summaries of the number of cooperators participating in the Project each year, total number of acres involved, and the equipment available from the District for farmers to use. Several of the reports presented economic comparisons of various tillage methods and also tips or guidelines for the person new to conservation tillage.

Although various staff people provided some input on parts of the annual report, the major responsibility was delegated to Dennis Flanagan, Assistant County Extension Agent. Each year 500 to 1,000 copies were printed locally by a commercial printer and distributed primarily to farmers in the Defiance area and to others upon request.

INCENTIVES AVAILABLE

To attract farmers to cooperate in the program, a number of incentives were provided by several agencies. The incentives varied depending on what was being demonstrated and where the plot was located in the county.

Most of the cooperators were eligible to receive cost-share payments from ASCS for conservation tillage practices. Provided they were willing to follow guidelines established by the Board of Supervisors, all cooperators were given the opportunity to use Project planters, drills, cultivators, and ridgers at no charge. It was preferred that the ridgers be used on lake plain soils only.

When a cooperator used District equipment, the equipment was delivered to his farm, hitched to his tractor if none was provided with the planter, and field adjusted. This usually

meant Project personnel also assisted in putting fertilizer and seed into the planter, followed it through the field for a time to determine if everything was functioning properly, and to check seed placement. During the last three years of the Project, a pest scouting service was available at no charge for those who participated in the program.

For those in the Upper Lost Creek Watershed, additional incentives were provided. An incentive payment was made to cooperators on a per acre basis for every acre under no-till production. Farmers were paid $40 per acre for row crops or drilled soybeans and $10 per acre for cover crops, wheat, or oats.

These payments were provided for several reasons. During the later years of the Project, it was very important to the monitoring program to have conservation tillage applied to a large percentage of the land in this watershed. Also, one frequently-asked question concerned what is needed to convince farmers to adopt conservation tillage. The incentive payment appeared to have minimal influence on the level of adoption and may not have been the answer to achieving large scale adoption of no-tillage.

Another incentive provided solely to the Upper Lost Creek Subwatershed cooperators was the free use of a disc-chisel plow and tractor. There was a stipulation that this implement be used only on fields where sufficient residue was present such as corn stalks or wheat stubble.

To administer the incentive payment program, the Board of Supervisors found it necessary to develop a set of guidelines which are located in Appendix C. These guidelines spelled out how the field size would be determined. In cases where fields were on the watershed boundary, payment would be made on the entire field if over 50 percent of the field was determined to be in the watershed. In accepting payment on a field, the farmer was required to provide protective cover after harvest of the crop. He agreed not to moldboard plow in the fall, but he could use the disc-chisel plow or similar implement on corn or wheat stubble. No fall tillage was permitted where soybeans were grown unless a cover crop was established following the tillage.

PROCEDURES FOR PROVIDING ASSISTANCE

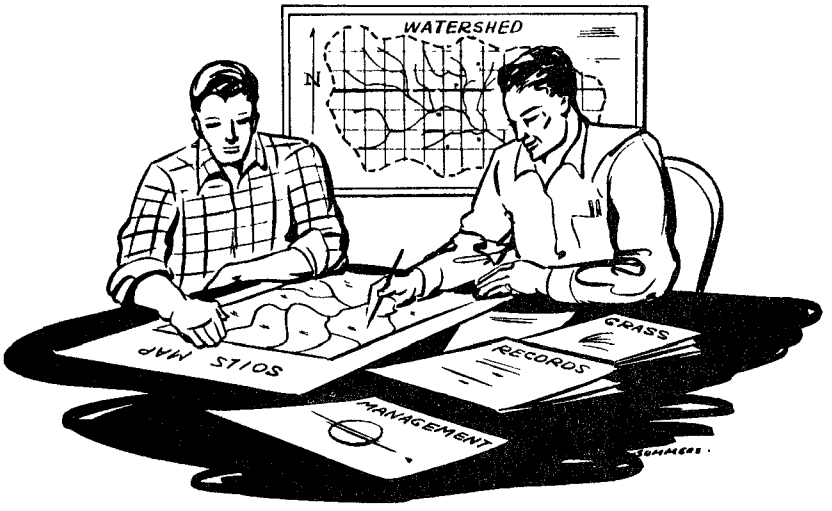
The level of assistance provided was dependent on the amount needed by the cooperator. When a potential cooperator expressed an interest in participating in the Project, he was first counseled on what he would be expected to do as a cooperator and what services the District would provide.

Planning for the demonstration plot usually began at the time of application. After obtaining information on the cooperator's normal crop rotation and farming practices, suggestions were made as to herbicide and fertility programs. A Resource Management System was planned whenever possible.

During late winter or early spring, an appointment was made with the cooperator to visit the plot. At this meeting, specific pesticide and fertilizer recommendations were usually made and Project procedures explained in more detail. At planting time, the cooperator was to contact the District office one or two days prior to the time he wanted to plant his crop to schedule a planter. Also at or just prior to planting, pest scouting began on the field and continued usually through July.

At harvest, the cooperator was to contact the District office and the staff would bring the weighing device to the plot and assist with yield checks. Informal planning of the next year's program often began at this point.

In the fall, those eligible and desiring to use the disc-chisel plow would contact the office to schedule the equipment. At the scheduled time, the tractor and disc-chisel plow were delivered to the farm, instructions given on operation, and assistance provided in field adjustments.



VI. PROJECT ACCOMPLISHMENTS

NUMBER OF PARTICIPANTS

The most rapid growth in the number of cooperators and the number of acres involved in the demonstration occurred between the first and second year (See Table 9). While the first year started out at a slow pace due to the "newness" of the Project, rapid growth was experienced during the second year. The number of cooperators and demonstration plots increased threefold during the second year of the Project and the number of acres increased by two and one-half times.

In 1983, the third year of the Project, the number of cooperators remained about the same, but the number of plots and acres in the Project increased by 36 percent and 16 percent respectively. By this time, several of the original cooperators had purchased and were using their own no-till planters. Although the total number of cooperators was the same for 1982 and 1983, 26 or 44 percent of the total were new participants in 1983.

Again in 1984, the total number of cooperators remained about the same as in 1982 and 1983 with approximately 25 percent of them being new cooperators. The no-till acreage planted with District equipment also remained about the same.

Over the four years, 95 farm operations or cooperators participated in the Project. If a father and son used the same line of equipment, even though they had separate farms or fields, they were considered to be one operation or one cooperator. Of the 95 cooperators, 41 participated one year, 25 participated two years, 19 participated three years, and 10 were involved all four years of the Project. Twenty-four (or 25 percent) of the 95 cooperators have either purchased no-till planters or grain drills or modified their equipment to plant no-till.

TABLE 9

SUMMARY OF OVERALL PROJECT PARTICIPATION

Crop Year	# of Coop.	# of New Coop.	% New Coop.	Acres Planted with Dist. Equip.	Total Acres
1981	20	20	100	681	851
1982	53	35	66	1,702	2,083
1983	58	26	44	1,545	2,495
1984	56	14	25	1,540	1,990
Total	187	95		5,468	7,419

UPPER LOST CREEK SUBWATERSHED

With regard to participation in the Upper Lost Creek Subwatershed, it must be remembered that early in the monitoring program it was an objective to keep the adoption of conservation tillage at relatively low levels to obtain base data for water quality. Therefore, conservation practices were not enthusiastically promoted until 1983. Starting in 1982, an annual inventory of land use was begun. Before 1982, it would be safe to say that no-tillage crop production was not practiced in the watershed. However, several farmers were using a very limited amount of reduced tillage.

Of the 2,350 acres in the Lost Creek area, about 2,100 acres are in agricultural production. From the beginning of the Project through 1984, the percentage of cropland in the watershed with 30 percent or more residue after planting grew from zero to 64 percent, as shown in Table 10.

LAKE PLAIN SOILS

On the fine textured lake plain soils, one of the unique and innovative practices demonstrated was the installation of shallow closely-spaced tile drainage systems. Systems were installed at two sites during 1983. The theory behind this practice is that water quality should be improved by filtering more water through the soil to the tile rather than removing it via surface runoff. Also, the rate of success with conservation tillage systems should be increased by improving the drainage on these soils.

Three-inch diameter tile were installed with a field tile drainage plow with only 16 to 20 inches of soil covering them. A one-third section of the field had the lateral tile spaced at 30 feet and another one-third section had them spaced at 15 feet. The remaining one-third of the twelve-acre fields had no tile installed. The widths of spacing will be evaluated and studied in the future as to which spacing, if any, is most cost-effective. No-tillage, ridge, and conventional systems are being studied on the sites. The conventional system will vary from year to year as the farmer is asked to use whatever system he would normally use on that particular field. It may be moldboard plowed, disc-chisel plowed, offset disced, or tandem disced. Figure 3 shows a sample layout of the fields.

Having monitored the crop yields on these plots for only one year, no conclusions can be drawn. However, there was a marked difference in the yields in 1984 with the closely-spaced tiled sections producing the highest yield. There is a belief among local farmers that tile drainage on the fine

TABLE 10

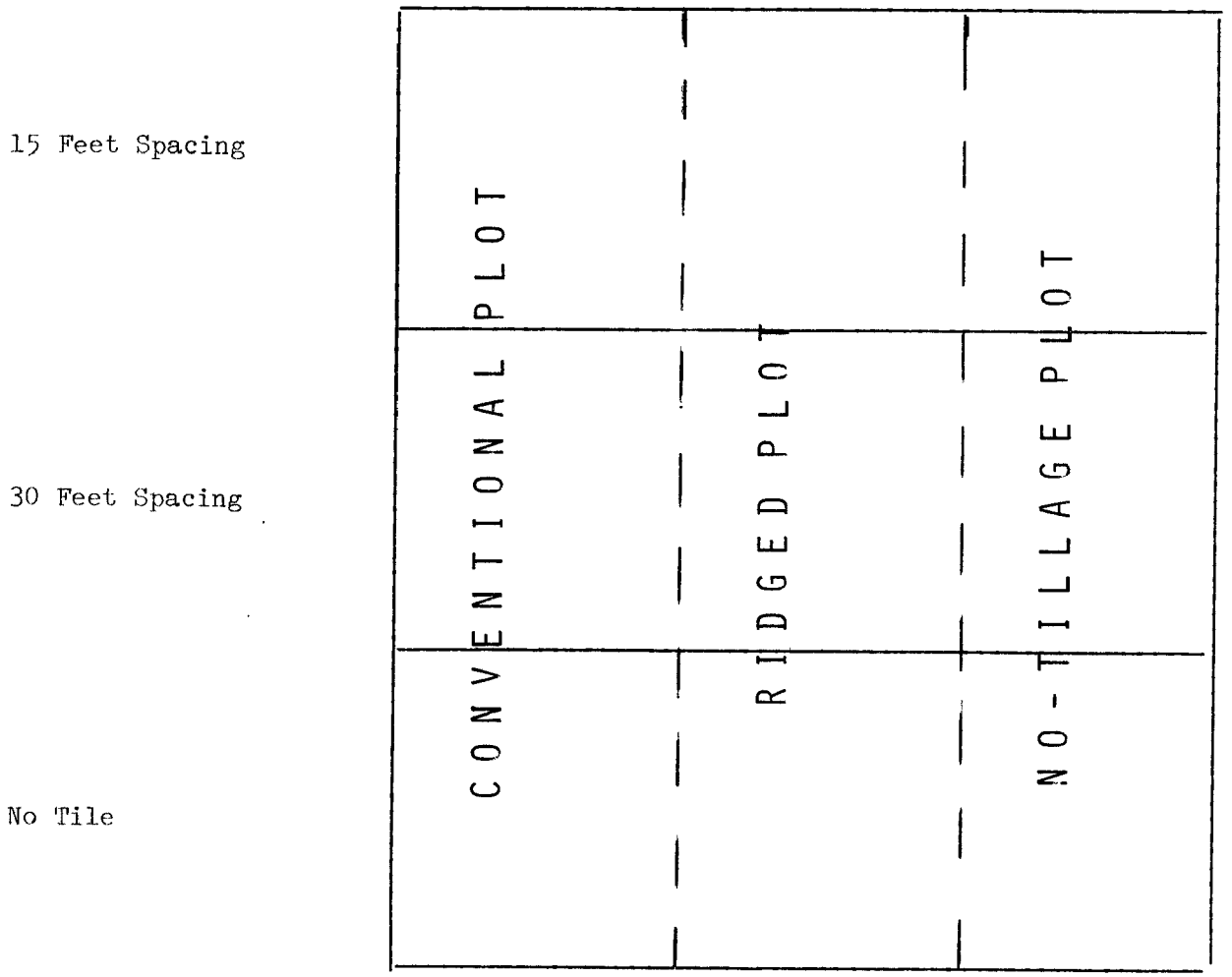
UPPER LOST CREEK WATERSHED PARTICIPATION

(2,100 Tillable Acres)

Crop Year	# of Cooperators	Acres No-till Corn	Acres No-till Beans	Acres No-till Wheat	Acres Reduced Tillage	Total Acres Reduced Tillage	Acres Protected By Cover Crop	Acres Protected Acres
1981	1	20	-	-	-	20	-	-
1982	3	59	-	-	17	76	215	291
1983	16	164	189	76	71	500	711	1,211
1984	14	306	99	22	316	743	596	1,339

FIGURE 3

SHALLOW TILE FIELD PLAN



clay soils loses effectiveness over a period of time. It will be interesting to note whether or not this occurs over the period of time these plots are studied.

NO-TILL CROP YIELDS

Averages of crop yields from the plots with comparisons are exhibited in Tables 11 through 15. Conclusions that can be drawn from these tables are as follows:

Soybeans

1) Soybeans grown after corn produce higher yields than after most other crops.

2) No-till soybeans yield slightly less (1 to 2 bushels per acre) than soybeans grown under conventional tillage methods except when planted in growing wheat.

3) Soil type has little influence on the success of no-tillage versus conventional tillage. There was no substantial decrease in no-till yields versus conventional on the poorly drained soils.

Corn

1) No-till corn grown after soybeans gives the best advantage to no-tillage corn production.

2) Heavy residue situations tend to decrease no-till yields.

3) Even though corn yields tend to decrease as drainage becomes poorer, corn production can be maintained or improved slightly with no-till as compared to conventional tillage methods.

Most of these tables indicate that conservation tillage crop production can be economically competitive with traditional production practices in Defiance County. One system not exhibited on the tables is continuous no-till corn since very little continuous corn is grown in Defiance County. Very few continuous no-till corn plots were involved in the Project.

RIDGE TILLAGE ACCOMPLISHMENT

Ridge-till or no-till on ridge systems are also not addressed in these tables or graphs because not enough data was collected to develop meaningful averages. Annual reports, particularly for 1983 and 1984, present the ridge plot data for those seasons. A major problem experienced by the Project was persuading farmers to maintain the ridges for

TABLE 11

THREE-YEAR SOYBEAN YIELD AVERAGES
BY VARIOUS RESIDUES
(BU/AC)

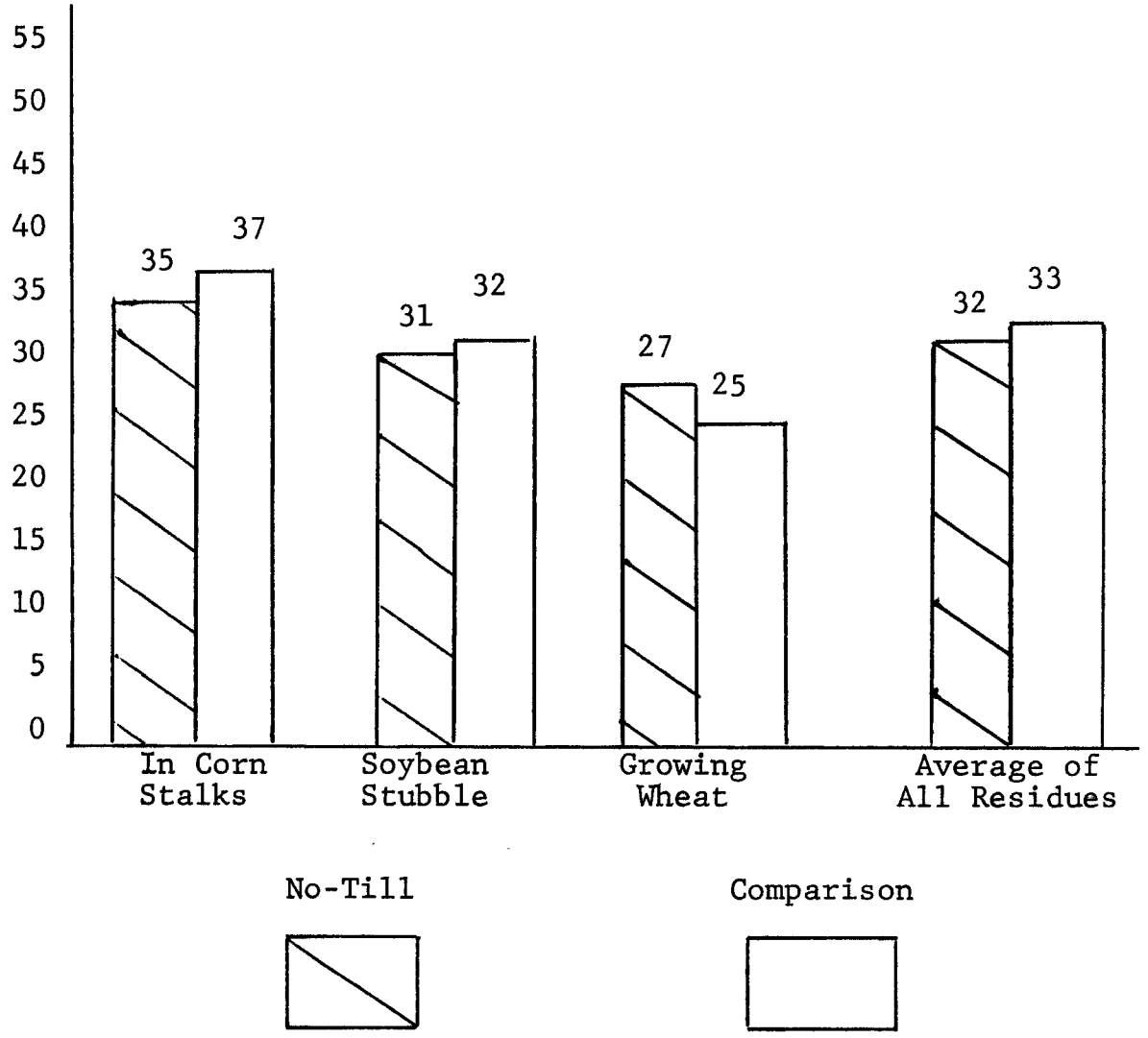
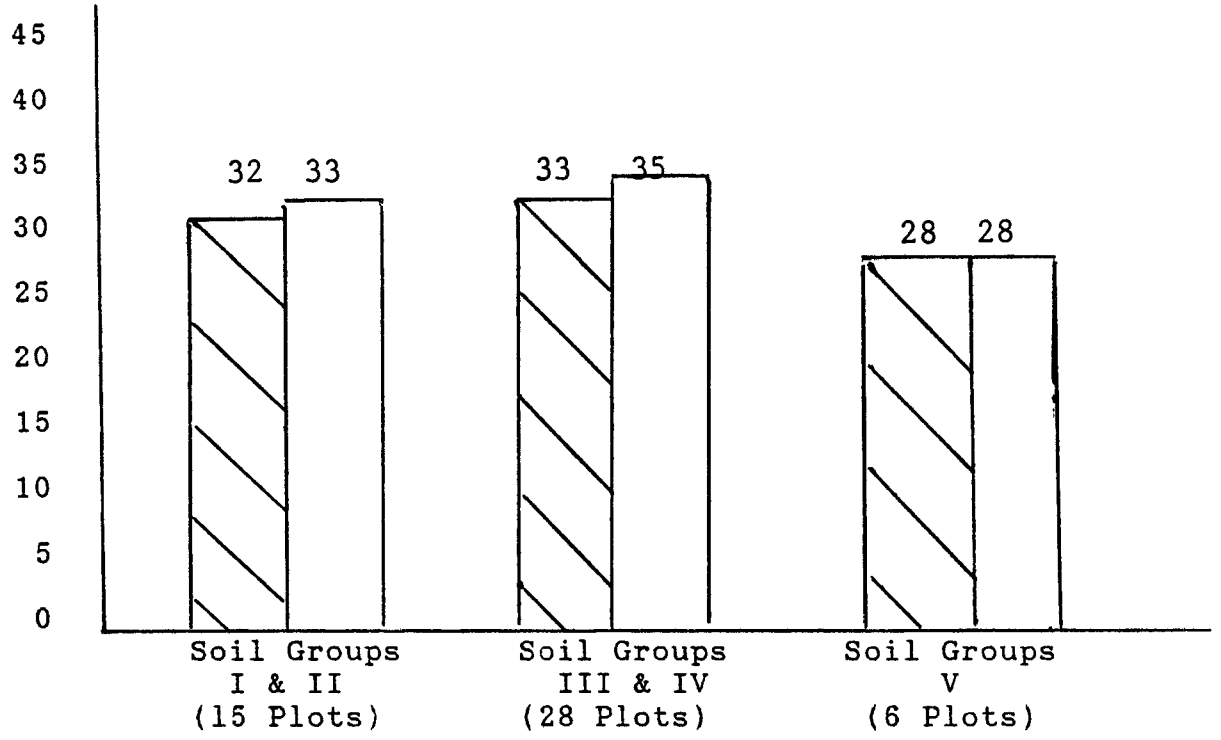


TABLE 12

THREE-YEAR SOYBEAN YIELD AVERAGES BY SOIL GROUP
(BU/AC)



Group I - Well drained soils (Glynwood, Ottokee, Seward)

Group II - Poorly drained but responds well to sub-surface drainage. Response to tillage similar to well-drained soils when tiled (Blount, Colwood, Haskins, Kibbie, Mermill, Millgrove, Nappanee, Rimer, Tedrow, Wauseon).

Group III - Poorly drained soils (Fulton)

Group IV - Very poorly drained soils. Response to tillage similar to well drained soils when tiled (Hoytville, Latty, Lenawee, Pewamo, Toledo)

Group V - Poorly and very poorly drained soils, limited response to sub-surface drainage (Paulding and Roselms)

TABLE 13
3-YEAR CORN AVERAGE
YIELD BY VARIOUS
RESIDUES
(BU/AC)

TABLE 14
4-YEAR CORN AVERAGE
YIELD OF ALL
RESIDUE TYPES
(BU/AC)

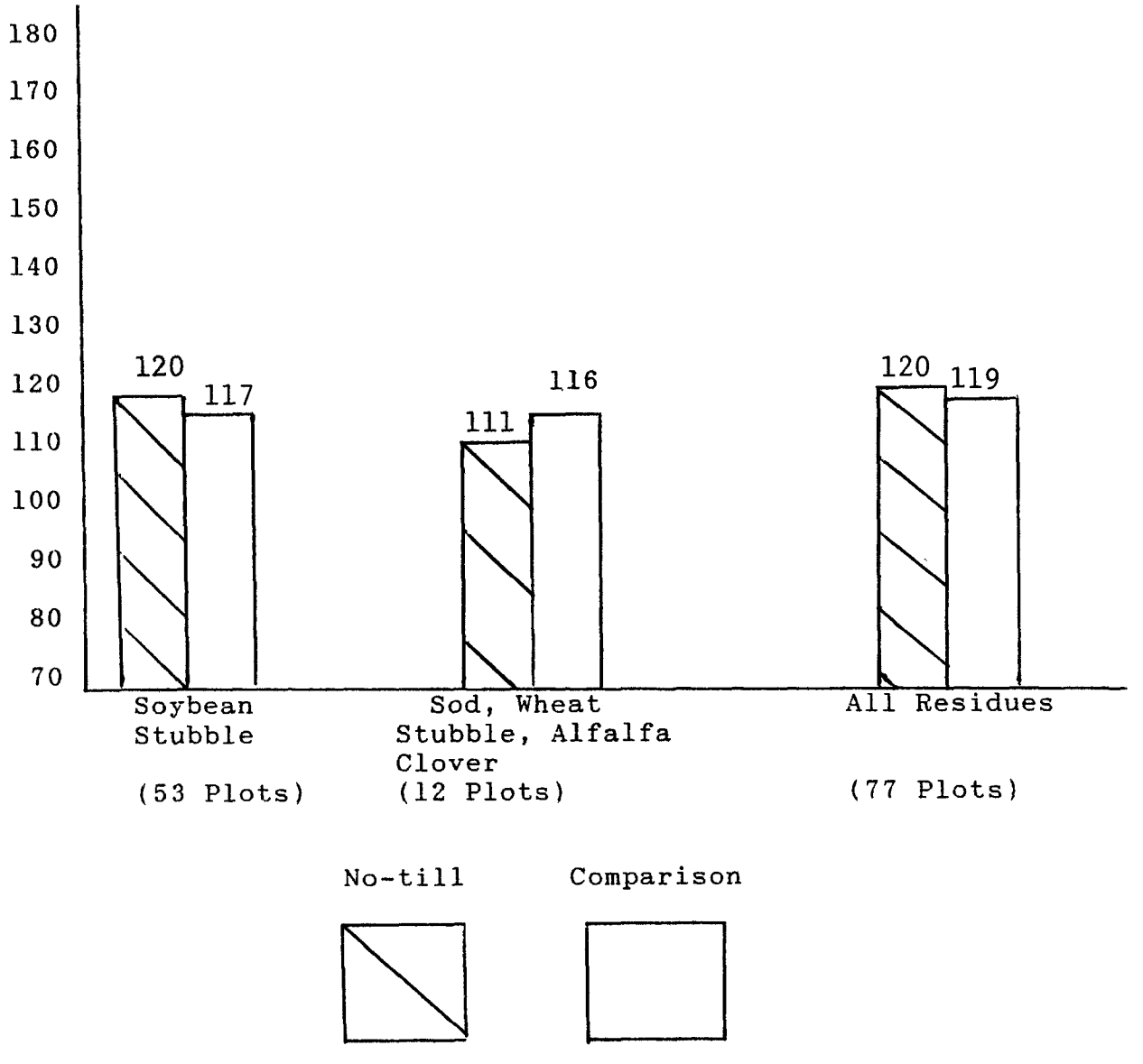
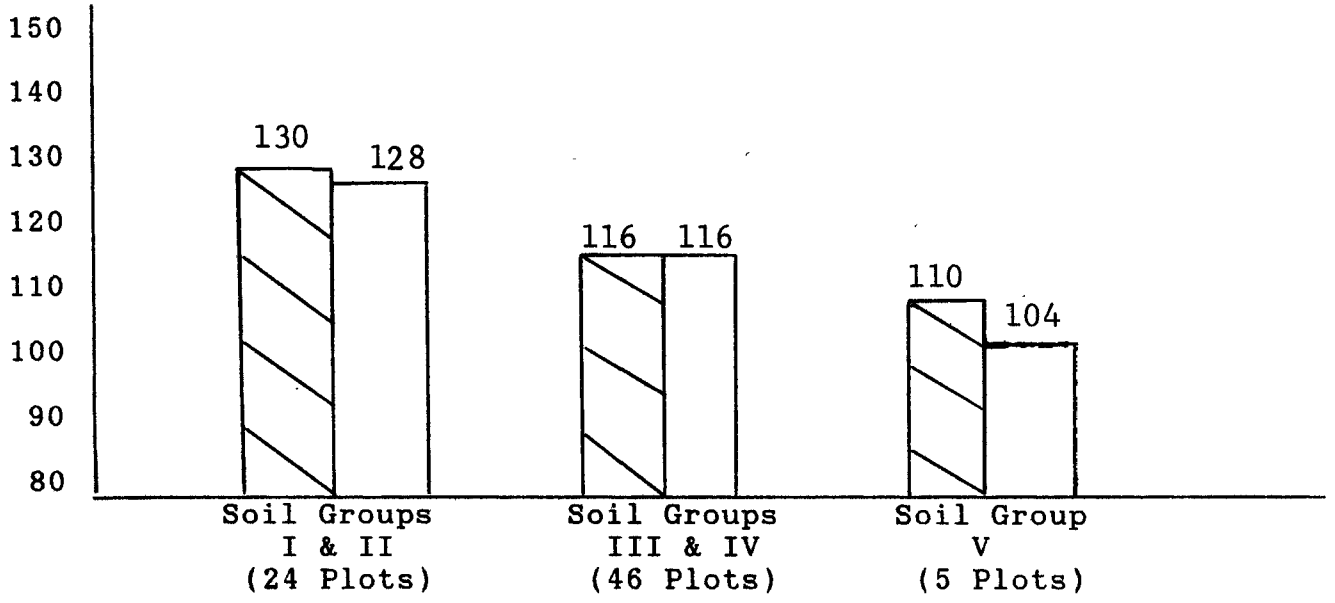


TABLE 15

3-YEAR CORN YIELD AVERAGES BY SOIL GROUP
(BU/AC)



Group I - Well drained soils (Glynwood, Ottokee, Seward)

Group II - Poorly drained but responds well to sub-surface drainage. Response to tillage similar to well drained soils when tiled. (Blount, Colwood, Haskins, Kibbie, Mermill, Millgrove, Nappanee, Rimer, Tedrow, Wauseon)

Group III - Poorly drained soils (Fulton)

Group IV - Very poorly drained soils. Response to tillage similar to well drained soils when tiled (Hoytville, Latty, Lenawee, Pewamo, Toledo)

Group V - Poorly and very poorly drained soils limited response to sub-surface drainage (Paulding and Roselms)

No-till Conventional

more than one year. Thus, two major benefits of the ridge system, increasing organic matter in the ridge and effective crop residue cover were lost. Wheat and clover are a part of most of these farmers' crop rotations and the success and management of these crops on ridges have not been evaluated.

At first glance, ridge-tillage appears to be the salvation to farming the lake plain soils. Not only does it propose to improve yields by providing a more ideal seedbed and environment for plant growth, it provides crop residue cover to reduce erosion, thus solving two major problems of farming lake plain soils.

After being readily adopted early in the Project, the adoption rate by new cooperators fell to zero in 1985.

Further data needs to be obtained before substantial conclusions are reached in this area. However, based on the knowledge gained from working with the system for several years, the following reasons are offered as to why acceptance and reliability are limited:

1) Reduction of soybean yields compared to narrow row (7 inches) soybeans[1].

2) Need for extensive change or addition to existing equipment.

3) Comparable results can be attained with no-till at a lower cost for equipment modifications.

4) The farmer is financially unable to give the system the necessary three to five years to improve yields.

5) Managerial ability appears to be beyond the scope of a majority of the Lake Plain farmers.

Row width of soybeans has presented problems with the ridge systems on the lake plain soils. In conventional systems, the trend is toward narrow-row soybeans, i.e. 7 to 8-inch row widths. On fine textured clay soils, growth of the soybean plant is usually limited (12-18 inches high); therefore, to obtain maximum utilization of sunlight, it is advantageous to grow soybeans in narrow rows. Ridge-till systems are generally in 30-inch or wider row widths and do not lend themselves to narrower rows. To date, Defiance County data does not reflect enough advantage to the ridge system on high clay content soils to compensate for the yield reduction due to row width for soybeans.

[1]See Ohio 1983-84 Agronomy Guide, pg. 49

INFORMATION & EDUCATION

Meetings have been a very important part of the educational program, with many different types being conducted. One very successful event has been the "Alternative Tillage Systems Meeting" in March of each year starting in 1982. The past year's Project results were presented at this meeting, as well as discussions on conservation tillage, pesticides, fertility, and monitoring. Attendance was normally around 70 people, except in 1984 when a blizzard significantly reduced attendance.

Each winter presentations on the Project and its results have been made to groups attending meetings. These have included the Defiance County Agronomy Day participants, Fairview Young Farmers, Ayersville Young Farmers, various service clubs such as Kiwanis and Child Conservation League, and no-till meeting participants in Henry, Fulton, and Williams Counties.

Special events have also been held for special audiences. Project cooperators have met with Project staff and the SWCD Board of Supervisors to discuss equipment, services, and educational programs. Several meetings have been conducted for farmers in the Lost Creek Watershed to explain the Project and assistance available.

Tours can be an excellent opportunity to show people exactly what conservation tillage looks like, as well as viewing some unique locations such as monitoring sites or water quality laboratories. Each June since the Project began, demonstration tillage plots have been toured throughout the county. Average attendance for each tour has been about 20 people.

Field days have been held each year in early September, and some fields have been toured at these events. Equipment is also displayed and demonstrated at annual field days. In 1982, 10 pieces of ridging and no-till equipment were demonstrated to about 150 people. In 1983, proper no-till spraying techniques, ridging, and no-till anhydrous ammonia application were seen by 90 in attendance. Publicity and sponsoring of a meal by local agribusiness have helped make these events successful.

Tours from other counties into Defiance and from Defiance to other areas have also helped to expand knowledge beyond Project boundaries. Numerous groups from around the world including people from the Netherlands and South Africa, Canadian Conservation Authority, farmers and students from University of Guelph, Ontario, and Ohio have visited Defiance County. Also, in July 1984, a group of about 20 Defiance farmers, SWCD supervisors, and Project staff visited

Heidelberg College's Water Quality Lab and farmers in the Honey Creek Project area. In August, a group consisting of Defiance SWCD staff and supervisors and Defiance County farmers visited the Essex Region Conservation Authority in Canada. Several conservation projects were viewed and conservation tillage fields were toured.

Training was conducted mostly through individual contacts as well as through some meetings. Project cooperators were trained in what pesticides and fertilizer to use on their no-till crops through pre-planting visits with Project staff. These cooperators were also trained in proper equipment operation when no-till or ridging equipment is delivered to the field. Project staff and the farmer set up the planter or ridger and then the farmer was instructed on proper planting depth and adjustment, planting speed, etc. The farmer then planted the demonstration plot on his own.

Training on the small group level was also incorporated into many of the meetings when topics such as variety selection, pest identification and control, and fertility programs were covered. Farmers attending Pesticide Recertification Training sessions taught by the Assistant County Agent were also instructed on special techniques and problems that they need to be aware of in conservation tillage.

Newsletters have been an important method of communication with those interested in the Demonstration project. Through June of 1982, existing Extension, SWCD, and ASCS newsletters were used to reach county farmers, but in July of 1982, a Defiance County-Lost Creek Demonstration Project newsletter was initiated. A mailing list was compiled from people who had attended tours and meetings, Project cooperators, and those who owned or farmed land in the Lost Creek Watershed. Currently, about 300 names are on the list.

Project newsletters covered current topics of importance such as plot signup, equipment availability, pest problems, and upcoming tours, and meetings. The newsletter was normally prepared and distributed on a monthly basis.

Many other informational and educational activities were carried out to reach as many people as possible. A good working relationship with the farm editor of the local newspaper allowed excellent coverage of tours and meetings as well as publication of articles and news photos.

The Assistant County Agent worked into the television schedule with other Extension agents and appeared on WTVG-TV

Channel 13, Toledo, Ohio, periodically on noon news broadcasts. Through television, a large number of people could learn of the Project and related topics.

Early in the Project, several radio presentations were made on WONW, Defiance, Ohio; WBNO, Bryan, Ohio; and WOWO, Ft. Wayne, Indiana, to explain the purpose of the program. The radio media was also used to announce meetings and tours.

Two brochures were printed and distributed to all county farmers through the ASCS and SWCD newsletter mailings. These small fact sheets described the Project, its purpose, and assistance available. Brochures were printed in early 1981 and mid-1983, and sent to 2,600 people on the ASCS mailing list and 1,400 on the SWCD list. They were also distributed at meetings and the fair booth.

The SWCD booth at the Defiance County Fair was another opportunity to inform more people about the Project. Each year at least a portion of the booth had pictures and materials on the Demonstration Project. In 1983, the entire booth's theme was the Lost Creek Demonstration Project with an extensive photo series of Project activities. Reports and brochures were also available, and the Assistant County Agent produced a slide-tape show that was on exhibit for several days during the fair. The Hiniker ridging cultivator and the grain-weighing device were on display at the fair in 1983, and in 1984 and 1985, the no-till drill was displayed.

A very important information/education activity was the publishing of an annual Demonstration Report that detailed each tillage demonstration performed in the Project. Data shown included tillage operations performed, herbicide and insecticide useage, seed varieties, and yields. Overall average yields and average yields based on soil type and residue type were also included. Sections of each report also deal with no-till management, nitrogen and phoshporus management and water quality monitoring. Many reports were distributed to interested farmers and others.

In March 1984, two no-till surveys were sent out, one to county farmers and one to area farm equipment dealers. The purpose of these surveys was to get some idea of the trend of area farmers toward using more reduced tillage. Response by the equipment dealers showed much higher sales of no-till planters in the past four years. Response by county farmers was low, but most of those who responded either were using conservation tillage or were interested in doing so.

SEDIMENT LOADING

Ground cover and residue management are effective means of erosion control. The more cover you have on the soil

surface to intercept the rainfall, the lower the erosion rates.

Cover management can be accomplished through rotations that include small grains and hay, no tillage crop production and minimum tillage using such tools as the chisel plow and field cultivators.

The typical conventional method of tillage in the county is the use of the moldboard plow after harvest. This method inverts the crop residue and exposes soil to the impacts of rainfall and runoff. As a result, little or no residue remains on the surface during the critical erosion periods. A typical rotation of corn, soybeans, and wheat where the primary tillage is fall moldboard plowing results in erosion rates of an average of two tons per acre per year. This is on soils with slopes of less than two percent, typical of the eastern three-quarters of the county. On soils with slopes of two to six percent found in the northwestern portion of the county, this results in soil loss rates in the three to 10-ton range. These losses are based on the Universal Soil Loss Equation (USLE), which computes average soil movement from a given area in tons per acre per year. The primary factors involved in the equation are rainfall, soil type, length and steepness of slope, and the tillage type used and crop rotation. It does not predict the amount of soil transported to the receiving stream corridor. The soil particles that reach the streams, however, are major contributing factors to water quality degradation. Their effect on water quality is mainly the result of the composition of attached materials.

Based on USLE calculation, the use of cover and residue management in the study area has reduced soil movement by an average of one-third, with a range of 28 to 50 percent.

The higher the clay content in the soil profile, generally the more chemically active and readily transportable the soil particle is. In Defiance County, over 90 percent of the soils have a clay content greater than 40 percent. Once detached, the clay particles remain in suspension for considerable distances, up to 100 miles or more. Thus, for example, the erosion of one ton of soil with a high clay content may present a more serious threat to water quality than a five ton loss from a soil that is higher in sand and silt content. The sands and silts require a higher water velocity to move them through the stream corridor and have smaller amounts of nutrients attached to them.

More complete data relating to this section is discussed in the reports from Dr. Terry Logan of OSU and Dr. David Baker of Heidelberg College mentioned previously in this report.

The trapezoidal flume was determined to be most ideal for measuring stream flow from the Upper Lost Creek Subwatershed. The rate of flow is constantly being recorded and water samples are drawn every six hours except at high flow when they are collected hourly.

VII. CONCLUSIONS

How has the Defiance County-Lost Creek Demonstration Project affected the adoption of conservation tillage in the county? There is no way to accurately determine what the situation would be today if the Project had not been in place, but the level of implementation would be substantially less than the current situation. There are no accurate figures on the amount of conservation tillage that occurred five years ago as the definition of conservation tillage has changed since that time. However, an estimate that conservation tillage has grown from less than 1,000 acres to a current level of 27,000 acres seems realistic. When a person drives about the county during May and June, it is surprising to see the large number of farmers applying conservation tillage to their land. The county is by no means at an acceptable level of adoption, but many farmers, independent of the District office, are using no-tillage on some of their acreage. More frequently than before, farmers come into the District office requesting assistance or information regarding a conservation tillage practice they have been using or seeking advice concerning a new practice they would like to add to their conservation tillage program.

Since the beginning of the Project, various changes have taken place with the several agencies involved. It is difficult to state whether these changes were a result of the Project or the result of the national trend toward conservation tillage. These changes may not have been something concrete or tangible, but more or less a change in attitude or program direction.

One impact of the Project was on the Defiance Soil & Water District itself. Although one of the objectives of the District in the past was to promote soil conservation practices, many of the practices were drainage oriented. Although drainage is still an integral part of the program, the protection of the soil and water resources has gained more attention. More emphasis is being placed on erosion control when drainage practices are installed. For example, where a structure or waterway might be installed to improve drainage or to prevent a gully, the cooperating farmer is also encouraged to adopt other measures that will keep the soil in place and reduce the amount of sediment entering the streams and lakes.

Although progress reporting in ASCS and SCS is now geared toward the amount of soil saved by the installation of conservation practices, both agencies are beginning to recognize the improvement of water quality as an objective in their programs. In Ohio, the SCS is providing training in water quality for both District and SCS personnel. SCS is

also emphasizing the development of complete Resource Management Systems for cooperators.

Probably the best example of intragency cooperation was bringing the rainfall simulator to Defiance County. The SWCD, SCS, CES, USDA-ARS, and OSU were all involved in this venture and each of them performed the task required of them with no problem. It has been this kind of cooperation that has brought both national and international attention to the efforts employed to improve water quality in Northwestern Ohio.

During recent years, approximately 2,000 to 2,500 acres and 50 to 55 cooperators have been involved in the Project annually. This was about the maximum number that could be handled effectively with the size of staff and number of planters available and maintain accuracy. Even at the level of 2,000 to 2,500 acres per year, it was sometimes questioned whether the Project had become an implementation program rather than a demonstration project. This was especially true when several cooperators desired the use of equipment on a major portion of their acreage.

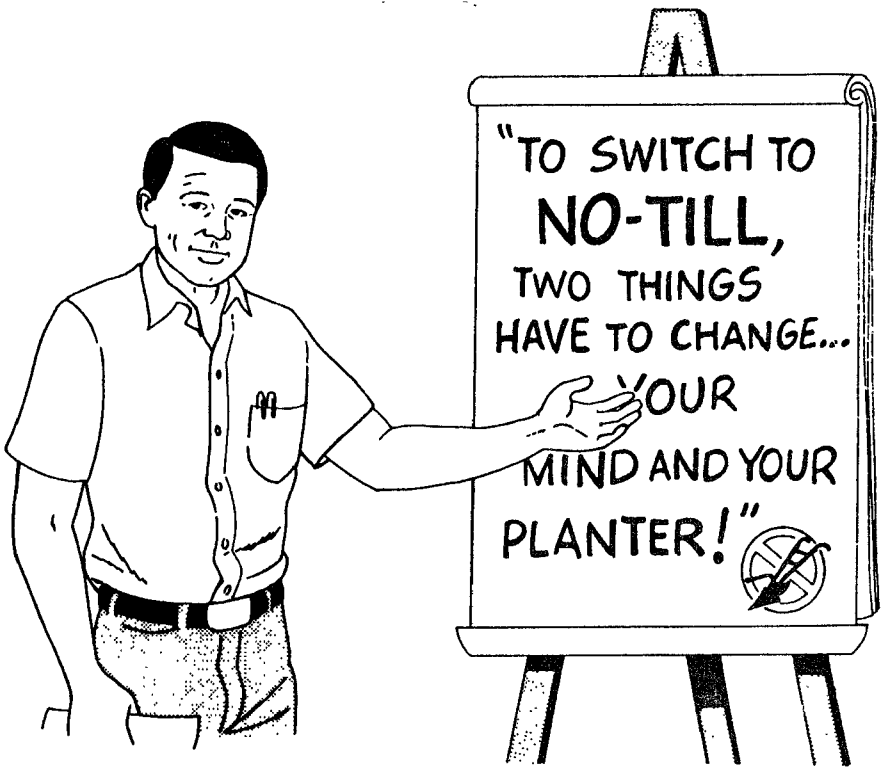
Early in the Project, equipment dealers were very reluctant to become involved with the conservation tillage effort. However, with the slow farm economy, sales of large equipment have declined and dealers began to realize that the conservation tillage effort may help to promote the sale of no-till planters. Even though the financial conditions of many of the farm equipment dealers is not the best, they are now more willing to lend support to conservation tillage both in terms of providing equipment and in assisting with field days and educational meetings.

One of the characteristics of the northwestern Ohio farming community brought out by the Demonstration Project was that farmers as a group are somewhat conservative and reluctant to make drastic changes in tillage practices. They are slow to change and perhaps rightfully so when one considers they are being requested to change from a traditionally proven system to one that is relatively new and unproven over the long term. Farmers are inquisitive and willing to try new things, but in general, they will use a system with which they are comfortable and feel less threatened by risk. Over a period of time, as they gain confidence with no-tillage crop production, it will be adopted by them on a larger scale.

Through the Project, many farmers have become aware that conservation tillage will have a place in their farming operation. Under proper management, most farmers can incorporate conservation tillage into their farming operations and still maintain economically productive levels.

Management is the key to successful conservation tillage. Yield checks on the conservation tillage plots affirmed some common beliefs while disproving others. For example, no-till corn can be grown most successfully after low residue crops, particularly soybeans, and this holds true on the very poorly-drained as well as the well-drained soils. Soybeans grown after corn, whether no-tilled or conventionally-tilled, are likely to produce higher yields than when grown after other crops. As with corn, yields of no-till soybeans on the poorly-drained soils were similar to conventionally grown soybeans.

In terms of economics, the immediate profits for no-till and conventional tillage systems are similar in Defiance County. On most farms, there is little difference in yield and the costs of production remain approximately the same. There is less fuel consumed using no-till but this is generally offset by the need to use a contact herbicide to control existing vegetation. Even though many are using conservation tillage, they have not accepted it to the point where they will reduce their capital investment by decreasing the size or amount of equipment, thereby decreasing their costs of production. One area where the farmer will realize an advantage is timeliness of planting which could be reflected in improved yields or the ability to farm more land with the same line of equipment.



VIII. RECOMMENDATIONS

As previously mentioned, farmers are adopting conservation tillage, but will the period of time it takes them to convert be longer than the water quality goals set by Congress and administered by USEPA? Perhaps now is the time to initiate a study to determine the agricultural community's attitude toward conservation tillage and the water quality problem. Farmers in Defiance County have had access to equipment and technical assistance for five planting seasons with a good number of farmers participating in the demonstration project. Yet, it appears that the overall adoption of the conservation tillage in the county is relatively low. Why haven't more farmers changed tillage methods? Are they in the process of changing now? What would it take to make them change? Answers to these questions and others need to be known before good recommendations on future programs can be made.

For the present, local units of government need to be made aware of the importance of the conservation tillage effort and that sometime in the future more responsibility may be given them to improve water quality from nonpoint sources.

AGENCY PROGRAMS

With respect to the roles agencies should play in the future, soil and water conservation districts should continue working with cooperators as in the past, but need to emphasize that their role is not that of a "planter jockey" but the role of a conservationist. Their overall purpose in helping cooperators get started with conservation tillage systems should be clearly defined.

The educational program needs to be strengthened. As was stated earlier, the Cooperative Extension Service has been cooperating, but conservation is just a part of their overall program responsibilities. More emphasis needs to be placed on local media coverage of tillage activities in the county either by CES or the District. The educational program is being assisted by farm periodicals which emphasize conservation tillage through articles and commercial advertisements.

In the past, ASCS has provided cost-share payments to farmers implementing conservation tillage on their farms. While this was an encouragement for farmers to use the practice, in many cases, it had little long-term effect. If this incentive is to be used in the future, it needs some stipulation tied in to assure some long-term effect. This

stipulation could involve requiring a specific crop rotation or requiring the funds be used toward the purchase of conservation tillage equipment.

FUTURE PROGRAMS

As for the future of the Demonstration Project, the District intends to continue to operate Project equipment, probably at a reduced level during the next several years. Several sources of funding are being investigated with county and/or state government being requested to supply funding for personnel to conduct the conservation tillage aspect of the Project. SCS has made a commitment to Heidelberg College to assist in the continued monitoring of the Upper Lost Creek Watershed. This continued study will involve a closer examination of impacts from the pesticides being applied in this watershed.

REFERENCES

(1) Agronomy Guide 1983-84, Bulletin 472, Cooperative Extension Service, The Ohio State University, February 1983

(2) Ohio Agricultural Statistics 1983, U.S. Department of Agricultural, Statistical Reporting Service, August 1984.

(3) Ohio Farm Income 1983, U.S. Department of Agriculture, Statiscal Reporting Service, November 1984.

(4) Soil Survey of Defiance County, Ohio, U.S. Department of Agriculture, Soil Conservation Service, U.S. Government Printing Office, Washington, D.C., July 1984.

(5) Logan, T. J., Continued Watershed Monitoring and Rainulator Study, Volume IV, The Ohio State Unniversity 1985

(6) Neibling, W. H., O. R. Stein, T. J. Logan, and W. C. Moldenhauer. Soil Loss from New and No-Till Ridges on Low Gradient, Paulding Clay. National Soil Erosion Laboratory, USDA-ARS in Cooperation with Purdue Agricultural Experiument Station West Lafayette, Indiana, 1985

(7) Defiance County-Lost Creek Demonstration Project 1981 Demonstration Report, Defiance Soil and Water Conservation District, February 1982.

(8) Defiance County-Lost Creek Demonstration Project 1982 Demonstration Report, Defiance Soil and Water Conservation District, February 1983.

(9) Defiance County-Lost Creek Demonstration Project 1983 Demonstration Report, Defiance Soil and Water Conservation District, February 1984.

(10) Baker, Dr. David B., Nutrient, Sediment and Pesticide Runoff from the Lost Creek Watershed, Defiance County, Ohio. Water Quality Laboratory, Heidelberg College, Tiffin, Ohio, June 1986.

APPENDIX A

VACANCY ANNOUNCEMENT

DEFIANCE SOIL AND WATER CONSERVATION DISTRICT

Defiance Soil and Water Conservation Distric

R R. 2, BOX 11, 66 NORTH DEFIANCE, OHIO 43512 PHONE 782-8751

VACANCY ANNOUNCEMENT

Position Title
Administrative Technician

Position Location
Defiance, Ohio
Defiance County

Salary & Benefits
Salary Negotiable
10 paid holidays
Blue Cross-Blue Shield Health Plan
80 hrs./yr. vacation leave
120 hrs./yr. sick leave
Public Employees Retirement System
Workmen's Compensation

Position Description

The employee occupying this position will assist the District Supervisors and staff in carrying our their responsibilities as grantees of a water quality demonstration grant from the U. S. Environmental Protection Agency. The employee will be directly responsible to the district board of supervisors with existing staff providing guidance and assistance in daily operations.

This position has been established to facilitate the implementation of a water quality demonstration program. General tasks are to:

1) Coordinate project activities with Cooperative Extension Service, Ohio Agricultural Research and Development Center, Heidelberg College and landowners in the project area.

2) Provide technical assistance to landowners applying conservation practices in order to carry out project objectives.

3) Assist the project secretary in maintaining adequate records to sufficiently document the grants requirement of 25% local funding.

4) Assist the Assistant County Agent in developing and carrying out an information and education program.

5) Secure needed equipment and supplies necessary to carry out the project objectives.

6) Serve as the district's representative in all contract negotiations required for the successful completion of the project.

7) Assist in daily functions of the District.

Position Requirements

1) Education beyond high school, or high school graduate plus related agricultural experience.

2) Practical knowledge of agriculture and the ability to work with agricultural equipment.

3) Applicants must be able to effectively communicate in writing and verbally to individuals and groups.

4) The ability to gain the confidence and cooperation of landowners in trying new and unadopted conservation practices.

5) Show initiation and the ability to plan programs.

6) The ability to interpret a variety of technical materials, to define problems, collect data and draw valid conclusions.

7) A valid Ohio Driver License.

8) Able to do field work that includes extensive walking and some manual labor.

Employment Conditions

This position is full time - 80 hours per two-week pay period. Hours of work are flexible. This position is subject to all conditions of the District Personnel Employment Policy. Attendance at occasional night meetings is required.

Salary

Starting salary is negotiable based on experience and education, but should be in the area of $12,000.

Method of Evaluation

All candidates responding to this vacancy announcement will be evaluated on their experience, educational background and special skills. Those best qualified will be interviewed by the board of supervisors.

How to Apply

Individuals are asked to apply in writing to Albert Schroeder, Chairman, Defiance Soil and Water Conservation District, Rt. 2, Box 11, 66N, Defiance, Ohio 43512. Applications with resume and references must be received by 5:00 P. M., Friday, September 19, 1980.

Applicants will be evaluated without regard to race, color, religion, sex or national origin.

APPENDIX B

DEFIANCE COUNTY - LOST CREEK DEMONSTRATION PROJECT

1985 GUIDELINES

DEFIANCE SOIL AND WATER CONSERVATION DISTRICT

DEFIANCE SOIL & WATER CONSERVATION DISTRICT

ROUTE 2 • BOX 11 • STATE ROUTE 66 NORTH • DEFIANCE, OHIO 43512 • (419) 782-8751

DEFIANCE COUNTY - LOST CREEK DEMONSTRATION PROJECT - 1985 GUIDELINES

GENERAL GUIDELINES

1. A signed application must be on file with the SWCD for a farmer to be considered a project cooperator.

2. All plots will have a comparison between at least two tillage practices.

3. Cooperators shall keep records of all cultural practices on demonstration plots, and allow tours of the crop, have a yield check taken and permit publication of this information. A cooperator will risk being ineligible for future equipment use should be not comply with these requirements.

4. The SWCD will schedule equipment for the good of the project. Early and new applicants will receive priority if scheduling becomes a problem.

5. Fields for demonstration plots shall be well-drained with no serious weed history. Plot sites are subject to approval by project personnel.

6. All fields shall have a recent (within 2 years) soil test from Ohio State University. If a field does not have a current soil test, the SWCD will have a cooperator submitted soil sample analyzed at no cost to the cooperator.

7. All demonstration plots will be included in a Pest Management Program at no charge.

8. The acreage limit for the planters will be 40 acres per crop for each farm operation. A fee will be assessed to the cooperator on acreages over 40 acres per crop. This fee will be $5 per acre where the district planter is used and $10 per acre if a tractor is supplied with the equipment. This guideline does not apply to land in the Lost Creek Watershed or to farmers demonstrating ridge-till on fine textured soils. (sandy clay, silty clay, clay)

9. The acreage limit for the no-till grain drill will be 40 acres per crop or one day.

10. All equipment will be used in Defiance County only.

NO-TILL GUIDELINES

1. Recommended plot size for no-till is 5 to 20 acres.

2. Planters are not available for replant except on fields in the plot program.

3. Several no-till planters and a no-till drill will be available for no-till corn or soybeans. Planters are 6-30" rows, and one can also plant 15" soybeans.

4. Planters are to be used primarily for no-till, but may be used to plant adjacent tillage plots to gain a uniform comparison.

5. All planters are equipped for dry fertilizer, which farmer will supply.

RIDGING GUIDELINES

1. Two pieces of equipment are available for ridging. These are: 6 row disk ridger for forming ridges in the fall; and a 6 row cultivator for forming ridges during summer cultivation.

2. Best results for fall ridging occur on a field that is plowed following wheat harvest, then worked and land leveled then ridged.

3. Ridged plots should have a comparison between ridge and flat.

4. Cooperators are encouraged to plant on the same ridge a minimum of two years.

FALL TILLAGE GUIDELINES

1. The district owned dick-chisel plow will be restricted to use in the Lost Creek Watershed.

2. Persons wishing to demonstrate conservation tillage (chisel plowing) may do so with their own equipment. Project services, including yield checks, will be provided to these cooperators.

APPENDIX C

1984 Guidelines for Incentive Payments In The Upper Lost Creek Watershed

Defiance Soil and Water Conservation District

DEFIANCE SOIL & WATER CONSERVATION DISTRICT

ROUTE 2 • BOX 11 • STATE ROUTE 66 NORTH • DEFIANCE, OHIO 43512 • (419) 782-8751

1984 Guidelines for Incentive Payments in the Upper Lost Creek Watershed

Purpose: Even though many of the soils in the Upper Lost Creek Watershed being monitored by the Defiance Soil and Water Conservation District are better suited for conservation tillage than others in the county, the Board of Supervisors has decided to provide an incentive payment to those landowners and/or farmers in the watershed who implement no-tillage crop-production practices. The rationale for this decision is that with the monitoring program in this watershed, it is imperative that conservation tillage, particulary no-till, be implemented to the maximum so that its effects on water quality can be measured.

Equipment: District planting and tillage equipment is available at no cost to cooperating farmers. In the scheduling of equipment, farms in the watershed are given priority.

Payment Rate for No-Tillage: Row Crops or Drilled Soybeans - $40 per acre
Cover Crops, Wheat or Oats - $10 per acre

Time of Payment: Spring planted crops - August 1984

Determination of Field Size and Eligibility: Field size will be determined from A.S.C.S. measurements or actual field measurements if fields have been split or boundaries have changed. If at least 50% of a field lies within the watershed, payment will be made on the entire field. If less than 50% of a field lies within the watershed, payment will be made on the basis of actual acres. The Defiance SWCD Board of Supervisors have the final authority in the question of any disputes arising from field eligibility or size.

Fall Tillage on Fields Where Payment is made: Where no-till corn is grown in 1984, the District's no-till drill may be used to seed a cover crop. Fall tillage will be limited to light disking or disk-chisel plowing.

Where no-till soybeans are grown in 1984, no fall tillage will be permitted. If wheat follows soybeans, the District's no-till drill may be used to sow wheat or if the 1985 crop will be corn, it is recommended that the farmer consider planting a cover crop. The no-till drill may be used to seed the cover crop or it may be flown on before bean harvest.

From this date on where no-till wheat, oats, or spring or summer seeded cover crop has received incentive payment from the Defiance SWCD, fall tillage may consist of disking or disk-chisel plowing. If corn is expected to the the 1985 crop, no-tillage planting is encouraged.

In summary, it is the opinion of the Board of Supervisors, that fall plowing not be permitted on land where incentive payments have been made. S.C.S. and District personnel are more than willing to assist in planning an erosion control program that will also be economically attractive to the farmer.

APPENDIX D

1984 AND FINAL REPORT
PHOSPHORUS FERTILITY MANAGEMENT DEMONSTRATION PROJECT
FOR
DEFIANCE AREA SOILS HIGH IN AVAILABLE PHOSPHORUS

MARION E. KROETZ

1984 AND FINAL REPORT
PHOSPHORUS FERTILITY MANAGEMENT DEMONSTRATION PROJECT FOR DEFIANCE AREA SOILS HIGH IN AVAILABLE PHOSPHORUS

OSU Research Foundation Project No. 714743

Accomplishments

This report summarizes the data from the third and final year of the phosphorus demonstration program and includes two and three year data when appropriate. Attached to this report are final reports for 1982 and 1983.

Cooperators in the program were asked to compare three phosphorus rates on soils with phosphorus test above 40. Several of the locations had test below 40 with the lowest test in the program 23 Lb. available phosphorus per acre. Treatment A was their normal phosphorus rate, Treatment B the recommended rate in the Ohio Agronomy Guide which is crop removal or less for fields with phosphorus test above 30, and Treatment C no phosphorus. These rates were selected to demonstrate that the recommendations in the Agronomy Guide provide sufficient phosphorus with yield about the same for all treatments. Most cooperators normal rate was about the same as recommended rate, and therefore only have Treatments B and C.

The demonstration was set up to be convenient for the cooperator and as a result, some locations had two variables. The easiest way to get the zero phosphorus rate (Treatment C) was to shut off row fertilizer. Therefore, Treatment C has a phosphorus variable and also a row fertilizer variable at most locations. Plant analysis was used to determine if yield difference was due to phosphorus or another nutrient supplied by row fertilizer.

Ohio's research shows that optimium soil phosphorus test for corn is 40 Lbs. available phosphorus per acre and for soybeans 30 Lbs. per acre. These were the level where yield was not increased by applying phosphorus or increasing the phosphorus level in the soil. The top of the phosphorus response curve for wheat is around 60 Lbs./acre. Phosphorus recommendations in the Ohio Agronomy Guide provides crop removal rates of phosphorus for corn and soybeans with phosphorus soil test between 30 and 60, less than crop removal between 60 and 90 and zero phosphorus when soil test is about 90 except with very high yield goals. Phosphorus recommendations for soils testing below 30 is the amount needed to produce the same yield as would be achieved with a test above 30. Phosphorus crop removal for 150 bu. corn is 60 Lbs. P_2O_5/acre and 60 bu. soybeans 50 Lbs. P_2O_5/A.

Seven corn, two soybeans, and two wheat demonstrations were completed in 1984. Four demonstrations were lost due to fertilizer spreading and harvesting problems. Twenty one (21) corn, 10 soybeans, and 2 wheat demonstrations were completed during the three years of the project. Table 1 list production practices for all 15 locations in 1984.

Yield and related information for 1984 are reported in Table 2. The aveage phosphorus rate used on corn in Treatment B was 47 Lbs./acre which is less than crop removal but more than recommended for an average test of 88. Corn yield for Treatment B was slightly higher than Treatment C, but probably not significant. Most of the yield difference for Treatment B occurred on two farms, Colonial Hill (location 75) and Clarence Oberlitner (location 76.) Plant analysis (Table 4) shows the biggest difference between Treatment B and C was potassium level at initial silk on these farms. Since location 76 did not have potassium in row fertilizer, this effect, if real, was probable due to improved root system usually associated with row fertilizer. Three locations with visual difference observed from row fertilizer had no yield difference.

Location 77 had a 2.6 bu. yield increase from row fertilizer. Again, plant analysis shows the biggest difference with potassium level. Manganese deficiency was observed in Treatment C at this location and could be responsible for the yield difference if real. Acidifying effect of row fertilizer often prevents manganese deficiency.

Response to phosphorus on wheat was associated with soil test level. Phosphorus increased yield about 15 bu./acre at Wayne Dinius (location 21) where soil phosphorus test was low and had no effect on yield at John Rettig (location 42) where phosphorus soil test was high.

Three year yield summary is listed in Table 3. The yield difference for the 21 corn demonstration was 3.5 bu./acre favoring crop removal rate of phosphorus over no phosphorous. This small yield difference is primarily due to 3 locations, the two locations previously mentioned from 1984 and one location in 1982 with a 21.9 bu. increase from phosphorous (row fertilizer). Plant analysis showed the increase in 1982 was from nitrogen in the row fertilizer, not phosphorous.

Three year summary for the 10 soybean demonstrations show no yield difference from phosphorous and/or row fertilizer. Treatment B had average yield of 42.2 bu./acre and Treatment C 42.6 bu./acre.

Plant analysis are summarized in Table 4. Phosphorous level for both corn and soybeans are similar for Treatment B and C. The main difference between Treatment B and C was potassium level. As suggested earlier, this could be the effect on root development. However, it could also be an environmental or some other effect.

Phosphorous soil test comparisons are listed in Tables 5,6 and 7. Table 5 list six locations comparing 1982 and 1984 test. Some individual farms show big variation between the two years. The summary shows very little difference between 1982 starting test and Treatment C with no phorphorous for two years. One year comparisons in Table 6 and 7 shows the same trend.

Research at Purdue and other locations shows that the drawdown of phosphorous in the soil is very slow. The yield levels in this demonstrations would draw down phosphorous soil test about 3 Lbs./year according to Purdue's research. At this drawdown rate, it would take about 17 years to reduce the phosphorous soil test from 90 to 40 Lbs./acre when no phosphorous is applied.

The data in Tables 5-7 illustrates the problem with making recommendations from a single soil test. Wide variations in results make dealers and other reluctant to recommend less than crop removal rates. Average for all locations tends to give more reliable information from soil test, plant analysis, and yield comparisons than individual farm data. Farmers need to soil test every 1 to 3 years with multiple samples from a unit of land to determine the actual soil fertility level for the farm. With multiple samples, high phosphorous level farms can be identified and lower than crop removal rates of phosphorous can be recommended with confidence.

SUMMARY

This three year phosphorous demonstration program provided results similar to Ohio's research showing corn and soybean yield did not increase from fertilizer phosphorous when soil phorphorous level is above 40 Lbs./acre. This should provide growers confidence in using recommendations that call from crop removal rates or less when soil test are 30 or higher.

Since we also had a row fertilizer is variable in this demonstration, we do not want growers to conclude that row fertilizer should not be used. While the data suggests that there was no response to phosphorus in the row, we recognize the need to apply low rates of phosphorus to maintain fertility level on many farms. Phosphorus should be placed in the soil rather than on surface, especially in conservation tillage to avoid buildup of phosphorus at the surface which could result in increase phosphorus leaving the soil with runoff. Also there are times when nitrogen in row fertilizer is needed for early growth. Therefore, row fertilizer is still a good practice.

Plans are to include this data in an Extension publication than can be distributed throughout Ohio.

ACKNOWLEDGEMENTS:

Special thanks to the farmers in Northwest Ohio for conducting these demonstrations with their County Extension Agent, Agriculture. Also thanks to Dr. Terry Logan for laboratory and other support of the project and to USEPA for their financial assistance.

PROJECT PERSONNEL:

Marion E. Kroetz - District Specialist, Agronomy
Bill Rohrs - Defiance County Extension Agent, Agriculture
Bob Cole - Henry County Extension Agent, Agriculture
Dave Reed - Fulton County Extension Agent, Agriculture
Harry Freeman - Hancock County Extension Agent, Agriculture
George Ropp - Van Wert County Extension Agent, Agriculture
Terry Logan - Dept. of Agronomy, Ohio State University

REPORT PREPARED BY:

Marion E. Kroetz

February, 1985

Table 1. Test Conditions for Phosphorus Demonstration, 1984.

Location	11	21	22	24	32
County	Defiance	Fulton	Fulton	Fulton	Hancock
Soil Type	Hoytville	Hoytville	Ottokee		Lenawee
1984 Crop	Corn	Wheat	Corn	Corn	Corn
1983 Crop	Soybeans	Soybeans	Corn	PIK	Soybeans
Beginning Soil Test Year	1982	1982	1982	1984	1982
pH	6.2	7.0	6.0	6.9	6.5
P	108	47	306	260	63
K	321	335	702	269	267
Ca	5230	5690	1960	4935	5220
Mg	449	813	355	325	860
CEC	19	18	8	15	19
Drainage	Tile	Tile	Tile	Tile	Tile and Surface
Planting Date	5-14	10-15	5-16	5-10	5-15
Hybrid or Variety	Cargill 436	Caldwell	Pioneer 3744	Rupp 1690	Landmark 733
Seed Drop	25900	135 lb.	26,000	27,200	26,500
Tillage	No Till	Disk	Fall Disk	Spring Plow	Fall Chisel
Row Fertilizer Analysis	6-28-28	6-26-26	9-23-11	19-17-0	None
Row Fertilizer Lb./A. Treatment A	-	275	-	-	0
Treatment B	171	275# 6-13-26	200	200	0
Treatment C	137# 9-0-48	275# 6-0-26	200# 9-0-11	0	0
Nitrogen Lb./A. (Does not include Row N)	244	70	170	168	210
Source of Nitrogen	Anhydrous	Ammonium Sulfate	28		60# - 28% 150# - Anhydr
Date of Nitrogen Application	6-12	Spring	½ Planting ½ Sidedress	Planting	Planting an Sidedress
Potassium Lb./A. (Does not include Row K	-	-			90
Herbicides	Atrazine 1.5 qt. Dual 1 qt. 2,4-D ½ pt. Banvel ½ pt	None	Atrazine Dual	Bladex Atrazine Sutan	Bicep
Insecticides	None	None	Thimet	Counter	None
Phosphorus Lb. P_2O_5/A. Treatment A	-	71	-	-	-
Treatment B	48	36	46	34	44
Treatment C	0	0	0	0	0

Table 1. **Test Conditions for Phosphorus Demonstration, 1984.**

Location	36	37	38	42	47
County	Hancock	Hancock	Hancock	Henry	Henry
Soil Type	Blount	Hoytville	Blount	Hoytville	Oakville
1984 Crop	Soybeans	Corn	Soybeans	Wheat	Corn
1983 Crop	Corn	Corn	Corn	Soybeans	Soybeans
Beginning Soil Test Year	1982	1983	1983	1982	1984
pH	7.2	7.3	7.0	6.3	6.5
P	53	38	79	103	38
K	211	308	285	411	194
Ca	3390	5870	3890	7050	1720
Mg	877	528	656	688	275
CEC	12	17	13	25	7
Drainage	Tile and Surface	Tile	Tile	Tile	Tile
Planting Date	6-18	6-5	6-7	10-10	May 10
Hybrid or Variety	Asgrow 3127	Asgrow 3127	Voris 339	Hart	Bojac 451
Seed Drop	220,000	130,000	175,000	120 lb.	28900
Tillage	Fall Disk	Fall Plow	Fall Plow	Fall Disk	No Till
Row Fertilizer Analysis	2-6-12	5-15-40	-	-	8-23-5
Row Fertilizer Lb./A.					
Treatment A	-	-	-	-	-
Treatment B	180	150	-	-	160
Treatment C	0	0	-	-	0
Nitrogen Lb./A. (Does not include Row N)	-	-	-	-	230
Source of Nitrogen	-	-	-	-	Anhydrous
Date of Nitrogen Application	-	-	-	-	Sidedress
Potassium Lb./A. (Does not include Row K	120	-	108	40	138
Herbicides	Dual Lorox	Sencor Dual	Lorox Lasso	-	Aatrex Dual Banvel
Insecticides	None	None		-	None
Phosphorus Lb. P_2O_5/A.					
Treatment A	-	-	88	78	-
Treatment B	11	22	44	39	37
Treatment C	0	0	-	0	0

Table 1. Test Conditions for Phosphorus Demonstration, 1984.

Location	48	74	75	76	77
County	Henry	Van Wert	Van Wert	Van Wert	Van Wert
Soil Type	Hoytville	Blount-Pewamo	Blount-Pewamo	Blount-Pewamo	Blount-Pewamo
Crop	Corn	Corn	Corn	Corn	Soybeans
Crop	Soybeans	Wheat	Soybeans	Soybeans	Soybeans
Beginning Soil Test Year	1984	1984	1984	1984	1984
pH	6.6	6.8	6.4	5.2	6.2
P	42	23	45	34	36
K	296	223	271	166	157
Ca	7020	6120	4050	2770	3120
Mg	840	1035	770	620	723
CEC	24	20	14	16	13
Drainage	Tile and Surface	Random Tile	Tile	Tile	Tile and Surface
Planting Date	May 4	May 9	May 2	May 7	May 17
Hybrid or Variety	Gries 618	Pioneer 3744	Asgrow Rx 777	Asgrow Rx 777	Madison 2900
Seed Drop	28,000	25,900	25,000	24,000	10/ft.
Tillage	No Till	Fall Plow	Fall Plow	Fall Chisel	Fall Chisel
Row Fertilizer Analysis	6-26-26	18-46-0	4-10-10	10-34-0	4-10-10
Row Fertilizer Lb./A. Treatment A	-	-	-	-	-
Treatment B	250	135	325	185	156
Treatment C	0	0	0	0	0
Nitrogen Lb./A. (Does not include Row N)	150	160	201	170	-
Source of Nitrogen	28	28 Anhydrous	Anhydrous	Anhydrous	-
Date of Nitrogen Application	Sidedress	42# Planting 118# Sidedress	Sidedress	Sidedress	-
Potassium Lb./A. (Does not include Row K	0	190	0	120	90
Herbicides	Atrazine Bladex Banvel	Atrazine Bladex	Bladex Aatrex	Atrazine Dual	Lexone Dual
Insecticides	None	None	None	None	None
Phosphorus Lb. P_2O_5/A. Treatment A	-	-	-	-	-
Treatment B	65	62	32	63	16
Treatment C	0	0	0	0	0

TABLE 2. YIELD AND RELATED INFORMATION FROM PHOSPHORUS DEMONSTRATION 1984

Location		County	Crop	Early Visual Diff	Starting Avail. P/A	Phos. Rate P_2O_5/A		Yield/A		
						A	B	A	B	C
					Lb.	Lb.	Lb.	Bu.	Bu.	Bu.
11	Bob Rettig	Defiance	corn	no	108	-	48	-	108.1	108.
21	Wayne Dinius	Fulton	wheat	yes	47	71	36	58.8	57.4	43.
22	Jared McClarren	Fulton	corn	yes	306	-	46	-	171.4	167.
32	Neil Harris	Hancock	corn	no	63	-	44	-	160.0	154.
36	Darwin Searfoss	Hancock	soybean	no	53	-	11	-	35.2	38.
37	Ray Beck	Hancock	corn	no	38	-	22	-	-	-
38	Gerald Johnson	Hancock	soybean	no	79	88	44	39.9	39.6	-
42	John Rettig	Henry	wheat	no	103	78	39	64.1	58.1	61.
47	Bob Griteman **	Henry	corn	yes	38	-	37	-	178.2	178.
74	Circle L *	Van Wert	corn	yes	23	-	62	-	163.3	166.
75	Colonial Hill**	Van Wert	corn	yes	45	-	32	-	181.9	165.
76	C. Oberlitner**	Van Wert	corn	yes	34	-	63	-	183.7	170.
77	Bob Reis **	Van Wert	soybean	no	36	-	16	-	45.2	42.
	Average		corn (7)		88	-	47		163.8	158.
	Average		soybeans (2)		66	-	27		40.2	40.
	Average		wheat (2)		75	74	37	61.4	57.7	52.

* Old cooperator, New Location in 1984

** New Cooperator in 1984

Treatment A - More than Recommended P_2O_5

Treatment B - Recommended P_2O_5

Treatment C - No P_2O_5

TABLE 3. THREE YEAR YIELD SUMMARY FOR PHOSPHORUS DEMONSTRATION

	CORN			SOYBEANS		
		Treatment			Treatment	
	Number	B	C	Number	B	C
		Bu.	Bu.		Bu.	Bu.
1982	8	127.3	124.7	2	47.3	47.0
1983	6	105.1	102.1	6	41.1	41.8
1984	7	163.8	158.7	2	40.2	40.4
Average	21	133.1	129.6	10	42.2	42.6

TABLE 4. PLANT ANALYSIS FROM PHOSPHORUS DEMONSTRATION 1984

Location	Crop	Treatment A			Treatment B			Treatment C		
		N	P	K	N	P	K	N	P	K
		%	%	%	%	%	%	%	%	%
11 Bob Rettig	corn	-	-	-	3.07	.27	1.51	3.00	.25	1.72
22 Jared McClarren	corn	-	-	-	-	-	-	-	-	-
32 Neil Harris	corn	-	-	-	3.49	.36	2.97	3.25	.36	2.34
36 Darwin Searfoss	soybean	-	-	-	5.73	.41	2.15	5.41	.39	2.06
37 Ray Beck	corn	-	-	-	3.49	.38	2.26	3.62	.39	2.19
38 Gerald Johnson	soybean	4.93	.46	2.56	5.20	.37	2.27	-	-	-
47 Bob Griteman	corn	-	-	-	3.28	.36	2.56	2.97	.35	2.14
48 Jerry Waisner	corn	-	-	-	2.83	.30	1.43	2.66	.30	1.46
74 Circle L	corn	-	-	-	2.76	.28	1.46	2.79	.26	1.34
75 Colonial Hill	corn	-	-	-	3.07	.30	1.87	3.01	.31	2.08
76 C. Oberlitner	corn	-	-	-	2.76	.28	2.05	3.11	.29	1.80
77 Bob Reis	soybean	-	-	-	4.54	.37	2.26	4.71	.38	1.62
Average	corn	-	-	-	3.09	.32	2.01	3.05	.31	1.88
Average	soybean	-	-	-	5.13	.39	2.20	5.06	.38	1.84

Minimum Sufficiency Levels:	Corn	Soybeans
	%	
N	2.76	4.25
P	.30	.30
K	1.90	2.00

TABLE 5. COMPARISON OF SOIL PHOSPHORUS LEVEL 1982 - 1984

Location	Beginning Test 1982	1984 Test Treatment		
		A	B	C
	Lb.	Lb.	Lb.	Lb.
11 Bob Rettig	108	-	50	55
21 Wayne Dinius	47	57	57	27
22 Jared McClarren	306	-	231	296
32 Neil Harris	63	-	68	74
36 Darwin Searfoss	53	-	45	46
42 John Rettig	103	194	124	147
Average (6)	113	-	96	107
Average (2)	75	125	90	87

TABLE 6. COMPARISON OF SOIL PHOSPHORUS LEVEL 1982 - 1983

Location	Beginning Test 1982	1983 Test Treatment		
		A	B	C
	Lb.	Lb.	Lb.	Lb.
13 Bob Shininger	42	-	54	42
23 Wendell Sutton	248	-	104	70
31 Ray Beck	61	-	48	110
33 Jim Hulbert	91	-	74	130
34 Gerald Johnson	76	-	28	40
41 Tom Eggers	289	260	234	305
71 Circle L	54	-	54	36
Average	123	-	85	105

TABLE 7. COMPARISON OF SOIL PHOSPHORUS LEVEL 1983 - 1984

Location	Beginning Test 1983	1984 Test Treatment A	B	C
	Lb.	Lb.	Lb.	Lb.
37 Ray Beck	38		14	39
38 Gerald Johnson	79	92	47	

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1 REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-905/9-87-001		

4. TITLE AND SUBTITLE	5 REPORT DATE
The Defiance County Lost Creek Demonstration Project	January 1987
	6. PERFORMING ORGANIZATION CODE: 5GL

7 AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
Robert Rettig, Project Administrator	GLNPO Report No. 87-01

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
Defiance Soil and Water Conservation District R. R. 2, Box 11 66 North Defiance, Ohio 43512	11. CONTRACT/GRANT NO.: S005553-01

12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
U.S. Environmental Protection Agency Great Lakes National Program Office 111 West Jackson, 10th Floor Chicago, IL 60605	No-Till 1980-1985 14. SPONSORING AGENCY CODE: Great Lakes National Program Office-USEPA, Region V

15. SUPPLEMENTARY NOTES
Ralph G. Christensen, Project Officer
John Lowrey, Technical Assistance

16. ABSTRACT

The purpose of this project is to demonstrate methods of reducing nutrient runoff and improving water quality flowing from non-point sources to Lake Erie specifically from agricultural land.

The Project proposed to demonstrate and measure the effectiveness of Best Management Practices in reducing sediment and nutrient loss from agricultural land. Best Management Practices are soil conservation practices which are expected to have a beneficial impact on water quality.

Several unique and innovative practices were to be demonstrated on the fine textured lake plain soils and the suitability of these practices as they relate to crop production was also to be evaluated. Primary conservation practices demonstrated were no-till and ridge till land management along with fertilizer and pesticide application. Pest scouting was also done.

An effective information and education program was to be designed and carried out to gain acceptance of the conservation program in the Defiance County Project.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Phosphorus No-Till Water Quality Practices Runoff Total-P Sediment Concentrations Erosion Clay Content Ridge Till		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21 NO. OF PAGES
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