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A PRELIMINARY ECONOMIC APPRAISAL OF THE SOIL CONSERVATION PROGRAM IN THE  
WEST BRANCH OCTORARO CREEK WATERSHED IN LANCASTER COUNTY, PENNSYLVANIA  
For the Period 1935 - 1938

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A PRELIMINARY ECONOMIC APPRAISAL OF THE SOIL CONSERVATION PROGRAM IN THE WEST BRANCH OCTORARO CREEK WATERSHED, IN LANCASTER COUNTY, PENNSYLVANIA.\*#

David H. Walter

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Studies are being made to determine the economic and social effects of planned soil and water conservation programs on individual farms. This is a preliminary report for the West Branch Octoraro Creek watershed in Lancaster County, Pennsylvania. The period of time that has elapsed since the beginning of the Soil Conservation work in the area is too brief to determine any definite trends or results. It is possible, however, to describe the agriculture of the area, point out the problems of soil erosion, and make a preliminary economic appraisal of the recommended changes and possible results during the next few years. Policies of the Service and attitudes of the farmers may have changed somewhat since this report was written and will undoubtedly continue to change in the future. It is also true that, in general, future farm plans should gradually be improved as a result of experience and additional data concerning conservation practices.

The West Branch Octoraro Creek watershed was selected as an erosion control demonstration project in 1935 by the Soil Conservation Service. It has an area of about 30,000 acres, most of which is farm land. The area is located about 15 miles southeast of the city of Lancaster and about 60 miles west of Philadelphia. The topography is gently rolling in the northern part of the watershed to rather steep hillsides in the southern portion of the area. The average growing season is about 175 days in length. Rainfall averages about 40 inches, slightly more than half of which occurs during the growing season.

#### Agriculture of the Area

This report is based primarily upon surveys conducted on both cooperating and non-cooperating farms in 1935, 1936 and 1938, and data from the farm plans prepared for 21 farms. The first survey made in 1935 included 109 farms which covered approximately half of the farm land in the area.

The average size of the farms studied was 120 acres (Table 1). This was somewhat larger than the average of all farms in the county, or in the watershed. Seventy-four acres or 61 per cent of the farm was in crops in 1935. Ten per cent was in woodland and 19 per cent was in permanent pasture.

CROPS.--Numerous crop rotations are followed in this area because of the types of farming and the relative high fertility of the soil compared to other sections of the state. One rotation is corn the first year, potatoes, tobacco or other cash crops the second year, wheat the third year, and mixed hay the fourth year. Another rotation common in the southern part of the area is corn, oats,

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wheat and hay each one year. A number of farms followed a four-year rotation of corn, wheat and hay.

Table 1.--Utilization of Farm Land on 109 Farms in Southern Lancaster County, Pennsylvania, 1935

Land use	Acres per farm	Per cent of total	Per cent reporting
Crops	74.1	61	100
Woods, not pastured	11.2	9	76
Woods, pastured	1.3	1	22
Permanent pasture	22.8	19	95
Other pasture	2.1	2	21
Other land	3.3	3	30
Farmstead	5.6	5	100
Total	120.4	100	

Corn, wheat and mixed hay were the most important crops and these three occupied almost 75 per cent of the crop land (Table 2). Clean tilled crops were grown on 40.3 per cent of the crop land, semi-erosion resistant crops on 31.5 per cent, and erosion resistant crops on 26.0 per cent. Census data for the past 40 years indicate that the acreage of wheat, oats and rye has been decreasing, while the acreage of alfalfa and barley has been showing phenomenal increases.

Crop yields shown in Table 2 for 1935 were about normal for the area and were considerably above the state average for most of the crops. There was a wide variation of yields on different farms which is true in practically any agricultural area, due to such factors as erosion, fertility practices, quality of seed and type of soil.

A high percentage of all crops grown on the 109 farms received an application of fertilizer in 1935. Eighty-six per cent of the acreage in the important crops received an average of 323 pounds per acre (Table 3). The percentage of individual crop acreages fertilized ranged from 61 per cent of the soy bean crop to 100 per cent of the sweet corn crop. Analysis of the data indicates that the applications of fertilizer on farms operated by tenants were practically the same as on farms which were owner-operated. The reason for this is probably due to the type of lease on most of the rented farms which provides for the landlord to purchase all of the fertilizer.

Very little lime was applied to the land in this area. For the crops harvested in 1935 only 6.2 per cent of the entire acreage was limed with an average application of about one half ton per acre. The lime requirements are generally rather low, it being possible to grow a fair crop of legume hay on most farms without applying additional lime.

Practically all of the operator's share of the corn, oats, and barley was used for feed on the farm (Table 4). Only 14 per cent of the wheat was fed while 65 per cent of the total crop was sold by the operators. One fifth of the hay was sold. Most of this went to the near-by Lancaster stock yards which provides a regular market for considerable quantities of timothy and mixed hay.

Table 2.--Acreage and Yield of Specified Crops Grown on 109 Farms in Lancaster County, Pennsylvania, 1935

Crop*	Acres per farm	Per cent of total	Per cent reporting	Average yield
Clean tilled crops				
Corn for grain	20.1	27.0	100	50.8 bu.
Corn for silage	2.3	3.1	37	10.4 T.
Sweet corn	1.7	2.3	18	2.1 T.
Potatoes	2.2	2.9	89	176.0 bu.
Tobacco	.6	.8	23	1230.0 lbs.
Tomatoes	.9	1.2	32	4.7 T.
Peas	.4	.5	11	1.3 T.
Soy beans	1.6	2.2	35	1.9 T.
Buckwheat	.2	.3	3	23.6 bu.
Total	30.0	40.3		
Semi-erosion resistant crops				
Oats	4.7	6.3	65	32.9 bu.
Wheat	17.5	23.5	96	24.8 bu.
Barley	1.0	1.3	18	35.7 bu.
Rye	.3	.4	8	15.9 bu.
Total	23.5	31.5		
Erosion resistant crops				
Alfalfa	1.5	2.0	31	2.0 T.
Mixed hay	13.8	18.5	90	1.4 T.
Timothy	3.1	4.2	30	1.2 T.
Clover	.6	.8	6	1.9 T.
Other hay	.2	.3	7	1.2 T.
Total	19.2	26.0		
Other crops	1.8	2.4	73	
Total	74.5**	100.0		

\*Classed in three groups: clean tilled, semi-erosion resistant and erosion resistant according to their relative effectiveness in preventing erosion.

\*\*Average .4 acres double cropped.

Table 3.--Fertilizer Practices on Specified Crops Planted for Harvesting in 1935 on 109 Farms in Lancaster County, Pennsylvania

Crop	Acres reported	Per cent of acres fertilized	Pounds per acre fertilized	Cost per acre fertilized
Corn for grain	2356	81	289	\$3.20
Oats	528	87	253	2.77
Wheat	1908	94	310	3.59
Barley	104	76	321	3.62
Potatoes	225	94	962	12.49
Soy beans	192	61	298	3.07
Sweet corn	138	100	257	3.33
Total or average	5451	86	323	\$3.73

Table 4.--Per Cent of Different Crops Sold or Used on 106 Farms\* in Lancaster County, Pennsylvania, 1935

Crop	Total used or sold	Sold by		Used for	
		Operator	Landlord	Seed	Feed
Corn	93992	4.5	12.0	.4	83.1
Oats	16936	4.7	8.0	4.2	83.1
Barley	4354	6.6	-	3.0	90.4
Wheat	47105	64.7	12.4	7.4	15.5**
Hay	3499	16.3	4.5	-	79.2

\*Data not available for 3 farms.

\*\*Includes 2.2 per cent used in home.

LIVESTOCK.--The average number of livestock per farm and the per cent that reported each kind is shown in Table 5. Dairy cows were found on all of the 109 farms, but only 84 were raising heifers for replacement. Beef cattle were reported by only 19 farms. Chickens were raised on all farms, and were the second most important type of livestock. Over three fourths of the farms reported hogs, which were primarily for home use.

Table 5.--Average Number of Livestock and Per Cent of Farms That Reported Each Type on 109 Farms in Lancaster County, Pennsylvania, 1935

Type of livestock	Average per farm	Number reporting	Per cent reporting
Cows	10.8	109	100
Heifers	3.6	84	77
Bulls	1.1	87	80
Beef cattle	3.2	19	17
Horses	2.5	101	93
Mules	1.1	53	49
Ewes	.3	6	6
Brood sows	.6	48	44
Other hogs	3.3	85	78
Hens and pullets	207.0	103	94
Other poultry	11.8	34	31

During the past 50 years, according to census data, important trends have taken place. The number of dairy cows remained about the same, but the production per animal increased. The number of chickens on farms was about doubled while numbers of hogs declined. Numbers of beef cattle and sheep have fluctuated widely, but there has been no definite trend during the past 50 or 60 years.

The amounts of feed, other than pasture and corn fodder, fed per head to the various types of livestock is shown in Table 6. Feeding practices vary considerably between different farms because of such factors as home grown crops available, quality of livestock, and prices received for products sold. The data indicate the general feeding practices in the area which, in all probability, will be continued much the same until more profitable practices are found. About

one third of the concentrate feed for cows and chickens was purchased, but practically all other grain feed was supplied with home grown crops.

Table 6.--Pounds of Feed Fed Per Year to Specified Livestock on 34 Farms During the Three Years 1935, 1936, and 1938 in Lancaster County, Pennsylvania

	Grain			Roughage		
	Home grown (Pounds)	Purchased (Pounds)	Total Concentrates (Pounds)	Hay (Pounds)	Silage (Pounds)	Hay Equivalent (Pounds)
Work animals	2526	17	2543	4556	96	4588
Cows	2214	969	3183	2942	2395	3740
Heifers, bulls, etc.	339	16	355	510	74	535
Steers	1962	396	2358	1530	2893	2494
Hogs	960	44	1004	--	--	--
Poultry	44	23	67	--	--	--

INCOME.--Receipts per farm averaged \$3,133. Milk sales accounted for over one third of this, while all livestock receipts amounted to \$2,036 or 65 per cent of the total (Table 7). The poultry was the second most important livestock enterprise. Numerous cash crops are grown in the area which include tobacco, wheat, potatoes and truck crops. Canning crops are an important source of income on many farms. In 1935, wheat was the most important cash crop.

Table 7.--Source of Receipts on 109 Farms in Lancaster County, Pennsylvania, 1935

Source	Amount per farm	Per cent of total	Per cent reporting
Fluid milk	\$1,146	36.6	87
Other dairy products	13	.4	7
Livestock increase	155	5.0	88
Total dairy	\$1,314	42.0	100
Eggs	\$ 354	11.3	89
Poultry	167	5.3	85
Total poultry	\$ 521	16.6	94
All other livestock	\$ 201	6.4	61
Total livestock	\$2,036	65.0	100
Tobacco	\$ 49	1.6	18
Canning crops	72	2.3	38
Potatoes	138	4.4	51
Hay and straw	91	2.9	49
Corn	81	2.6	31
Wheat	238	7.6	83
Truck	39	1.2	23
Other crops	36	1.1	10
Feed and supply increase	143	4.6	69
Total crops	\$ 887	28.3	93
Labor off farm	\$ 31	1.0	19
AAA payments	89	2.8	71
All other miscellaneous	90	2.9	43
Total receipts	\$3,133	100.0	100



Labor was the most important item of expense which made up over 20 per cent of the total, although more than one third of this was a charge for unpaid family labor (Table 8). An average of \$374 was spent for concentrate feed, mostly high protein supplements for the dairy and poultry. Other major items of expense were for buildings, machinery, milk hauling, fertilizer and taxes.

Table 8.--Expenses on 109 Farms in Lancaster County, Pennsylvania, 1935

Item	Amount per farm	Per cent of total
Hired labor	\$308	14.8
Family labor	183	8.8
New buildings and repairs	116	5.6
Purchased grain	374	17.9
Feed grinding	38	1.8
Fertilizer	173	8.3
New machinery and repairs	88	4.2
Milk hauling	116	5.6
Taxes	99	4.7
Grass and other seed	67	3.2
Threshing	33	1.6
Truck	48	2.3
Tractor	43	2.1
Auto, farm use only	64	3.1
Insurance	30	1.4
All other	304	14.6
<b>Total expenses</b>	<b>\$2,084</b>	<b>100.0</b>

The amount of receipts, expenses and labor income\* on farms in the area differed considerably. Many factors were responsible for these variations, such as size of business, yields, livestock production, type of farming, efficiency, marketing methods, and prices. Because of the many factors involved, it is almost impossible to determine the extent of the effect any one factor has on labor income. It is possible, however, to group the farms according to one or more factors and determine whether there is or is not a close relationship to labor income.

If the farms are grouped according to the acres in crops, the 32 farms having the most acres in crops made a slightly higher labor income than the other groups (Table 9). The higher labor income for this group may have been due in part to the higher yields as indicated by the average crop index. It is evident that increasing the acres in crops will not necessarily increase labor income, but must be combined with other favorable factors.

\*The term "Labor Income" is applied to the amount of money a farmer has for his year's work after paying all farm expenses, including a depreciation charge on machinery and a charge for unpaid family labor, and deducting a 5 per cent interest charge on his investment.

Table 9.--Relation of Acres in Crops to Other Factors on 109 Farms in Lancaster County, Pennsylvania, 1935

Acres in crops	Number of farms	Average acreage in crops	Productive man work units per farm	Acres of crops per man	Crop index	Labor income
Less than 50	29	35	318	25	94	\$395
50 - 89	48	70	487	36	99	486
90 and over	32	118	771	43	108	528
Total or average	109	75	526	35	100	\$474

When the farms were grouped according to the relative crop yields, the labor income increased as the crop index increased (Table 10). The labor efficiency was about the same in the different groups of farms, but as the crop yields increased the size of the farm business increased as indicated by the productive man work units.

Table 10.--Relation of Crop Index to Various Factors on 109 Farms in Lancaster County, Pennsylvania, 1935

Crop index	Number of farms	Average crop index	Productive man work units per farm	Man work units per man	Labor income
Less than 90	35	75	454	252	\$302
90 to 104	32	96	528	257	454
105 and over	42	121	583	247	633
Total or average	109	99	526	251	\$474

As indicated before, practically all of the dairy products sold was in the form of fluid milk. The 64 dairy farms selling fluid milk were grouped according to the pounds of milk sold per cow. The group of 22 farms with an average production of less than 5,000 pounds made a labor income of \$83 compared to a labor income of \$668 on the farms where the production was 6,000 pounds or over per cow (Table 11). For each group of farms the price of milk, size of farm, and the labor efficiency were about the same, indicating that production per cow was an important factor in returning a relatively higher labor income.

Table 11.--Relation of Pounds of Milk Sold Per Cow to Various Factors on 64 Dairy Farms Selling Fluid Milk, Lancaster County, Pennsylvania, 1935

Pounds of milk sold per cow	Number of farms	Average pounds of milk sold per cow	Average price of milk per cwt.	Productive man work units/farm	Labor income
Less than 5,000	22	4,300	\$1.93	573	\$ 83
5,000 to 5,999	21	5,453	2.11	498	412
6,000 and over	21	6,839	1.93	515	668

Two important factors affecting labor income on dairy farms are number of cows and livestock production. The 17 dairy farms with number of cows above average and a livestock production index below average made a labor income of minus \$17 (Table 12). The 17 farms with both number of cows and production index above average made an average labor income of \$1,008. The chances for making a high or low labor income are greater with a large sized business.

Table 12.--Relation of Size and Production to Labor Income on 65 Dairy Farms, Lancaster County, Pennsylvania, 1935

	Number of farms	Number of cows	Livestock production index	Average labor income
Number of cows below average				
Livestock production index below average	15	8.2	82	\$ -17
Livestock production index above average	16	8.4	123	332
Number of cows above average				
Livestock production index below average	17	18.0	84	246
Livestock production index above average	17	17.1	129	\$1,008

Of the 109 farms studied in 1935, 65 were classed as dairy, 25 general, 8 animal specialty, 7 poultry and 4 crop specialty. Very few of these farms were highly specialized. Although the farms are classed into definite types, very few of them have more than 50 per cent of their gross income from one source. Most of them had considerable income from several cash crops and usually two or more livestock enterprises. The labor incomes varied considerably for the various types, but this should not indicate that the same groups will make the highest labor incomes every year. Relative prices are continually changing. The animal specialty farms made the highest labor income of the various types in 1935, but this was largely due to highly favorable price trends during that period.

Eighty-two of the 109 farms were owner-operated, while the other 27 were rented. Twenty-two of the owner-operators rented additional land (Table 13). A comparison of the size, labor efficiency, and labor income on these groups of farms shows very little difference. The owner-operators who did not rent additional land had the highest crop yields.

Table 13.--Relation of Tenure to Various Factors on 107 Farms\* in Lancaster County, Pennsylvania, 1935

Type of tenure	Number of farms	Acres per farm	Animal units	Man work units/man	Crop index	Labor income
Owner-operated	60	114	22	245	103	\$504
Owner-operated additional land						
Rented	22	153	24	243	92	257
Share rented	25	107	20	266	98	571
Total or average	107	120	22	249	100	\$467

\*Two cash rented farms omitted.

In Lancaster County there is a wide variation in the proportion of the crop acres planted to the various crops. It might be desirable from a soil and water conservation viewpoint to increase the percentage of the crop acres used for hay and decrease the percentage in clean tilled crops. If the farms are grouped according to the percentage of the crop acres in hay, those having the highest percentage in hay had average crop yields, average sized farms, and a labor income slightly below average (Table 14).

Table 14.--Relation of the Per Cent of the Crop Acres in Hay to Other Factors on 109 Farms in Lancaster County, Pennsylvania, 1935

Per cent of crop acres in hay	Number of farms	Average per cent of crop acres in hay	Crop index	Man work units per farm	Livestock production index	Labor income
Less than 25	33	19	96	515	94	\$370
25 to 30	38	28	103	534	101	632
31 and over	38	37	100	526	106	406
Total or average	109	29	100	526	100	\$474

If the farms are grouped into 20 making the highest farm incomes and 20 making the lowest farm incomes, compared to all 109 farms, differences in organization and production can be indicated. The 20 farms making the highest farm income averaged \$2,506 per farm compared to an average farm income of \$9 for the 20 farms making the lowest farm incomes (Table 15). The average of all farms was \$1,049. These figures indicate that the majority of the farms made a fair farm income.

Farms making the highest farm income and also labor income were larger, had higher yields, had higher livestock production and applied more fertilizer and manure per acre of crops than the 20 farms with the lowest farm income.

The land use pattern was about the same on each group of farms as indicated by Table 15, but the farms with the highest income had a slightly higher percentage of their crop acres in erosion resistant crops and a little lower percentage in clean tilled crops than the farms making the lowest farm income. Farms making the highest income had a higher percentage of their livestock represented by beef cattle.

#### Soil Conservation Program

PROBLEM.--The first white settlers came to this section about the year 1700. A wide variety of crops was grown from the start, including many of the crops grown there today. A high percentage of the crop land has always been used for the production of cultivated crops such as corn and tobacco. Gradual changes have taken place in the agriculture of the area such as shifts in crop production and type of livestock produced. Improvements have been made in production and marketing methods. During the past two centuries one important factor has received very little attention, soil conservation. Originally the top soil was from 12 to 15 inches in depth. Soil surveys indicate that from 50 to 75 per cent of this top soil has been lost on the sloping land from water

Table 15.--Comparison of the 20 Farms Making the Highest Farm Income and the 20 Farms Making the Lowest Farm Income With All 109 Farms in Lancaster County, Pennsylvania, 1935

	20 high income farms	20 low income farms	Average for 109 farms
Acres in farm	143	102	120
Acres in crops	95	65	75
Animal units	32	17	22
Capital investment	\$15,855	\$11,178	\$11,505
Productive man work units	737	441	526
Crop index	115	94	100
Livestock production index	131	76	100
Purchased fertilizer per acre of crops	\$2.85	\$2.10	\$2.29
Tons manure per acre of crops	2.8	2.2	2.6
Man work units per man	280	200	251
Per cent of capital represented by receipts	39	21	29
Per cent of crop acres clean tilled	41	43	40
Per cent of crop acres erosion resistant	27	25	29
Per cent of receipts from crops	25	23	22
Per cent of receipts from livestock products	43	48	46
Per cent of animal units represented by dairy cattle	54	57	59
Per cent of animal units represented by beef cattle	14	4	8
Per cent of animal units represented by poultry	12	13	12
Per cent of farms owner-operated	65	80	75
Gross receipts	\$6,228	\$2,353	\$3,423
Gross expenses	\$3,722	\$2,344	\$2,374
Farm income	\$2,506	\$9	\$1,049
Labor income	\$1,713	\$-549	\$474

erosion. Several factors may be given why farm owners and operators have not given more serious consideration to the problem of soil erosion: (1) the most serious soil losses occur as sheet erosion which goes on practically unnoticed, (2) the subsoil is relatively fertile which has helped to maintain yields on eroded land, (3) the use of commercial fertilizer has tended to offset any adverse effect on yields resulting from erosion, and (4) there has been a gradual improvement in strains and varieties of the various crops which has had a tendency to increase crop yields.

Erosion in the area is determined largely by one or more of the four factors: rainfall, nature of the soil, slope of the land, and the type of vegetative cover.

Rainfall in the area averages about 40 inches annually. Much of this escapes as runoff, especially during heavy rains of short duration, at which time it is impossible for the soil to absorb the entire amount. The result is usually little or no erosion in well protected areas such as pasture and woodlands to severe sheet and gully erosion on land planted to clean tilled crops.

The soils of the area are chiefly Chester and Manor. Both are naturally subject to moderate sheet and gully erosion. In addition to the ease with which they erode, the absorptive and water-holding capacity of these soils have been lowered by past erosion and depletion of organic matter. These factors tend to accelerate the rate of erosion under normal conditions.

The topography is gently rolling in the northern section with slopes generally less than 12 per cent to rather steep hillsides in the southern portion of the area where slopes up to 40 per cent are found. With the type of soil in the area and the usual rainfall, erosion is serious even on the more gentle slopes when not protected by vegetation.

The high percentage of the crop land devoted to clean tilled and small grain crops indicates the acreage without a good vegetative covering. It is when the land is planted to these crops that practically all of the erosion takes place. From the standpoint of erosion control a reduction in the acreage of clean tilled crops would be advisable but may not be economically justified from the standpoint of annual farm returns.

In addition to the above factors there are others that tend to increase or decrease the amount of erosion. One good example is cultivation on the contour. Each drill or cultivation mark in the soil on the contour tends to make small ridges which hold back water until it can be absorbed by the soil. Cultivation up and down the hill provides many small natural water courses, thus tremendously increasing runoff and erosion. Another factor affecting the degree of erosion is the length of slopes plowed or worked at the same time. A long slope will collect more water than a short slope, which will result in more erosion than if this long slope were broken by contour strips of alternating close growing and cultivated crops. Practically no strip cropping or contour cultivation was practiced in Lancaster County until some of the farmers began cooperating with the Soil Conservation Service program a few years ago.

**CONTROL MEASURES USED.**--The general program of the Soil Conservation Service has as its aim the best plan of land use on each farm for the conservation of soil and water under the present system of farming on each farm. What are believed to be improved land uses and farm practices are recommended and included in the 5-year farm conservation plan. In an effort to reduce erosion the program must take into consideration all the factors affecting erosion mentioned above. The important control measures recommended are contour strip cropping, improvement of hay and pasture land, reforestation, protecting woodlands from grazing and the use of various structures such as terraces, contour furrows, and permanent waterways to supplement the other control measures.

Strip cropping was recommended on all farms that followed a regular rotation and had an erosion problem. In most cases the strips were laid out on or very close to the contour. Plans provided for the strips to be in general

from 75 to 125 feet in width, depending on the degree of slope, the amount of erosion, and the soil type.

The Soil Conservation Service, recognizing that a good sod will prevent erosion even on steep slopes, usually encourages an increase in acreage and in the quality of the hay and pasture land if it fits into the farm program. This is especially true in cases where this type of land use is desirable from the standpoint of livestock needs and to reduce erosion. The cooperating farmers have organized a lime association through which they can purchase ground limestone at less than one dollar per ton. This low cost to the cooperating farmer is made possible by using C. C. C. labor to quarry the limestone. Improvement of hay and pasture is encouraged in this way.

The reforestation program, as in other areas, consists of planting the very steep, badly eroded, and waste land to a type of forest trees adaptable to the existing conditions. Demonstrations are conducted in woodland cutting and management to instruct farm operators how to handle their woodland for maximum returns. Old woodlands formerly grazed are protected from livestock grazing and fire.

To supplement the above measures, certain types of structures are used. Terraces and diversion ditches have been constructed on many of the farms. These structures help control the excess rainfall by either holding it back until it is absorbed or by diverting the water slowly down a natural or artificial watercourse. Contour furrows in pastures are being used to a limited extent in the area.

**CHANGES RECOMMENDED.**---When planning a soil conservation program for a farm, a detailed 5-year cropping and land use plan is made for the operator. This plan is worked out embodying recommended principles of erosion control, soil fertility and land use. An examination of these farm plans reveals the planned changes that are to be made during the 5-year period.

Of the farmers from whom economic records were obtained in 1935, 1936 and 1938, 21 are cooperating in the Soil Conservation Service program. Most of these farm plans became effective in 1936. Under the program the acres in crops will be reduced an average of 1.4 acres on these 21 farms. Pasture has been increased 1.4 acres and the woodland .8 acres (Table 16).

Table 16.--Land Use as Called for in the Soil Conservation Service Cooperative Agreements on 21 Farms in Lancaster County, Pennsylvania

Land use	Average acres before contract	Average acres after contract	Acreage change	
			+	-
Crops	68.5	67.1		1.4
Pasture	24.4	25.8	1.4	
Woodlands	14.0	14.8	.8	
Miscellaneous	5.6	4.8		.8
Acres in farm	112.5	112.5	-	-

The program calls for an increase in the acreage of those crops giving effective erosion control and a reduction in the acreage of crops providing poor protection from erosion. The changes called for in crop acres are shown in Table 17. The new plan calls for a reduction of 2.5 acres in clean tilled crops and 2.7 acres in semi-erosion resistant crops, while the erosion resistant crops have been increased 3.8 acres.

Table 17.--Crop Acreage Changes as Called For in the Soil Conservation Service Cooperative Agreements on 21 Farms in Lancaster County, Pennsylvania

Type of crop	Average acres before contract	Average acres after contract	Acreage change	
			+	-
Clean tilled*	24.3	21.8		2.5
Semi-erosion resistant	21.0	18.3		2.7
Erosion resistant	21.1	24.9	3.8	
Other crops	2.1	2.1	-	-
Total acres in crops	68.5	67.1		1.4

\*Table 2

In addition to the changes mentioned above, important changes will be made in the retirement of crop and pasture land to trees. An average of 1.5 acres of crop land was converted to pasture, and .6 acres to trees. One-tenth of an acre of pasture per farm will be planted to trees.

Considerable change will be made in the physical layout of each farm. According to the agreements the average farm had originally 8.2 fields in crops, but after the program has been fully worked out, the average farm will have about the same number of large fields, but they will be divided into strips (Table 18). The average acreage per crop field will be reduced from 8.4 to 2.6 acres. In many cases the number of short or point rows has been increased while in many other cases the length of rows has been increased by removing old fence rows.

Table 18.--Changes in the Number and Acreage of Crop Fields as Called For in the Soil Conservation Service Cooperative Agreements on 21 Farms in Lancaster County, Pennsylvania\*

	Number fields per farm	Acres per field
Before agreement	8.2	8.4
After agreement	26.2	2.6

\*Each contour or field strip considered as a separate field.



Changes Accomplished

Survey records have been obtained from 34 farm operators for each of the three years 1935, 1936 and 1938. Twenty-one of these are cooperating with the Soil Conservation Service, while 13 are not. The small number of farms in the sample and the limited time that has elapsed since the Soil Conservation program has been adopted preclude drawing any conclusions from a comparison of these two groups of farms. In addition to the changes brought about by the program, there are other factors which tend to influence the farm program. These factors include the influence of cycles in livestock production, the price changes, and the weather. Assuming that non-cooperating farms will be influenced by these factors also, a comparison of cooperators and non-cooperators should show the effect of the Soil Conservation program apart from these other influences. For this reason, data are given in most cases for the three years for both cooperators and non-cooperators. Both groups had about the same proportion of farms operated by tenants and cooperating in the Agricultural Adjustment Administration program.

LAND USE.--In 1935 the land use pattern on both the cooperating and non-cooperating farms was about the same, the former having a slightly higher proportion of the farm in woods and less in crops than the latter. From 1935 to 1938 very little change has taken place on the non-cooperating farms (Table 19). On the cooperating farms there was a decrease of more than 11 acres in crops, or a change from 59.8 per cent of the farm in crops in 1935 to 52.8 per cent in 1938. About one third of this decrease was due to fewer acres rented.

Table 19.--Land Use on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania, in 1935, 1936 and 1938

	13 non-cooperating farms			21 cooperating farms		
	1935	1936	1938	1935	1936	1938
	<u>Per cent</u>			<u>Per cent</u>		
Crops	65.7	66.1	64.6	59.8	56.9	52.8
Woods	8.0	7.8	7.8	14.0	14.8	16.3
Pasture	20.5	18.4	20.0	21.0	21.5	23.9
Farmstead	4.4	5.0	4.2	4.0	4.2	5.2
Other land	1.4	2.7	3.4	1.2	2.6	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
	Acres			Acres		
Total acres	122.0	119.7	131.8	122.2	115.0	117.4

Changes in the cropping pattern for both groups of farms are shown for the three years in Table 20. The significant changes indicated are a decrease in clean tilled crop acreage and an increase in hay acreage on the cooperating farms. Acreage of tobacco, although relatively small, has increased each year on both groups of farms.

A comparison of yields for the important crops indicates that the cooperating farms show some improvement over the non-cooperating farms. With the exception of wheat and alfalfa, yields on the cooperating farms increased

more or decreased less when average 1935 and 1936 yields are compared with 1938 yields (Table 21). Alfalfa yields were probably lower on the cooperating farms because of the increased number of farmers in the group who were growing the crop for the first time possibly obtaining relatively poor results in their first attempt. Four of the non-cooperating farms reported alfalfa in 1935 and 1938 while 8 of the cooperating farms reported alfalfa in 1935 and 16 of them in 1938. The indicated increase in yields on cooperating farms was probably due to the increased use of lime and fertilizer. However, conservation of moisture may have been a contributing factor.

Table 20.--Per Cent of Acres in Specified Crops on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania, in 1935, 1936 and 1938

Crop*	13 Non-cooperating farms			21 Cooperating farms		
	1935	1936	1938	1935	1936	1938
	Per cent			Per cent		
Clean tilled						
Corn for grain	28.7	27.7	28.3	27.5	22.4	19.7
Corn for silage	2.0	2.9	2.8	2.3	3.8	4.7
Potatoes	2.7	2.0	2.1	3.1	3.1	2.6
Buckwheat	1.0	3.3	1.1	.3	.3	-
Tobacco	.6	.9	1.2	.3	1.1	1.8
Soy beans	1.5	2.8	2.7	1.4	2.0	1.5
Truck	3.5	3.2	4.4	2.9	3.1	2.9
Total	40.0	42.8	42.6	37.8	35.8	33.2
Semi-erosion resistant						
Oats	5.5	6.2	4.9	7.1	8.8	6.4
Wheat	24.5	23.4	25.4	22.8	24.4	22.4
Barley	1.8	.6	1.1	2.2	2.9	2.1
Rye	-	-	-	.1	.3	-
Total	31.8	30.2	31.4	32.2	36.4	30.9
Erosion resistant						
Alfalfa	2.2	2.1	1.4	1.6	1.1	4.7
Clover	2.9	-	-	.1	2.4	1.5
Mixed hay	16.9	18.8	21.0	21.1	18.0	19.0
Timothy	4.4	4.6	2.6	2.9	1.7	4.0
Other hay	.6	.6	-	.7	1.1	2.9
Total	27.0	26.1	25.0	26.4	24.3	32.1
All other crops	1.2	.9	1.0	3.6	3.5	3.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total acres	80.1	79.1	85.2	73.1	65.5	62.0

\*Table 2

Table 21.--Average Yield of Crops on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania in 1935-1936 and 1938

	13 non-cooperating farms			21 cooperating farms		
	Average 1935-1936	1938	Per cent change	Average 1935-1936	1938	Per cent change
Corn, bu.	53.3	43.6	-18	54.6	48.2	-12
Oats, bu.	40.6	28.7	-29	40.8	33.6	-18
Wheat, bu.	21.5	25.5	+19	24.4	27.4	+12
Potatoes, bu.	159.0	192.0	+21	242.0	348.0	+44
Alfalfa, T.	2.2	3.4	+54	1.9	1.9	00
Mixed hay, T.	1.25	1.4	+12	1.25	1.4	+12
Other hay, T.	1.4	.8	-43	1.0	1.0	00

LIVESTOCK.--The number of livestock per farm for 5 years is shown in Table 22. On both the cooperating and non-cooperating farms a slight increase in number of dairy cows and heifers has taken place. The number of hogs fattened on cooperating farms has been decreasing slightly. The present stage of the dairy cycle and the soil conservation programs tend to encourage an increase in numbers of dairy cows and heifers. An important counteracting factor in some areas is the loss of many cows through blood testing work.

Table 22.--Average Number of Livestock Per Farm on Hand November 1, 1934, 1935, 1936, 1937 and 1938 on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania

	13 non-cooperating farms					20 cooperating farms*				
	1934	1935	1936	1937	1938	1934	1935	1936	1937	1938
Dairy cows	9.7	9.8	9.8	10.2	10.2	9.1	9.9	10.4	10.1	10.8
Heifers	2.2	2.5	2.9	3.1	4.1	3.3	3.5	3.2	3.1	4.2
Bulls	.9	1.0	1.0	1.5	1.2	.8	.8	.9	.8	1.0
Steers	5.8	4.7	4.7	6.6	1.2	5.6	4.6	5.2	6.2	4.8
Work animals	4.2	4.2	3.9	4.0	3.8	3.5	3.6	3.6	3.4	3.2
Brood sows	.8	1.1	.9	.9	1.7	.6	.6	1.0	.8	1.0
Other hogs	4.9	5.1	6.3	7.2	6.6	4.4	3.8	3.6	3.0	2.3
Hens and pullets	258	283	270	275	307	166	198	218	175	186
Other poultry	11	19	28	4	4	2	6	11	4	3

\*One farm omitted because most of herd was lost in test.

INCOME.--Considerable variation occurred in the proportion and amount of receipts from different sources. From 1935 to 1938 tobacco and the dairy accounted for an increased proportion of gross receipts. Receipts from AAA payments, although relatively unimportant, decreased during the 3-year period. In both 1935 and 1938 the average gross receipts for the 21 cooperating farms was about the same as for the 13 non-cooperating farms (Table 23). Fluctuating prices for individual commodities was probably the outstanding reason for the fluctuations from year to year in receipts from specific sources.

Total expenses increased from 1935 to 1938 on both groups of farms. Individual items of expense were about the same for the three years (Table 24). Grain feed expense has tended to decrease on the non-cooperating farms, but has increased on the cooperating farms.

Table 23.--Per Cent of Receipts from Each Source on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania in 1935, 1936 and 1938

	13 non-cooperating farms			21 cooperating farms		
	1935	1936	1938	1935	1936	1938
	Per cent			Per cent		
Crops						
Grain	9.9	11.1	8.4	7.2	8.6	6.0
Tobacco	.3	1.5	3.1	.4	.9	4.7
Potatoes	1.8	6.9	3.7	5.3	11.4	6.5
Other crops	10.3	5.5	8.4	5.1	3.7	4.1
Total crops	22.3	25.0	23.6	18.0	24.6	21.3
Livestock						
Dairy	36.2	35.3	39.7	39.9	40.9	49.0
Poultry	19.3	18.8	19.5	11.3	10.7	11.0
Other livestock	10.4	7.6	7.5	9.3	3.4	9.4
Total livestock	65.9	61.7	66.7	60.5	55.0	69.4
Miscellaneous						
AAA payments	2.2	1.7	1.3	2.1	1.6	1.9
Man labor off farm	1.1	1.9	2.2	3.2	2.1	3.1
Other miscellaneous	.5	1.0	.5	.3	5.0	.4
Total miscellaneous	3.8	4.6	4.0	5.6	8.7	5.4
All other	8.0	8.7	5.7	15.9	11.7	3.9
Total per cent	100.0	100.0	100.0	100.0	100.0	100.0
Gross receipts	\$3,436	\$3,334	\$3,243	\$3,315	\$4,070	\$3,279

Some definite changes are indicated between the cooperating and non-cooperating farms from 1935 to 1938. On the cooperating farms there was a decrease in crop acres, a higher percentage of the corn fed rather than sold, comparatively better yields, more lime and fertilizer used per acre of crops, and a little more feed purchased. The labor income for the cooperating farms was comparatively better between 1935 and 1938, but for the period 1936 to 1938 the labor income on non-cooperating farms decreased less than for the other group (Table 25).

#### Implications of Program

CONSERVATION OF SOIL.--Data obtained at the various erosion experiment stations show conclusively that strip cropping and contour cultivation on sloping land greatly reduce the soil and water losses that follow up-and-down hill cultivation or planting a long slope to a single crop. These and other control measures recommended by the Service should greatly decrease the soil and water losses on these farms.

PRODUCTION.--Total production is determined by acreage and yield per acre. Reduction of erosion, conservation of moisture, a possible improvement in the physical condition of the soil, a possible increase in applications of lime

Table 24.--Per Cent of Expenses from Various Sources on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania, in 1935, 1936, and 1938

	<u>13 non-cooperating farms</u>			<u>21 cooperating farms</u>		
	1935	1936	1938	1935	1936	1938
	Per cent			Per cent		
Labor, hired	12.4	10.8	13.2	10.8	11.4	12.2
Labor, family	11.2	11.0	8.7	12.4	7.0	9.3
New buildings and repairs	4.2	8.6	5.3	6.0	15.3	2.9
New machinery and repairs	4.8	5.9	4.9	2.6	4.4	4.0
Milk hauling	4.5	3.5	4.2	4.3	4.3	5.2
Truck	.2	.5	.3	1.9	1.5	2.0
Tractor	2.7	2.7	4.2	.9	1.1	1.6
Auto	4.0	2.9	3.9	3.0	2.5	3.7
Taxes	5.1	4.2	4.9	4.2	3.7	4.1
Electricity	.4	.4	1.1	.3	.3	.5
Purchased grain	19.7	14.0	17.3	14.4	12.1	15.8
Seed	3.0	3.1	4.4	3.5	4.1	4.1
Fertilizer	8.1	7.9	8.6	7.5	6.8	8.6
Lime	.6	.6	.7	.8	.6	2.0
All other	19.1	23.9	18.3	27.4	25.1	24.0
Total per cent	100.0	100.0	100.0	100.0	100.0	100.0
Gross expenses	\$2,169	\$2,547	\$2,614	\$2,188	\$2,764	\$2,294

Table 25.--Comparison of Various Factors on Non-cooperating and Cooperating Farms in Lancaster County, Pennsylvania

	<u>13 non-cooperating farms</u>			<u>21 cooperating farms</u>		
	1935	1936	1938	1935	1936	1938
Acres in crops	80.1	79.1	85.2	73.1	65.5	62.0
Animal units	22.2	22.8	23.1	21.6	22.8	21.8
Crop index	125	121	118	129	136	121
Value products sold per cow	\$95	\$89	\$104	\$93	\$106	\$108
Per cent of corn fed	86.0	88.0	89.0	85.0	91.0	97.0
Tons purchased feed	12.3	9.0	10.8	8.1	7.7	9.8
Value fertilizer per acre crops (excluding hay)	\$2.88	\$3.06	\$3.57	\$3.18	\$3.59	\$4.43
Tons lime per acre crops in past 3 years	-	-	.15	-	-	1.13
Labor income	\$593	\$113	\$-38	\$564	\$728	\$406

and fertilizer after establishing the program, and some improvement in varieties and practices will tend to maintain or increase yields. On the other hand, a continuation of some erosion and lack of good fertility practices on some farms will tend to retard an improvement in yields. With "normal" weather conditions, yields will probably not improve much on cooperating farms over the yields on

non-cooperating farms in the next few years. During periods of dry weather contour cultivation will conserve more of the moisture at a time when this is an important factor in determining yields, while during especially wet seasons possibly contour cultivation might tend to decrease yields by conserving too much moisture. However, with general farm crops on the principal soils in the area, Chester and Manor, this is not a hazard.

On the 21 farms, the acreage of clean tilled crops will be decreased by 2.5 acres or 10 per cent by the end of the 5-year agreement period. In 1938 a check up showed that the acreage of clean tilled crops had already been reduced 4.3 acres or 18 per cent from the average at the beginning of the program (Table 26). Most of this reduction in acreage will be in corn which is usually fed to livestock. The program will probably result in a slight decrease in total corn production but increases in yields could easily offset the decreased acreage for most farms.

Table 26.--Acreage of Specified Crops in 1938 and Recommended Under the Soil Conservation Service Program for 21 Farms in Southern Lancaster County, Pennsylvania (Not Including Rented Land)

	Before contract	1938 crop year	After contract
Clean tilled			
Acres per farm	24.3	20.0	21.8
Acreage change		-4.3	-2.5
Per cent change		-18.0	-10.0
Semi-erosion resistant			
Acres per farm	21.0	19.2	18.3
Acreage change		-1.8	-2.6
Per cent change		-9.0	-13.0
Erosion resistant			
Acres per farm	21.1	19.7	24.9
Acreage change		-1.4	+3.8
Per cent change		-7.0	+18.0
<b>Total acres</b>	<b>66.4</b>	<b>58.9</b>	<b>65.0</b>

Semi-erosion resistant crops, mostly wheat and oats, will be reduced 2.6 acres per farm or 13 per cent. In 1938 a reduction of 1.8 acres or 9 per cent had taken place. The above changes will probably result in less wheat for sale and less oats for feed. It is not likely that yields will be increased enough in the next few years to offset the planned decrease in acreage.

The erosion resistant crops (all hay except soy beans) will be increased 3.8 acres or 18 per cent under the program. In 1938 the acreage had decreased 1.4 acres from the original acreage at the beginning of the program. An unusual increased use of lime on cooperating farms, an increase in alfalfa acreage, and an 18 per cent increase in all hay acreage should result in an increase in yield and from a 25 to 30 per cent increase in total hay production.

There is no doubt that some of these farms will follow the practice of renting additional land to supplement future needs that cannot be met on their own land. In 1935, 5 of the 21 cooperating farms included in this analysis and

2 of the 13 non-cooperators rented additional land. These 7 farms rented an average of about 50 acres of land, approximately two-thirds being crop land and the rest pasture. In 1938 there had been about a 65 per cent reduction in the acreage of land rented by cooperating farms, but the non-cooperators have continued to rent about the same amount of land.

Pasture before the program consisted of 22.8 acres of permanent pasture, 2.2 acres of temporary pasture, 1.3 acres of woodlands, and an average of 12 acres of crop land grazed after harvest. The acreage of permanent pasture will be increased 1.4 acres under the program. In addition, much of the pasture will be treated with lime and fertilizer. In many cases some of the poorest pasture land was reforested and more fertile land was used in its place. The above changes will improve the permanent pastures considerably. On the other hand, aftermath grazing will be inconvenient or impractical in some cases under a system of strip cropping. Many farmers, however, are overcoming this difficulty by the use of an electric fence. The available pasture will be about the same as before the program.

The acreage planted to forest trees is relatively small for the area, but on a few farms it is rather important. In most cases this is on land unsuited to the production of other crops or pasture. Reforestation will eventually create effective erosion control and will be of more value than idle or waste land.

**TYPES OF FARMING.**--The important sources of income in the area (Table 7) are dairy cows, poultry, beef cattle, canning crops, potatoes, wheat and tobacco. Some of the farmers produce most of the above, while others depend upon two or three for their income. Assuming that the land use program recommended will change production somewhat as outlined above, it is probable that adjustments will be made in livestock and acreage of specified crops.

An increase in the production of hay will have a tendency to increase the number of roughage-consuming animals. In all probability this will mean more dairy cows and heifers. On a few farms, however, there will be a shift from corn to grass silage. The shift would tend to counteract the change in the acreage of the various crops planned under the program. An increase in the numbers of dairy cows would call for increased purchases of grain feed unless feeding practices change materially.

Since the practice of feeding beef cattle depends largely upon the current price of feeders and the available feed supplies, the change in crop acreage may affect the number and time of year they are purchased for individual farms but should have little effect on this enterprise as a whole.

The poultry enterprise will probably be affected very little by the program. The reduction in grain production, especially wheat, will result more in a decrease in amounts for sale rather than for feed.

Hogs are produced primarily for home use in this area. A few farms make a practice of raising hogs for sale. A reduction in corn acreage will tend to reduce the number of hogs raised, especially on a few of the farms.

The growing of cash crops such as potatoes, tobacco, sweet corn and peas will probably continue much the same as before, unless on some farms these

crops were generally unprofitable and the Soil Conservation Service has encouraged the operators to change to a more profitable crop from the viewpoint of net returns and soil conservation. Prices and the available labor supply is an important factor affecting a farmer's decision in growing these crops.

**LABOR AND POWER COSTS.**--The program will, in most cases, bring about a complete change in the farm layout, especially in the boundaries of each individual strip. In most instances these strips may be considered as separate fields because usually the cropping plan calls for a different crop in adjoining strips for each year. These changes have raised the question of how much will labor and power costs change as a result of the program.

Changes in time required for various field operations will depend largely upon the size and shape of the new fields as compared to the old fields. Studies in various states have shown that labor is more efficient in working large fields than small ones. The average size of the fields has been reduced under the program, but in many cases the strips run the length of two or more original fields which should increase the efficiency on these strips. On some farms the time needed for doing the field work, per acre, will be increased as a result of the program while on others it will be decreased.

However, if the cropping plan is carried out as indicated in Table 17, an 8 per cent reduction in time used to produce these crops based on average requirements will follow providing there is no change in efficiency. The reduction in acreage of crops requiring a relatively large amount of labor per acre, such as corn, is the reason for the decrease. Under the new farming plan most of the field operations would be conducted on the contour. This would eliminate much of the up-and-down hill work which was the usual practice before adopting the Soil Conservation Service program. Horse and tractor power should be reduced under these conditions. Results of experiments in Kansas show that contour work uses less power and fuel than working up and down hill.\*

**INDIVIDUAL FARMS.**--In discussing the implications of the Soil Conservation program up to this point, the effect upon the area as a whole was emphasized. It might be well at this time to select a few farms and point out some of the possible effects of the program upon each one. In doing this it would be highly desirable to have one or more farms representative of the entire area, but obviously that is impossible. The planned program is far from uniform on different farms. For the average farm acreage of clean tilled crops has been reduced, but on some farms acreage of these crops will be increased, because of the needs of the farm business. Possibly the best approach is to select several farms, each of which may be typical in many respects to a number of farms in the watershed. The effect of the program upon the agriculture of the area may or may not be implied by the individual farm cases. That depends upon what farms are selected as samples.

The program planned for Farm Number 1, Table 27, will increase the acreage of clean tilled crops and decrease the acreage of erosion resistant crops. Pasture acreage will remain the same. According to survey records the land use on this farm has not changed much in the past three years; the most important being a decrease in the acreage of potatoes and corn. Numbers of cows and heifers

\*E. L. Barger, "Power, Fuel, and Time Requirements of Contour Farming."



have been doubled from 1935 to 1938 (Table 28). During this same period much more grain feed was purchased and a higher percentage of the home grown grains were fed. Farm income increased from \$1,233 to \$2,878, primarily because of increased numbers of profitable dairy cows.

Table 27.--Acres of Crops and Pasture on 3 Farms in Lancaster County as Planned by the Soil Conservation Service

	Farm No. 1		Farm No. 2		Farm No. 3	
	Before agreement	After agreement	Before agreement	After agreement	Before agreement	After agreement
Clean tilled crops	22	29	24	13	20	18
Seni-erosion resistant crops	17	18	12	12	25	29
Erosion resistant crops	33	25	9	20	33	31
Permanent pasture	23	23	2	4	33	30

The Soil Conservation program calls for a decided increase in clean tilled crop acreage by 1941. This change will make it possible for the operator to greatly reduce his present grain feed bill. The land use plan appears to be very well suited to the type of farming followed and to the needs of the livestock on the farm.

Farm Number 2, Table 27, is primarily a poultry farm with additional income from various truck crops. The program will increase hay acreage and decrease the acreage of corn and truck crops. The data from survey records indicate that the cropping plan is being followed very closely. In 1938 this farmer made less income than in 1935 (Table 28). Available hay is in excess of present livestock needs. In 1938 fewer acres of truck crops and corn were grown, more feed was purchased, and fewer numbers of poultry were kept than in 1936. The proposed plan on this farm will evidently reduce the value of business and for this reason may reduce the amount of farm income.

Farm Number 3 (Table 27) will maintain about the same acreage of the various crops when his soil conservation program is adopted. Survey records indicate that there has been some decrease in crop acres from 1935 to 1938. During this same period there has been a decrease in animal units, livestock receipts per animal unit, crop yields and farm income, while there has been an increase in the amount of feed purchased (Table 23).

There are no indications that the program has definitely contributed to the decreased income on this farm. Of course, all the factors are not taken into account in this analysis. From personal observation and knowledge of this farm, the decline in income is mainly due to declining interest in farming and lack of good management, and is not due to the program of conservation planned for it.

FARM INCOME.--The factors that affect farm incomes in any area are very numerous, and it is difficult to determine accurately the effect any one factor has upon income. For this reason it is impossible to say what effect the Soil Conservation program alone will have upon farm income. To determine the effect of the program upon incomes it would be necessary to know the answers to

Table 28.--Land Use, Livestock and Other Data for 3 Farms in Lancaster County as Reported by the Farm Operator

	Farm no.1		Farm no.2		Farm no.3	
	1935	1938	1935	1938	1935	1938
Acres						
Clean tilled crops	23	18	21	15	16	15
Semi-erosion resistant crops	16	20	11	9	26	25
Erosion resistant crops	28	30	9	20	30	25
Pasture	25	25	11	4	32	33
Livestock, average number						
Cows	8.0	16.5	1.0	1.0	7.0	7.0
Heifers	5.0	10.0	0	0	2.0	0
Work animals	3.5	4.0	4.5	3.0	3.0	2.0
Hens and pullets	20	20	705	675	300	250
Total animal units	14	26	12	11	14	12
Income and other factors						
Productive man work units	412	534	435	390	357	313
Crop index	175	160	113	105	105	79
Tons feed purchased	9	22	14	20	1.5	4.8
Livestock receipts per animal unit	\$202	\$240	\$244	\$161	\$133	\$91
Farm income	\$1,233	\$2,878	\$1,661	\$922	\$772	\$-39

such questions as the effect or influence upon yields, costs of labor, fertilizer, feed, etc., type of farming, efficiency, what adjustments will be made in the proposed plan, feeding practices, and many others. None of these questions can be fully answered at this time.

One of the most important factors that might change the farm returns is the land use plan recommended, usually a decrease in clean tilled acres and total acres in crops, and an increase in hay acres. This normally results in a smaller volume of business which is likely to decrease net returns unless counteracted by increased yields, increased amounts of purchased feeds or increased efficiency. On most farms the change in the cropping plan should not have much direct effect upon returns because the shift from the original plan has not been excessive.

It is possible that in many cases the adoption of a soil conservation program may result in lower incomes temporarily while numerous adjustments are being made, but eventually may result in a more profitable organization from the standpoint of soil conservation and sound farm management. A continuation of good soil conservation practices will tend to maintain yields, pasture production and farm income, while a farming system that continually depletes the soil will certainly result in relatively lower yields and net returns.

### Summary of Physical Accomplishments

At the time this manuscript was finally approved for release (February 1, 1941), a re-survey of both cooperating and non-cooperating farms had been made covering the year 1940. A publication showing further progress and effects of the program will be released some time in the future.

A Soil Conservation District whose area is 183,565 acres was voted in by the farmers of part of Lancaster County in 1938 and is now in successful operation. Up to January 1, 1941, 425 farmers operating 43,000 acres have cooperated either with the Lancaster Soil Conservation District or the Soil Conservation Service in a program of soil and moisture conservation on their farms. In addition, through spread of practice many other farmers have adopted one or more soil conservation measures on their farms--of which no record is available.

A survey of major physical accomplishments on the land as shown by records of the District Supervisors of the Lancaster Soil Conservation District and the Soil Conservation Service follows:

<u>Practice</u>	<u>Unit</u>	<u>Total amount accomplished</u> January 1, 1941
Contour cultivation	acres	13,137
Strip cropping	acres	9,539
Diversions	linear feet	149,127
Terracing	miles	40
	acres	674
Tree planting	acres	1,081
Obstruction removal (for strip cropping and terracing)	acres	3,422
Contour furrows	acres	468
Planting grass	acres	1,423
Gullies treated	number	1,818
All conservation practices combined	acres	35,102