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Economics of soil conservation in West Virginia

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Economics of Soil Conservation in West Virginia

by E. C. WEITZELL

If a program for the conservation of agricultural resources is to be effective, (1) the benefits must be as great as or greater than the costs and (2) it must be applied to profitable farm enterprises

WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION
MORGANTOWN

C. R. Orton, Director

IN COOPERATION WITH THE BUREAU OF AGRICULTURAL ECONOMICS AND WITH THE SOIL CONSERVATION SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE

TABLE OF CONTENTS

Economics of Soil Conservation in West Virginia*

by E. C. WEITZELL**

THE CONSERVATION OF AGRICULTURAL RESOURCES in West Virginia involves consideration of many factors. Some are agricultural in nature, others social and industrial. Economic and social development following establishment of the early settlements is of particular significance as a background to consideration of many factors currently affecting conservation. Likewise, the interrelationship with agriculture of mining, lumbering, and manufacturing is extremely important when evaluating the forces affecting the utilization of land resources.

More important than all, perhaps, is the present social and economic status of the rural people. Regardless of the factors which may have affected conservation in the past, it is possible only to modify present conditions in order to aid conservation in the future. However, the complexity of the several factors makes it necessary to limit this treatise to an evaluation of the effects of the program applied by the Soil Conservation Service and to determine the economic feasibility of the program for the principal types of farming.

The planning of individual farm units and the development of area or district plans for conservation are dependent on the economic and social factors involved. The desires and abilities of individuals to modify the use of resources are important considerations in the effort to attain conservation of privately owned resources. It may be fairly definite, from the long-time or social point of view, that certain measures of conservation should be carried out; yet it may be to the individual's advantage, in the short period, to exploit his resources in order to survive. Hence, the economic and social pressures impinging upon private enterprise are particularly important in the endeavor to obtain the optimum use of land resources over a long period of time.

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* This treatise is an adaptation of a thesis presented to the University of Wisconsin in partial fulfillment of the requirements for the degree of Doctor of Philosophy. For a more thorough and comprehensive analysis, with particular regard to the theoretical concepts of conservation and farm-management problems, the reader may refer to unpublished copies of the original manuscript, on file with the Department of Agricultural Economics, West Virginia University.

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OBJECTIVES AND METHOD OF STUDY

The objectives of this study are threefold:

(1) to determine the economic effect of a definitely planned soil- and water-conservation program on individual farms by observing, over a five-year period, land use, crop production, farm organization, and income;

(2) to evaluate the business aspects of farming *for the purpose of determining the feasibility of a program of soil conservation;*

(3) to indicate some of the factors which should be taken into consideration when planning the use of privately owned farm lands.

The data on which this study is based represent the business and practices of about 900 farms in six areas (Fig. 1) covering the period June 1, 1935, to June 1, 1939. During each summer the data were collected by private interviewers with farm operators. The same farms were studied each year. Although some were eliminated for various reasons, new farms were not added. All inventories were checked annually to insure continuity and comparability from year to year.

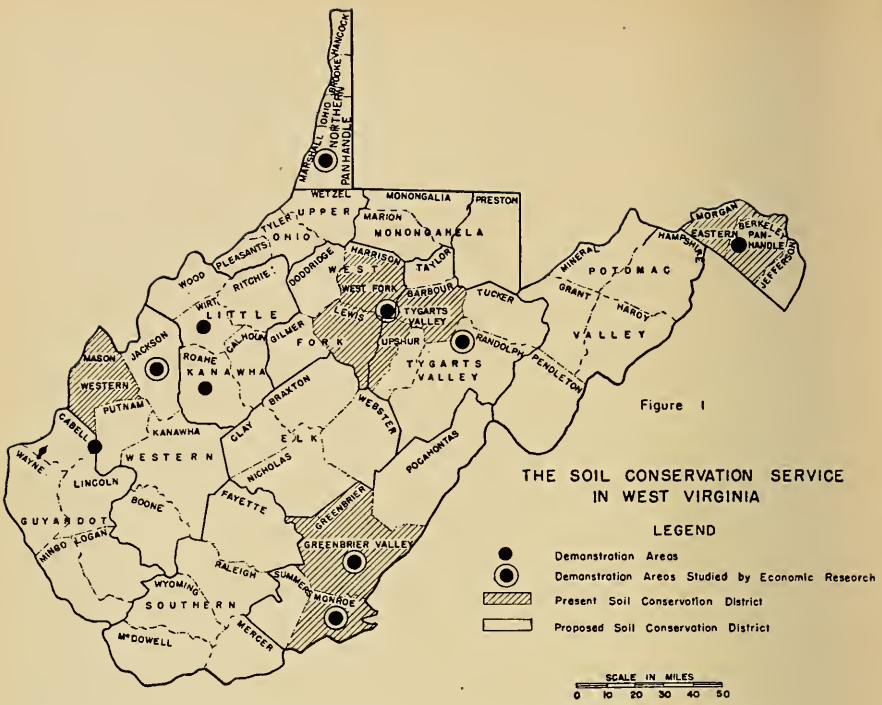

Figure 1

SOIL CONSERVATION IN WEST VIRGINIA

A recent investigation[1] in the Northern Panhandle indicates that an appreciable number of farmers had devised *field* and *contour* strip-cropping to check the erosion of sloping lands. Similar practices were found in the surrounding counties of Ohio and Pennsylvania.[2] On the other hand, most farmers were either unaware of the damage being done by erosion to farm lands or they were extremely slow in devising remedial measures.

During 1933 the Soil Erosion Service of the United States Department of the Interior established Project 13 at Spencer, West Virginia, for demonstrating measures of erosion control. Early in 1935 this work was transferred to the Department of Agriculture; the new organization was designated as the Soil Conservation Service.[3] The new agency continued the work previously inaugurated and has since expanded its demonstration projects and work areas as indicated by Figure 1.

Within these areas more than 2540 cooperative working agreements with individual farmers have been consummated. The objective has been to demonstrate *methods of conserving*

[1] Weitzell, E. C., *Strip-Cropping in Northern West Virginia.* Agr. Exp. Sta. Mim. Circ. 24, 1937.

[2] Morse, H. H., and Alger, H. B., *A Study of Some of the Older Strip Cropping In Ohio, Pennsylvania and West Virginia,* U.S.D.A., SCS-TP-20. 1939.

[3] *Soil Conservation Act,* Public No. 46, 74th Congress of the United States.

soil and water. Cooperative agreements with individual farmers provided for correcting present maladjustments in land use; rejuvenation of grazing lands by the addition of lime and fertilizer; protection, planting, and management of woodlands; pasture management; improvement in agronomic and soil-fertility practices; and engineering devices such as contour furrows, diversion ditches, gully control, strip-cropping, and other practices. In general the aim has been to provide suitable ground cover at all times for the prevention of sheet and gully erosion while providing at the same time for a more secure rural population under the prevailing system of private property in land.

THE DEMONSTRATION PROGRAM

The application of the *soil conservation program* may best be described by the "report of operations"[4]. The several phases are important as a background for subsequent analysis of the effect of the program.

Cropland

In general, a reduction has been planned for acreage devoted to crops. The degree of reduction varies, depending on the amount of hill land currently devoted to crops and on the existing severity of erosion. In Marshall County, for example, where the majority of farm land is subject to severe erosion, the planned reduction in crop acreage is 36 percent (Table 1). On the other hand, a reduction of only one percent is planned for the Harrison Area, where a much higher percentage of cropland is less steep.

TABLE 1—*The Planned Program for Cropland on 852 Farms in Six Areas of West Virginia*

Area	Number of farms	Percentage change in: All cropland	Clean-tilled crops	Small grains	Sod crops
Marshall[1]	256	—36	—25	—23	—47
Harrison	85	— 1	—21	—14	22
Randolph	138	—21	— 7	—11	—35
Jackson	68	— 7	—35	70	32
Greenbrier	134	—17	—10	—28	—13
Monroe	171	—17	—22	—10	—18
Six areas	852	—21	—21	—13	—26

[1] Project and camp work areas combined.

Contour tillage and strip-cropping are planned for all sloping croplands that are to be cultivated in order to check accelerated erosion (Table 2). These practices take the place of

[4] These data have been adapted from the *Report of Operations*, Soil Conservation Service, Clarksburg, W. Va. (The dates vary for the several areas, but the number of farms indicates point in progress.)

"square" fields and "up and down hill" cultivation and involve the replanning of the land-use pattern in many cases.

The proportion of clean-tilled and non-sod crops has been reduced, in general, while the sod crops are planned to assume a more important position in the production program. Likewise permanent hays (*i.e.*, alfalfa and mixed-legume meadows) are planned to replace rotation meadows. Thus the breaking of sod will be less frequent, and resistance to erosion strengthened.

The entire program is planned to provide more consistent and thorough cover for all lands subject to surface-water run-

TABLE 2—*Contour Tillage Planned in Soil Conservation Program for 852 Farms in Six Areas of West Virginia*

Area	Number of farms	Acreage before and after planning			
		Contour tillage		Strip-cropping	
		Before	After	Before	After
Marshall[1]	256	5131	5599	203	5281
Harrison	85	472	1232	125	776
Randolph	138	465	2358	34	2037
Jackson	68	400	875	--	494
Greenbrier	134	60	1587	26	2623
Monroe	171	111	3395	82	3427
All areas	852	6639	15046	470	14638

[1] Project and camp work areas combined.

off. Sod waterways serve as non-erosion channels for the removal of free water from plowed fields. Cover crops are recommended for critical periods between the harvesting and planting seasons. Furthermore, land less suitable for the growing of cultivated crops, being low in fertility and steep, is planned to be retired to hay and pasture. Such cover will check erosion and aid in rebuilding depleted fertility.

Grazing Land

Lands devoted to grazing have been neglected in the past. Fertility has been depleted and cover has become thin. The planned program of soil conservation is designed to improve

TABLE 3—*Pasture Land at Time of Planning Compared to that Planned for 852 Farms in Six Areas of West Virginia*

Area	Acreage		Acreage treated[1]	Acreage contour-furrowed
	Before	Planned		
Marshall[2]	12,830	13,454	8,884	192
Harrison	10,406	9,724	1,513	175
Randolph	7,134	4,552	1,214	304
Jackson	12,177	9,510	561	210
Greenbrier	17,422	15,245	1,651	461
Monroe	21,150	20,398	2,496	548
All areas	81,119	72,883	16,319	1,890

[1] Lime, fertilizer, and seed necessary to establish a desirable cover constitute treatment.
[2] Project and camp work areas combined.

pasture conditions inasmuch as practically all grazing lands in the state are sloping and therefore subject to severe erosion if good cover is not maintained (Table 3).

Reductions in acreages have been planned for some areas, seriously eroded areas being retired to forest plantings. The general aim is to improve the cover on all lands devoted to grazing. Contour furrows are provided where needed to retard surface washings until a desirable cover is established. Seeding is necessary in some cases. Lime and phosphate fertilizer are needed in greater or lesser quantities on all grazing lands. Since grazing constitutes a major land use in the Appalachian Region, the improvement of pasture land is a major function of the soil conservation program. Proper management of pastures during the various grazing periods has been emphasized in order to prevent overgrazing and consequent injury to sod.

Woodland

Farm woodlands have received even less attention than grazing lands since the development of Appalachian agriculture. Little effort has been given to protecting and caring for future farm-timber supplies. Since an appreciable area of the state which has been cleared is not suited to the production of grass or other crops, new forest plantings have been made (Table 4). Present stands have been fenced against grazing, and management plans have been developed for representative farm woodlots. The general objective is to encourage the utilization of land for its best long-time use by acquainting farmers with the methods and importance of producing woodland products as a supplementary enterprise.

TABLE 4—*Woodland Before and Planned for Conservation on 852 Farms in Six Areas of West Virginia*

Area	Acreage		Acreage treated	Acreage planted
	Before	Planned[1]		
Marshall[2]	3432	6805	5108	1366
Harrison	100	1158	1117	538
Randolph	1678	5338	1151	616
Jackson	455	3341	2601	1021
Greenbrier	2870	4536	2310	541
Monroe	2137	4717	1450	599
All areas	10672	25895	13737	4681

[1] Woodland heretofore unprotected and new plantings.
[2] Project and camp work areas combined.

Supporting Operations

Data in Table 5 indicate a portion of the operations that have been carried out, in addition to land-use adjustments, in an effort to check soil erosion. A major operation has been the processing of limestone for aiding pasture improvement. Diver-

sion ditches have been used widely in eliminating the concentration of water where gullies and sheet erosion are serious. Fencing for the protection of woodlands against grazing and to facilitate grazing rotation has been a general task. Drainage is important in some areas for permitting the use of level land for cropping in order that steep land may be retired to a less intensive use. Various types of dams, gullybank sloping, and

TABLE 5—*Miscellaneous Erosion Control Work on 852 Farms in Six Areas of West Virginia*

Item	Areas					
	Marion	Harrison	Randolph	Jackson	Greenbrier	Monroe
Limestone processed (ts.)	8,768	4,937	3,211	[1]	12,376	11,379
Diversions (lin. ft.)	78,566	20,240	32,506	14,776	39,801	37,476
Fencings (rds.)	51,181	13,429	13,238	[1]	14,089	18,713
Drainage (lin. ft.)	3,500	----	2,896	[1]	200	----
Temporary dams (no.)	488	403	30	967	322	418
Permanent dams (no.)	408	59	14	12	95	58
St. bank prot. (sq. yds.)	9,878	2,537	605	[1]	0	0
Ponds (no.)	0	0	0	2	8	7

[1] Data not available.

gully plantings have been installed to heal the wounds of active gully erosion. Stream bank protection has sometimes been deemed desirable where bottom land is being destroyed by constant cutting of a stream channel. Stock ponds are provided, particularly in areas of subterranean drainage, in order that the best use may be made of some lands. Artificial water supplies are often essential when grazing lands are subdivided for management purposes.

Many other special practices have been used in support of the efforts to conserve soil and water on farm lands. However, the preceding tables indicate the general practices constituting the program. In order to effect the demonstrations described above, subsidies in the form of labor, limestone processing, fertilizer, fence wire, and other materials have been made to individual landowners who agreed to follow the planned program for a five-year period. Undoubtedly the speed of the work has been accelerated by reason of such inducements; *i.e.*, educational work has been made easier.

SOIL CONSERVATION DISTRICTS

Soil conservation methods and practices were tested and demonstrated on individual farms with the aim that practices which were demonstrated to be useful in the conservation of soil and water would be accepted generally by farmers. However, the "sphere of influence" of these demonstration areas was not so great as desired. It was apparent that a need existed ". . . for some mechanism or avenue whereby the principles

and tools of wise land use could be introduced and applied over most or all the area requiring treatment."[5]

Soil Conservation districts were recommended for this purpose. States were encouraged to enact enabling legislation for the organization of such districts. Soil Conservation districts are designed for the "coordination of programs" and for the "coordinate application of appropriate programs in the interests of achieving maximum" conservation of soil and water. The central aim is to "attain a better standard of living through wise land use and conservation of soil and water resources."[6]

Enabling legislation providing for the establishment of Soil Conservation districts was enacted by the West Virginia Legislature in 1939.[7] This law provides, among other things, that 25 landowners may petition the State Soil Conservation Committee, established by law, for the establishment of a district for a proposed area. Recognizing such display of interest on the part of landowners, the State Committee holds a hearing within the proposed district. If it determines, as a result of the hearing, that there is need for the proposed district, the committee defines the boundaries and causes a referendum to be held, at which all *landowners* within the proposed boundary are eligible to vote for or against the formation of such district. After the referendum, and if at least 60 percent of the votes cast are in favor of the formation of a district, the State Committee further determines whether the operation of the district is administratively practicable and feasible. If the district is approved, two supervisors are appointed by the State Committee and three are elected by the landowners to act as the governing body of the district.

Before March 1, 1941, ten referenda were held in connection with ten proposed districts (Table 6). In five of the referenda

TABLE 6—*Results of Ten Referenda for Organization of Soil Conservation Districts in West Virginia*

Soil Conservation District	Number of counties	Number voting		Percentage of all farmers in area voting[1]
		For district	Against district	
West Fork (WV-SCD-1)[2]	2	799	53	18
Eastern Panhandle (WV-SCD-2)	2	264	119	19
Greenbrier Valley (WV-SCD-3)[2]	2	987	70	21
Western (WV-SCD-4)	1	368	150	21
Upshur-Barbour (WV-SCD-5)[2]	2	343	129	10
Hughes River	1	270	341	29
Northern Panhandle[2]	4	354	1089	34
Little Kanawha	5	1391	1487	29
Great Bend[2]	1	315	282	22
Tygarts Valley[2]	1	219	551	39

[1] 1935 Agricultural Census.
[2] Including parts or all of camp work areas and demonstration projects established more than one year before referendum.

[5] Bennett, H. H., *Report of the Chief of the Soil Conservation Service.* 1939, pp. 8-14.
[6] Bennett, H. H. *Ibid.*, pp. 10, 12.
[7] Soil Conservation District Law, S.B. 199, Reg. Session, W. Va. Legis. 1939.

the voting was favorable to the formation of the proposed districts, while in five it was not. (The five approved districts are being established as indicated on Figure 1.) In those areas approving the formation of districts less than 18 percent of the landowners residing therein participated in the referenda, while in those areas where the proposal was defeated 31 percent of the eligible voters participated. In practically all cases, appreciable opposition was offered.

The opponents of district organization have based their action on the fear of public control of private property. Section 9 of the Soil Conservation District Law[8] provides for land-use regulations upon approval by 60 percent of the *voting landowners*. Under the provisions of Section 10, these regulations become binding on *all* landowners; furthermore, failure to conform may result in compulsory court action to require nonconforming users to apply specified erosion-control practices or to be subject to judgment by the court for the expense of installation of erosion control by the district.

The success of the "district" program is yet to be demonstrated. The operation of such districts independent of public subsidy will depend on the initiative of farmers and on their ability to act in a cooperative or collective fashion. Continued public subsidy will stimulate operation temporarily in so far as farmers are able to realize a gain from their participation in the program. The real test of the district type of organization will come when the respective districts are allowed to succeed or fail on the basis of the merits that they offer for doing a job in a collective fashion which was not done by farmers operating individually. The extent to which Soil Conservation districts actually are, or become, farmers' organizations enabling farmers to do collectively what the individual cannot accomplish on his own will decide the case. Such organizations, independent of government subsidy, will pass quickly unless they are an asset to the business of farming.

It is not difficult to see that such units of local government may render a real benefit to West Virginia farmers, to the extent that they will act collectively. The processing and purchasing of lime and fertilizer; the acquisition of expensive machinery for terracing, drainage, and other operations; and the execution of other jobs that are beyond the scope of the individual farm business represent some of the types of services that should be facilitated by Soil Conservation districts. Furthermore, this type of organization offers suitable channels through which various agencies may work with the farmer more effectively; and the farmers, in turn, may take advantage of better business practices and agency services in a more satisfactory manner.

[8] *Ibid.*

GENERAL FACTORS AFFECTING CONSERVATION

The environment and the philosophies of people have a noticeable effect on the manner in which resources are utilized and on the degree of acceptance of new ideas. Practices that have been followed by several generations are often reluctantly discarded for more advanced methods. Likewise, a people that is industrially minded often fails to appreciate land resources as much as those peoples who have depended almost entirely on the land for many generations.

Perhaps the most potent forces in the determination of the interest in and the foresight manifested toward resource conservation are philosophy of life and standards of living. Frugal agricultural people who look forward to valuable land holdings are quick to see the importance of conservation. On the other hand, a commercially minded people, little mindful of the distant future, is prone to exploit resources, hoping to move on to other sources of income. Observation seems to indicate that real conservation depends on a close tie-up between social institutions, custom, landed estates for children, and greater dependence on farming as a vocation. The policy of taking from land and investing in commercial enterprises must be changed to the ideal of investing *and reinvesting* in land for the assurance of future income.

PHYSICAL CHARACTER OF RESOURCES

Climate, topography, and soils are probably the most important factors influencing erosion. On large areas of the State, agricultural practices must be confined to those which will prevent excessive run-off and erosion.

West Virginia has 40 to 50 inches of rainfall annually, distributed fairly uniformly throughout the year. There are numerous exceptions to this mean condition, as indicated in Table 7. During any year, sections of the State may suffer from excessive or from insufficient precipitation. Furthermore, intensive rainfall after a more or less droughty period results in serious erosion damage where ground is covered inadequately. Drought periods frequently create grazing problems in late summer, particularly on steeper lands and in the limestone plateaus with subterranean drainage. Another serious erosion factor is the frequent freezing and thawing, during periods of heavy precipitation, where soil cover is sparse. Consequently it is important that the hillside soils be kept adequately covered during all seasons of the year to guard against excessive soil losses.

"More than any other factor, slope determines the suitability of land for agriculture. As the slope increases, erosion becomes more severe, fertility is maintained with greater difficulty, and

TABLE 7—*Precipitation for Second and Third Quarters of Years and Total Annual Precipitation in Six Areas in West Virginia with Which This Study is Concerned, 1935-1940*

	Inches of rainfall in counties:[1]								
	Greenbrier			Monroe			Randolph		
Year	Total	2nd[2]	3rd[2]	Total	2nd	3rd	Total	2nd	3rd
1935	51.6	12.0	15.8	[3]	---	---	58.2	15.7	17.4
1936	34.9	6.5	7.2	37.4	5.1	12.0	51.5	11.4	13.1
1937	39.9	6.8	12.2	37.9	6.3	11.4	50.6	12.9	13.2
1938	38.8	12.5	14.7	38.2	14.0	11.8	44.8	16.5	12.1
1939	30.6	8.2	7.7	29.0	7.3	7.9	48.9	16.2	9.7
Mean	39.5	10.6	10.5	37.9	10.1	10.2	44.9	12.7	12.4
	Jackson			Marshall			Harrison		
Year	Total	2nd	3rd	Total	2nd	3rd	Total	2nd	3rd
1935	52.9	15.1	17.2	41.8	12.1	12.7	47.5	12.8	15.3
1936	33.2	6.3	7.1	36.6	7.2	10.2	37.5	7.8	10.0
1937	40.9	8.9	8.4	51.0	16.7	13.0	50.7	11.2	7.0
1938	40.4	17.0	10.4	41.8	17.1	9.3	40.6	15.8	7.8
1939	39.3	10.7	9.5	39.1	13.7	8.5	44.1	13.1	10.5
Mean	40.0	11.1	9.7	37.7	10.2	10.8	43.7	11.9	11.6

[1] Reported by the United States Weather Bureau in *Climatological Data,* Parkersburg, W. Va.
[2] 2nd quarter—April, May, June.
3rd quarter—July, Aug., Sept.
[3] Data not available for 1935.

the cost of production increases."[9] The topography of agricultural land ranges from level river bottoms to hillsides having slopes in excess of 50 percent. Less than 16 percent of the entire land area of West Virginia has a slope of 12 percent or under. Almost 66 percent of the total area has a slope of 25 percent or more. Thus it is quite evident that, unless the hillside soils are kept covered, rapid run-off of surface water will create serious erosion problems, anywhere along the stream.

The six areas that are to be studied in detail here represent variations in topography within the several parts of the State. For example, Marshall County, representative of the Northern Panhandle, has very little land that is nearly level. This sharply dissected area is composed mostly of ridge tops and narrow bottom or terrace soils. In contrast, Greenbrier and Monroe Counties are characterized by reasonably large areas of rolling limestone plateaus. Much of the crop and pasture land there has a slope of less than 12 percent. In almost all counties there is an appreciable area of land not suited to any type of agricultural enterprise because of topography. In Jackson County a large percentage of the farms depend on narrow valleys for cropland. Spring and summer showers cause frequent overflowing of these bottom lands. In some years crops are completely destroyed by inundation and silting.

Bottom and terrace soils constitute less than eight percent of the total land area of the State. In many cases these soils

[9] Pohlman, G. G., *Land Classification in West Virginia,* W. Va. Agr. Exp. Sta. Bul. 284, 1937.

several common crops. In the absence of drainage they are usually devoted to permanent meadows or pastures.

The upland soils with limestone influence constitute the best grazing and meadow lands of the State. Still, large areas of upland sandstone and shale soils are utilized as crop and pasture land. The original soils were thin and in many cases very steep. Lack of suitable erosion-resistant cover has resulted in losing practically all the topsoil in some cases and in the development of serious gullies, which render the land almost worthless.

According to the Reconnaissance Erosion Survey,[10] about 10 percent of all land in the State is subject to little or no erosion. This consists of bottom lands and densely covered forest lands. The severity of erosion indicates that the problem of rejuvenating the productivity over wide areas is a serious one. The cost of rebuilding topsoil and fertility may be high on many farms. These facts also imply that much of the steeper, severely eroded land probably is suited to no other purpose than forestry.

In some areas, erosion of present pasture lands is possibly greater than that of the lands currently used for crops for the reason that much of the steeper land now utilized for pastures was originally devoted to crop production until fertility was greatly depleted. For example, a comparison of data for Marshall County[11] indicates more severe erosion of pasture than of cropland. These facts emphasize the desirability of correct land use and the need for erosion-prevention practices.

Approximately seven percent of the total land area of West Virginia is suitable for crop production; approximately 40 percent is adapted to grazing, and the remaining 52 percent, exclusive of urban and industrial lands, is adapted to forestry only. In general, West Virginia agriculture is composed of livestock grazing. Some counties have more land suitable for crops than others. For example, about 20 percent of the land in Monroe County is suited to crop production, while less than 4.0 percent is so adapted in Randolph.[11a]

Markets and Prices

During the five years covered by this project (1935-1939) farm prices varied widely. The general price level for 1939 was lower than it was during 1935. However, specific commodity prices were appreciably higher during the latter year. During 1937 the price level rose to the highest point of the period, principally as a result of the very high prices received for meat animals.

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[10] *Reconnaissance Erosion Survey of West Virginia,* United States Department of Agriculture, 1934.

[11] Weitzell, E. C., *Economic Implications of Soil Conservation in Marshall County,* W. Va. Agr. Exp. Sta. Bul. 293, 1939.

[11a] Pohlman, G. G., *op.* cit., p. 22.

Higher prices for meat animals in particular contribute, to a considerable extent, to the higher farm incomes following 1935. Poultry and egg prices were also higher during the period of 1936-1938, inclusive.

Prices paid by West Virginia farmers increased during the same period but, because of a lag, did not increase as rapidly. Hence farmers gained an advantage in net income during 1936 and 1937. They apparently continued to hold an advantage in purchasing power in comparison with U. S. farmers during the succeeding two years (Table 8). This increase is another contributor to higher farm incomes during 1936 and 1937. The purchasing power of West Virginia farm products appeared to be about the same in 1939 as it was in 1935. If we assume the same relationship between production and consumption, farm incomes should not differ greatly.

TABLE 8—*Prices Received and Paid by Farmers for Consumption and Production Commodities, 1935-1939*[1]

Year	Index of: Prices received[2]	Index of: Prices paid	Ratio of prices received to prices paid: W. Va.	Ratio of prices received to prices paid: U. S.
1935	102	125	82	86
1936	111	124	90	92
1937	117	130	90	93
1938	100	122	82	78
1939	101	121	83	77

[1] Index based on retail prices paid by farmers in the United States, 1910-1914 = 100; Prepared by the Bureau of Agricultural Economics, United States Department of Agriculture, *Agricultural Situation.*

[2] All commodities—West Virginia.

In general, West Virginia is a *deficit producing area,* as far as agricultural products are concerned. Although "home" markets are somewhat undeveloped, the possibilities of marketing the products raised are good. Large eastern consuming centers are within close range, and transportation facilities are satisfactory. In addition, the processing of milk within the State is expanding. The rapid growth of industry in connection with coal mining is also expanding home-market demands. Although somewhat removed from farm planning for conservation, the development of markets and marketing methods will undoubtedly aid in gaining higher incomes. Improvement in income, regardless of source, will render conservation more feasible in view of current consumption needs.

AGRICULTURE DURING FIVE YEARS OF CONSERVATION EFFORT

The aim of this résumé of agriculture during the five years, 1935-1939, is to indicate changes, or lack of change, in land use, cropping and fertility practices, livestock production, and income. It was during this period that the demonstration program of the Soil Conservation Service was administered. Comparisons will be made between *cooperators*[12] and *non-cooperators*[13] in an effort to point out the impact of the program on the four major types of farming. The farms designated as cooperators were planned during 1936 and 1937—the data for 1935 representing the agriculture extant before the time of planning. Since 1937 many additional farms have been planned, but it is obvious that only plans that were made before 1938 could produce results measurable during the period of this study.

Types of Farming

The rugged, mountainous State of West Virginia contains approximately 99,000 farms with an average size of less than 90 acres each (1940 Census). Although practically 60 percent of these farms are "low-income" or *self-sufficing* farms, the several types of production vary greatly—including tree fruits, small fruits, vegetables, and several types of livestock farming.

Those areas characterized by higher quality of land and better farms are devoted primarily to commercial livestock production; in the Eastern Panhandle, to fruit production.[14]

TABLE 9—*Types of Farming in Six Soil Conservation Areas in West Virginia, 1935-1939 Average*

Area	Percentage of farms according to type :[1]							Total number of farms
	General	Beef	Dairy	Poultry	Sheep	Self-sufficing	Part-time	
Greenbrier	35.7	20.8	23.5	---	3.7	12.9	3.4	135
Monroe	58.1	18.1	---	---	---	18.0	5.8	170
Randolph	32.2	---	19.9	---	---	32.4	15.5	86
Jackson	42.9	16.7	3.4	6.7	---	22.9	7.4	178
Marshall	53.9	---	29.7	---	---	13.5	2.9	142
Harrison	42.4	31.4	6.6	---	---	17.1	2.5	193

[1] Farms were classified by *type* of production according to methods set forth by F. F. Elliott, *Types of Farming In the United States,* U.S.D.A. 1933.

[12] *Cooperators* will hereinafter refer to that group of farmers who have signed and accepted cooperative agreements with the Soil Conservation Service, consisting of definitely planned programs of soil and water conservation.

[13] *Non-cooperators* are those farmers that had not signed cooperative agreements with the Soil Conservation Service.

[14] Armentrout, W. W., and Johnson, T. D., *Types of Farming in West Virginia,* W. Va. Agr. Exp. Sta. Bul. 292. 1939.

However, the larger percentage of the so-called commercial farms are of a "general" character, producing several types of commodities. Data in Table 9 indicate the predominance of general and self-sufficing farms in the six areas herein studied.

It is important to note that this type of farming classification is based on source and amount of income. Hence a farm may be classified as a specialized beef-cattle farm when cattle prices are high but may become a general farm in another year when beef-cattle prices are low and the usual volume of income is received from supplementary enterprises. A change in the type of farm does not mean necessarily that any physical changes have been made, either in the livestock program or in land use. As the various comparisons are reviewed, the character of farms should be kept in mind as a basis for evaluating apparent changes in the data. In an effort to check some of the variation caused by the shifting of some farms from one type to another, all farms that maintained the same classification of type throughout the period constitute an additional group for 1935 and 1939. The data for these *identical* farms follow that for *all farms*. Rather than burden the report with complicated tables of comparisons for each of the six areas, the data have been combined, and comparisons are made for all cooperating and all non-cooperating farms. Facts worth mentioning, regarding specific areas, are pointed out.

COOPERATORS AND NON-COOPERATORS

The Soil Conservation program has been quite similar on all types of farming. The improvement of pastures by liming, fertilization, contour furrowing, gully control, and seasonal management is a major part of the program on all cooperating farms. The programs of both the Soil Conservation Service and the Agricultural Adjustment Administration have endeavored to reduce the depleting character of the cropping pattern by substituting perennial legume hays for oats and soybeans and by reducing corn acreage.

The number of farms cooperating in the program for which records are available is indicated in Table 10. Of the commer-

TABLE 10—*Number of Cooperating and Non-Cooperating Farms Studied According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	50	50	51	100	93	114
Dairy	43	47	45	55	45	39
General	98	101	83	275	285	213
Identical farms:						
Beef cattle	27	--	27	30	--	30
Dairy	31	--	31	20	--	20
General	52	--	52	109	--	109

cial business units, general farms are the most numerous. Inasmuch as the areas from which these samples were taken represent some of the best agriculture of the State, a rather high proportion of specialized beef-cattle and dairy farms are included. Self-sufficing farms are treated in a separate section immediately following this one. There were so few units of this type cooperating in the conservation program that comparison between cooperators and non-cooperators is inadvisable.

It is apparent that cooperating farms were appreciably larger in land area than non-cooperators (Table 11), with the exception of dairy farms. The advantage in size is of particular significance in the case of general farms. Greater acreage and larger investments appear to have been given more attention in every area. For example, cooperating beef-cattle farms in Greenbrier County were capitalized at $51,000 as compared to $27,000 for non-cooperators. Investments in the cooperating general farms amounted to $12,213, while the value of non-

TABLE 11—*Size of Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:	Acres			Acres		
Beef cattle	471	509	463	410	468	434
Dairy	204	155	167	162	151	189
General	176	178	197	157	158	142
Identical farms:						
Beef cattle	567	--	549	522	--	521
Dairy	163	--	185	231	--	193
General	184	--	177	145	--	139

cooperating general farms was only $8,440. The value of land constituting cooperating farms also was about 14 percent higher than that of their non-cooperating neighbors.

It will become evident as this analysis progresses that size of operating unit has much to do with the comparative economy of operation. Hence the advantage of size and the benefits of the conservation program should not be confused. The more aggressive farmers apparently are increasing the acreage operated and the number of animal units when the opportunity is given, in order to realize greater returns. In general, however, there was a tendency toward smaller farms for the three major types, except in the case of cooperating dairy farms.

Land Use

In accord with a decrease in total acreage, a reduction in cropland is noted (Table 12). Furthermore, rather significant reductions have been made in the proportion of cropland per farm for both cooperators and non-cooperators. For example,

the proportion of cropland per cooperating dairy farm was reduced from 28 to 21 percent, while non-cooperators reduced this use from 26 to 23 percent of the acreage operated. General

TABLE 12—*Cropland on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:	Acres			Acres		
Beef cattle	70	72	65	59	64	60
Dairy	44	39	36	49	45	44
General	43	42	39	32	33	29
Identical farms:						
Beef cattle	84	--	78	75	--	68
Dairy	45	--	39	60	--	45
General	49	--	42	35	--	31

farmers in Marshall County seem to have made the most spectacular shifts in land use. In this area the proportion of cropland was reduced 35 percent in favor of an increase of pasture and woodland.

The comparisons indicate that some factor, probably the A. A. A. program, had about the same effect on shifts in land use as that of the Soil Conservation Service. On the other hand, the farmers' own desires may have been the responsible factor in the cases of both cooperating and non-cooperating farms; or a "spread of practices" stimulated by these and other agencies may be the answer.

In most areas, however, the reductions in cropland have not been as great as the cooperative agreements called for.[15] It is possible that some farm planners have been too enthusiastic about reducing cropland, rather than establishing practices that would successfully check erosion *with* crops. General farms in particular find suitable cropland a limiting factor in their production program. Hence effort designed to reduce further this land use must take into consideration the relative feasibility of alternative uses and the need for crops.

The proportion of pasture acreage varied but little during the five-year period. Slight increases may be noted for general farms, particularly in Marshall County, where pasture acreage was expanded about 14 percent. In most cases the retirement of cropland to pasture was counterbalanced by retiring severely eroded grazing lands to protected forest plantings (Table 13).

Maintenance of pasture lands on the larger specialized farms is mainly a matter of fertility and management to insure adequate soil cover. Approximately 70 percent of the area on beef-cattle farms is devoted to grazing, and this area involves the major portion of the conservation problem. Grazing prob-

[15] Refer to pages 6 to 12 for summary of planned programs for soil conservation.

TABLE 13—*Pasture Land on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	338	360	323	276	316	281
Dairy	114	73	75	76	66	103
General	96	101	107	81	84	79
Identical farms:						
Beef cattle	389	--	378	335	--	334
Dairy	78	--	80	133	--	110
General	99	--	100	74	--	72

lems have received but little attention in past years; as a result quality has depreciated.[16] Sheet erosion and gullies have cost the grazing industry large losses in carrying capacity. The current job is to rejuvenate productivity and to maintain it.

Woodland is another resource that has been ignored in connection with the operation of most commercial livestock farms. In many cases the virgin timber has been removed, after which no attention has been given to producing a new crop. The Soil Conservation program has provided fences for protection and management plans for farm woodlands. Data in Table 14 indicate the progress achieved. Cooperating farms stand out in this respect as a result of publicly subsidized fences which are to be maintained for five years as a demonstration, after which the farmer is free to manage as he deems best.

The value of protection in the farmer's mind and the demand for grazing will determine how he manages this land in the future. Although the value for grazing may be slight, woodlots

TABLE 14—*Woodland Protected on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	16	37	41	8	15	17
Dairy	8	29	40	13	10	12
General	9	17	21	5	10	7
Identical farms:						
Beef cattle	25	--	54	14	--	13
Dairy	9	--	47	10	--	11
General	4	--	23	4	--	7

will probably be grazed if more suitable pasture is scarce. Late-summer drought periods often prompt many farmers to graze woodlots.

Personal observation indicates that an appreciable number

[16] Weitzell, E. C., *Farm Management for Soil Conservation In the Harrison Area,* W. Va. Agr. Exp. Sta. Bul. 301, p. 16. 1941.

of farmers in some areas have returned to grazing areas previously fenced, after expiration of the five-year agreement. This has been noticeable in areas of low-quality pasture, where protection for several years has resulted in luxuriant growth on lands retired to new plantings.

On the other hand, if the cooperative farm-forestry program[17] demonstrates a feasible plan for the growing and marketing of forest products from farm woodlots, undoubtedly much of this protection will be permanent. This should be particularly true of larger farms where the area of more suitable grazing land is adequate and of reasonably good quality.

Crop Production

The most striking changes occurring in the agriculture of West Virginia since 1935 have occurred in the acreage of major crops grown per farm. Here again the cooperating farms stand out. Although similar changes occurred on farms in general, cooperating farmers exhibited greater tendency toward achieving a more conserving type of cropping program. In fact, the larger of these units are more easily changed, having a more flexible production pattern and greater possibility for alternative types of production. The smaller general and self-sufficing farms are limited to rather definite needs for crops on which the family and a few livestock depend. Furthermore, the larger livestock farms can utilize grass to greater advantage than is possible in the case of small subsistence units or poultry farms.

Reductions of 20 to 30 percent in corn acreage per farm may be noted for cooperators and a slight reduction for non-cooperators, except in the case of dairy farms (Table 15). Corn acreage reduction did not take place uniformly in all areas. In fact, general farms in the Randolph area expanded slightly the area devoted to this crop, while cooperators in Harrison and Greenbrier Counties reduced corn more than 40 percent. The percentage of cropland devoted to corn on cooperating dairy

TABLE 15—*Corn Acreage on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	17.3	15.9	13.0	12.6	12.5	11.5
Dairy	11.2	8.1	7.8	11.1	10.2	10.7
General	9.5	8.3	7.1	7.9	7.6	6.6
Identical farms:						
Beef cattle	22.9	--	13.0	16.3	--	14.6
Dairy	12.3	--	8.0	12.0	--	12.0
General	10.0	--	8.0	8.5	--	7.1

[17] Under the provisions of the *Cooperative Farm Forestry Act,* in Lewis County, West Virginia, the Service is planning demonstrations of intensive management of farm forests, supplementary to the usual farm enterprises.

farms declined from 27 percent in 1935 to 20 in 1939; while corn acreages as a percentage of cropland on non-cooperating dairy farms was increased from 20 to 27 percent during the same period.

Even greater contrast may be noted in connection with wheat acreage from 1935 to 1939 (Table 16). Cooperating beef-cattle farms in four areas reduced wheat materially, while in Jackson and Greenbrier areas the acreage of winter wheat was increased on non-cooperating farms. The major reductions in the production of wheat probably have been stimulated by the Agricultural Adjustment Administration. In general, there has been an appreciable shift away from non-erosion-resisting crops on both cooperating and non-cooperating farms. The extent to which this proves to be a permanent shift will depend on the value of alternative types of crops that have been substituted; this in turn depends largely on price relationships.

TABLE 16—*Wheat Acreage on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	11.2	13.0	7.8	6.4	8.2	7.0
Dairy	6.2	5.4	5.4	5.7	5.4	5.0
General	6.5	7.3	5.4	4.6	4.8	3.2
Identical farms:						
Beef cattle	16.0	--	11.3	10.1	--	10.7
Dairy	6.5	--	5.0	6.8	--	5.2
General	8.7	--	6.8	5.8	--	4.1

In so far as erosion control is concerned, and in order to complete a rotation, it is probably not necessary to reduce wheat acreage below that of corn. On the other hand, conservation recommendations have been in favor of substituting barley for wheat because of higher potential yields. Barley has been tried by a number of farmers in various locations. A few have doubled and tripled small grain yields by doing so. Probably a greater number have failed because of late planting and poor variety or strain. The fact that barley should be seeded before the corn usually is cut makes early seeding impossible; and this factor is largely responsible for the general failure to substitute barley for wheat.

Recommendations of the several agencies have been intended to discourage the production of spring oats, because of the lack of winter soil cover. Marshall County farmers have responded to this objective by reducing oat acreage 50 percent for all general farms and even more on cooperating farms. The reverse has been true in the Randolph area, where oats production has been expanded on both cooperating and non-cooperat-

ing dairy and general farms. These scattered data, together with numerous personal observations, indicate that dairy farmers in Marshall County have probably accepted the conservation program and put it into practice more effectively than has been true of any other area.

TABLE 17—*Mixed Hay Acreage on Cooperating and Non-Cooperating Farms According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	37	34	35	33	36	34
Dairy	16	15	12	20	19	17
General	19	17	15	14	15	13
Identical farms:						
Beef cattle	42	--	39	36	--	34
Dairy	17	--	13	24	--	19
General	21	--	17	14	--	13

The acreage of mixed clover and timothy on beef-cattle farms has not changed greatly (Table 17), except as alfalfa was increased. Variations occur from year to year, but the usual cropping pattern has not been changed much. In general, the larger beef-cattle farms include sufficient land which may be cultivated without serious erosion. Hence farmers are unable to realize much benefit from changing. This is particularly true where cropland has been given more attention and fertility has been held at a comparatively high level.

Cooperating dairy farms achieved notable progress toward a greater proportion of cropland in soil-conserving crops (Table 18). The proportion devoted to mixed hays and alfalfa was increased from 44 to 49 percent during the five-year period, while a similar increase of 47 to 50 percent was noted for non-cooperators.[18] In addition it is apparent that the quality of hay has been enhanced on an appreciable number of cooperating farms by the substitution of alfalfa for mixed hays.

TABLE 18—*Alfalfa Acreage on Cooperating and Non-Cooperating Farms, According to Type in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	.4	1.5	2.3	.4	.8	.8
Dairy	2.6	3.2	4.9	3.7	2.0	3.9
General	.8	2.2	3.9	.6	.8	1.2
Identical farms:						
Beef cattle	.8	--	2.5	.6	--	1.8
Dairy	2.4	--	6.4	4.6	--	3.7
General	1.9	--	4.3	.6	--	1.3

[18] There is indication that non-cooperating dairy farmers in Marshall County were following a more conserving type of cropping program in 1935.

Farmers in Marshall County were especially aggressive in substituting alfalfa for mixed hay. Alfalfa was expanded from 3.5 to 5.4 acres per general farm. This legume hay was grown only on scattered general farms in the Greenbrier and Monroe areas in 1935; but by 1939 the acreage advanced from 0.2 and 0.9 to 3.0 and 2.1 acres per farm respectively.

Comparatively high costs of seed and seedbed preparation have discouraged the production of alfalfa, along with the additional care necessary properly to harvest and store it. On the other hand, alfalfa yields have been much superior to that of mixed hay in all areas under observation (Table 19). Usually

TABLE 19—*Comparison of Mixed Hay and Alfalfa Yields on Beef-Cattle Farms in Four Areas of West Virginia, 1939*

Hay	Yield-per acre (tons) by areas:			
	Harrison	Jackson	Greenbrier	Monroe
Mixed	1.3	1.3	1.5	1.0
Alfalfa	2.7	2.8	2.8	2.3
Soybeans	1.6	1.9	2.5	3.0

alfalfa yields are higher than either mixed hay or soybeans.[19] In general, it is clear that cooperating farmers have made greater progress in improving meadows by the growing of alfalfa than has been true of those farmers not participating in the conservation program. For example, practically no alfalfa was grown by non-cooperating dairy farmers in the Greenbrier and Randolph areas.

Wheat and soybean hay are grown in some localities. Recent recommendations have been against soybeans, because of their lack of erosion resistance. However, they may be grown on bottom land without damage and are an especially good substitute when corn fails. These two crops are grown infrequently in the Greenbrier Valley, where better yields of wheat (grain) and mixed clover or alfalfa hay are obtained with less difficulty. Other crops such as potatoes, small fruits, and truck have not been important in the consideration of soil conservation, except on scattered individual farms.

Fertility Practices

The strong interest in improving rotation and permanent meadows has resulted in the treatment of appreciable acreages of cropland with lime and fertilizer (Table 20). The increase in the application of lime to cropland has been particularly noticeable since 1935. It is evident that commercial farms have treated an appreciable acreage with fertilizer in all years. Undoubtedly the program of the Agricultural Adjustment Admin-

[19] Greater attention to the preparation of soils for mixed hays, comparable to that followed for alfalfa, will undoubtedly increase mixed or clover hay yields appreciably.

TABLE 20—*Soil Amendments to Cropland According to Type of Farming in West Virginia, 1935-1939*

Type of farm studied	Acreage treated annually				
	1935	1936	1937	1938	1939
Cropland fertilized:					
Beef cattle	21.8	27.3	30.0	36.7	27.2
Dairy	17.8	16.5	20.8	16.2	16.9
General	13.9	12.3	14.4	11.3	12.4
Cropland limed:					
Beef cattle	1.6	10.5	9.6	8.4	7.3
Dairy	4.0	8.3	9.0	5.7	4.4
General	1.3	4.2	3.4	4.1	4.5

istration has been an important factor in stimulating the use of fertilizer and lime for improving soil fertility.

A common objective of the several agencies seeking to improve agricultural production has been the improvement of pastures. The elimination of broomsedge in favor of an adequate soil cover having higher grazing qualities depends on a reinvestment of some of the fertility that has been removed by many years of depletion.

Data in Table 21 indicate an appreciable acreage of pasture treated with lime and fertilizer on beef-cattle farms. On dairy and general farms the acreage treated per farm has been small. This fact appears rather important since pasture improvement is being stressed by the several agencies subsidizing soil amend-

TABLE 21—*Soil Amendments to Pasture According to Type of Farm in West Virginia, 1935-1939*

Type of farm studied	Acreage treated annually				
	1935	1936	1937	1938	1939
Pasture fertilized:					
Beef cattle	.6	.7	1.9	7.8	3.4
Dairy	.5	1.0	.8	2.9	1.9
General	--	.2	.9	1.9	.9
Pasture limed:					
Beef cattle	1.4	1.3	2.6	3.7	3.1
Dairy	--	--	--	2.2	.5
General	.2	.1	.7	.7	.5

ments. It is impossible to determine the farmers' violation of the intent of such subsidies; but the data, together with personal observation, indicate that farmers in general are not convinced of the apparent need for improving the fertility of grazing lands. Cropland is still their main interest from the standpoint of fertility. Perhaps custom is a major factor in distracting attention to cropland. Pasture is presumed to grow continuously without the need for a return of depleted fertility. However, a large number of pasture-improvement demonstrations are aiding in spreading pasture-treatment practices. Future demand

for grazing will prompt greater attention to the value of fertility amendments in maintaining carrying capacities.

Crop Yields

Fertility practices and the substitution of comparatively high yielding crops are factors in the conservation program which should contribute to higher crop yields. The effect of these items may not be fully apparent during the short period of three to five years in a comparison of averages for a number of farms. Examples of very definite improvement can be cited as individual cases, and they are not unusual. The data in Table 22

TABLE 22—*Crop Yield Index[1] on Cooperating and Non-Cooperating Farms by Type of Farm in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	150	148	150	136	134	140
Dairy	139	135	147	135	136	142
General	136	136	138	126	119	121
Identical farms:						
Beef cattle	148	--	150	148	--	141
Dairy	137	--	146	140	--	142
General	137	--	133	135	--	123

[1] Average crop yields for State, 1923-1932, equal 100.

indicate a stronger tendency toward higher yields in 1939 for cooperators than was true of non-cooperators, although lighter rainfall reduced yields in some areas. More legume hays, and less corn and wheat, together with other possible advantages that are difficult to measure, have evidently given cooperating farmers a slight advantage. This advantage may become greater as the conservation program matures.

Livestock

The number of animal units were expanded on both cooperating and non-cooperating farms between 1935 and 1939 (Table 23). The percentage expansion was somewhat greater for non-cooperating farms because of a much smaller average size of livestock enterprises. This trend cannot be attributed to any specific program, but rather to general expansion of the livestock industry throughout the State.[20] Such an increase in livestock could logically be expected after the severe droughts and depression of the early half of the decade. It is a healthy trend toward fuller utilization of resources and higher incomes. Soil conservation should aid and abet this move, making it more feasible

[20] According to data taken from the U. S. Census, "All cattle" had been expanded approximately eight percent between 1930 and 1939.

TABLE 23—*Animal Units on Cooperating and Non-Cooperating Farms by Type of Farm in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	69	76	78	61	66	63
Dairy	24	21	22	24	24	30
General	24	24	27	19	19	20
Identical farms:						
Beef cattle	83	--	93	61	--	70
Dairy	24	--	25	30	--	32
General	26	--	30	18	--	21

for West Virginia stockmen to compete with other production areas. In turn the general objective of resource improvement will be more feasible by reason of higher incomes, which should relieve the pressure on resources.

Farm Receipts and Income

Income to livestock farming is influenced by so many factors not associated with soil productivity that the effects of the program are difficult to trace into income. However, farm receipts (Table 24) follow closely the number and quality of livestock produced for sale. It should be noted that the effect of size of enterprise is clearly demonstrated by the larger cooperating general farms and the larger non-cooperating dairy farms, independent of their relationship to conservation. The advantage in larger size and investment of cooperating beef-cattle and general farms permits superiority in production, even at lower price levels. On the other hand, higher crop yields and better quality of hay and pasture undoubtedly contribute to the maintenance of a larger number of animal units at higher production levels.

TABLE 24—*Farm Receipts on Cooperating and Non-Cooperating Farms by Type of Farm in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	$4382	$5342	$4217	$3551	$4644	$3506
Dairy	1884	2028	1996	2235	2746	2826
General	1216	1725	1429	964	1024	874
Identical farms:						
Beef cattle	4883	----	4825	4256	----	3897
Dairy	1961	----	2182	2496	----	3259
General	1448	----	1448	971	----	918

In general, practices that will increase the productivity of both crop and pasture lands, enabling a larger number of animal units per 100 acres, will be economically feasible. One

of the greatest needs of West Virginia livestock farming is a larger volume of business. As long as farm prices remain at a reasonably high level, the additional returns made possible by pasture and cropland improvement will be accompanied by lower average total unit costs. Present overhead costs must be reduced per unit of output, and the only way to make this possible is to add enough additional costs to permit needed expansion.

Variation in farm expenses followed closely the variation in gross receipts, indicating that variable expenses were important in the livestock program. On the other hand, the major costs of the conservation program are not expressed as current farm costs. A large portion of the costs of lime and phosphate have been subsidized by various public agencies. The same has been true of other costs, including labor, in connection with the inauguration of the conservation program. Hence, the total impact of the program on the farm business is not commensurable at this point.

The farm records on which this analysis is based indicate that cash expenses for fertilizer, lime, and grass seed on beef-cattle farms during 1939 were from $30 to $50 higher per farm than was true in 1935. Peak expenditures of this type were reached in 1937 and have since fallen off. In general it can be said that since the annual costs of soil amendments on beef-cattle farms, even if entirely borne by the farmer, are such a small portion of farm receipts that they are usually not a burden. This assumes that the program is sound from a business standpoint and will improve both crop and livestock production. Any costs, regardless of the amount, represent a burden if not justifiable from an income standpoint over a period of time.

Although feed costs were much lower on cooperating dairy farms (Table 25), particularly in Marshall and Randolph areas, than on non-cooperating neighboring farms, farm receipts per animal unit were lower in the latter years. The production per animal unit on cooperating farms advanced from $83 to $89, while the increase was from $83 to $103 per animal unit on non-cooperating units. Thus it is rather clear that a number of factors affect profits, and it is quite reasonable that the amount of commercial feeding has had an appreciable effect on income.

TABLE 25—*Feed Expenses on Cooperating and Non-Cooperating Dairy Farms in Three Areas of West Virginia, 1935-1939*

Area	Feed expenditures (dollars)			
	Cooperators		Non-cooperators	
	1935	1939	1935	1939
Marshall	282	250	285	418
Randolph	131	142	288	304
Greenbrier	181	349	84	333

Variations in *farm income* (Table 26) are erratic, being subject to prices, climatic conditions, and managerial factors to the extent that the results of comparatively long-time adjustments are not discernible in a five-year period.

The level of costs is an important factor in determining income; consequently, higher incomes are dependent on a low ratio between expenses and receipts. The fact that incomes were slightly lower for cooperating farms does not necessarily indicate that the program has been a burden to this extent. Managerial factors and higher labor costs on larger farms are largely responsible for higher expenses in relation to receipts.[21]

TABLE 26—*Farm Income on Cooperating and Non-Cooperating Farms by Type of Farm in West Virginia, 1935-1939*

Type of farm studied	Cooperating			Non-cooperating		
	1935	1937	1939	1935	1937	1939
All farms:						
Beef cattle	$546	$562	$331	$460	$890	$498
Dairy	579	566	582	804	964	874
General	178	433	263	221	226	98
Identical farms:						
Beef cattle	650	--	568	676	--	747
Dairy	627	--	589	932	--	1005
General	350	--	320	269	--	122

Cropping patterns, fertility practices, livestock programs, and incomes have varied during the five-year period. In general, the reduction in grain crops should not hamper livestock production, while hay and pasture improvement are undoubtedly of much benefit. Many practices such as strip-cropping, pasture management, sod waterways, and crop rotations probably require a period longer than five years before benefits become apparent. In summary, it is rather obvious that *the conservation program has not materially changed the livestock farming in West Virginia.*

The commercial beef-cattle, dairy, and general farms apparently can benefit by those conservation practices which directly improve productivity. It is certain, however, that expenditures for conservation (or reinvestment) must be justified in terms of greater production per animal unit or per acre of land. *Otherwise conservation will be scrapped in favor of depletion* in order to raise the level of consumption for a short period.

An essential corollary to conservation is good farm management. Aggressive business management may mean taking advantage of the possibilities of soil improvements for greater production. In fact, good business practices include provisions

[21] It is particularly difficult to make accurate evaluations when "non-cooperating" farms are not *controlled* yet may be accepting some of the same practices and getting similar results as those cooperating in the planned program.

for the maintenance of resources at a high level of productivity for the benefit of future production. On the other hand, poor management may frustrate a conservation program by failing to realize the potential advantages. In other words, poor management may dominate the farm business to the extent that income is below the subsistence level. Hence resources will not be maintained, whether they be buildings, fences, or land.

SELF-SUFFICING FARMS

Small *subsistence* farms constitute approximately 60 percent of all farms in West Virginia and from 13 to 33 percent of the farms in the areas studied here. Since only a very small percentage of these farms were cooperators (Table 27), it would be rather difficult to make comparisons for illustrating progress toward greater conservation, and this will not be attempted. However, it is quite probable that the problems of depletion and erosion are more serious on farms of this type than commercial farms of larger acreages. For the purpose of pointing out some of the problems and reasons for giving so little attention to these farms as cooperators with the conservation program, some major characteristics will be reviewed briefly.

TABLE 27—*Number of Cooperating and Non-Cooperating Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Number of farms by areas					
	Marshall	Harrison	Jackson	Randolph	Greenbrier	Monroe
Cooperating:						
1935	7	3	4	5	4	4
1937	4	3	2	3	2	6
1939	3	3	4	6	3	3
Non-cooperating:						
1935	10	40	48	28	16	29
1937	8	33	47	25	16	24
1939	3	18	27	15	14	35

It may be noted in Table 28 that the few self-sufficing farms to which the program had been applied were about double the value of those not cooperating. This leads to an observation that self-sufficing farmers were not generally acceptable as co-

TABLE 28—*Investment in Cooperating and Non-Cooperating Self-Sufficing Farms in Six Areas of West Virginia, 1935*

Area	Total investment (dollars)	
	Cooperators	Non-cooperators
Marshall	$10,262	$3,733
Harrison	6,072	4,211
Jackson	6,082	3,394
Randolph	4,070	2,767
Greenbrier	6,262	3,586
Monroe	4,140	3,334

operators in the conservation program because of their size and low productivity. The program as applied in project and camp work areas was largely demonstrational. Small farms of low productivity and remotely located were not usually suitable to produce a satisfactory demonstration of what could be done to check erosion. This is particularly true because cooperator contributions to the program would have necessarily been limited; and where the necessary interest on the part of farmers was lacking, it was not feasible to expect even meager aid from the landowners. From the standpoint of administration it is tenable that the larger commercial farms appear to be more desirable. Larger acreages of land, on which changes conforming to the planned program were of greater scope, represented greater accomplishments in so far as coverage is concerned.

The character of many self-sufficing farms offers difficult problems to the conservation planner, and it acts as another deterrent to aid. The existence of this type of farm in a freely competitive commercial agriculture indicates that management is probably weak. The economic tendency which dictates that factors of a specific quality will tend to combine with other factors of similar quality, in general, is true of the competitive combination of management and land. Furthermore, original quality of resources deteriorates rapidly under poor management. This hypothesis should be kept in mind as the physical resources of self-sufficing farms are reviewed.

Less than 20 acres of cropland is available to most of the farms of this type, and from 20 to 60 acres of low-quality pasture. These limitations (Table 29) indicate an extremely small size of business, particularly when extensive types of enterprises are employed similar to those employed on 400-acre farms. From the planner's standpoint, small farms which cannot be enlarged should be replanned with enterprises of greater intensity.

The central aim of the conservation program has been *grass*

TABLE 29—*Size and Land Use of Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Acreage per farm by areas					
	Marshall	Harrison	Jackson	Randolph	Greenbrier	Monroe
Acreage operated:						
1935	106	92	113	85	65	76
1937	83	72	83	126	57	72
1939	94	85	106	95	55	82
Acreage in crops:						
1935	25	20	23	23	19	18
1937	17	17	17	23	16	14
1939	22	17	19	20	17	17
Acreage of pasture:						
1935	45	59	68	32	29	33
1937	35	47	47	39	27	36
1939	42	56	62	31	23	42

farming in place of grain, which means greater extensity rather than intensity. In planning, little effort has been given to supplanting present production with more intensive crop and livestock enterprises which would be more suitable to small units. Decreasing the acreage devoted to corn and oats and replacing this with meadow and pasture have constituted the conservation plans on small as well as large livestock farms.

Although few farms of this type were planned by the Soil Conservation Service, the general effect of all "conservation" education has been along the same lines. Thus the data in Table 30 indicate a uniform reduction in corn and wheat acreage, with slight increases in the acreage of hay in some areas. There is very little indication that the quality of hay (more legumes) has been improved. Practically no alfalfa has been seeded.

TABLE 30—*Major Crops Grown on Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Acreage per farm by areas					
	Marshall	Harrison	Jackson	Randolph	Greenbrier	Monroe
Corn acreage:						
1935	7.8	4.8	7.1	5.9	5.5	6.4
1937	4.4	4.1	5.9	5.2	5.0	4.6
1939	4.4	2.8	3.9	4.0	4.3	4.2
Wheat acreage:						
1935	1.3	.6	2.7	2.0	5.6	4.6
1937	2.3	.6	1.9	.9	4.6	3.2
1939	1.0	.1	1.2	1.0	3.2	3.1
Mixed hays:						
1935	12.1	11.9	10.6	9.8	6.4	5.0
1937	5.7	9.5	7.6	11.4	6.3	4.8
1939	9.7	11.2	11.4	8.6	8.0	7.1

TABLE 31—*Soil Amendments on Crop and Pasture Lands of Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Acreage cropland per farm:		Acreage pasture per farm:	
	Fertilized	Limed	Fertilized	Limed
1935	5.9	.7	--	.1
1936	4.7	.8	--	.1
1937	5.5	1.0	.1	.1
1938	5.3	1.3	.1	--
1939	5.8	2.2	.3	--

Likewise, practically no attention was given to pasture improvement. Lime and fertilizer amendments were made in only a few instances covering very small acreages (Table 31). An average of about five acres of cropland per farm was treated with fertilizer, and the lime that has been made available through the subsidy of public agencies was apparently applied to cropland almost entirely. Low crop yields seem to justify this action if proper erosion control practices are employed to prevent losses through washing. On the other hand, grazing con-

ditions are generally very poor on these small farms, making larger livestock enterprises impossible.

TABLE 32—*Animal Units and Crop-Yield Index on Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Number and index per farm by areas					
	Marshall	Harrison	Jackson	Randolph	Greenbrier	Monroe
Animal units:						
1935	6.3	8.4	8.0	4.9	7.6	7.5
1937	5.0	6.9	6.2	5.7	5.3	7.0
1939	6.8	9.1	8.3	6.6	7.0	10.1
Crop-yield index:						
1935	81	112	85	118	99	114
1937	79	110	84	102	92	107
1939	88	119	79	111	107	105

During the five-year period, crop yields have remained about constant, if one disregards climatic variations. The limited fertility practices and the lack of ability and impetus to acquire improved varieties and types of crops keep yields at a low level, three areas being below the State average of 100 for most years (Table 32).

The number of animal units per farm has been increased slightly, although the acreage of crop and grazing land has declined a little. However, the increase means little in terms of additional productivity because of its nature. Instead of adding types of livestock suited to small units of land, the tendency has been to expand extensive cattle enterprises. This is a logical development in view of the fact that *the public agricultural programs have not recognized the problem of subsistence or small-unit farming as being different from that of commercial agriculture.* Consequently grass farming for erosion control without adaptations to needs of self-sufficing farms, loans to "substandard" farmers for the purchase of cattle, and "conservation

TABLE 33—*Receipts, Expenses, and Income on Self-Sufficing Farms in Six Areas of West Virginia, 1935-1939*

Year	Amount (dollars) per farm by areas					
	Marshall	Harrison	Jackson	Randolph	Greenbrier	Monroe
Farm receipts:						
1935	373	317	290	173	262	261
1937	350	313	237	201	219	253
1939	223	275	251	227	213	312
Farm expenses:						
1935	429	430	348	328	425	335
1937	537	425	206	325	315	251
1939	436	431	277	365	302	380
Farm income:						
1935	— 56	—113	— 58	—155	—163	— 96
1937	—187	—122	32	—124	— 95	— 62
1939	—213	—156	— 18	—138	— 89	— 67

payments" have encouraged extensive farm organization rather than more adapted enterprises.

Consequently farm receipts have tended to decline from 1935-1939, rather than increase, with the exception of the Monroe and Randolph areas (Table 33), where the expansion in livestock enterprises has been most pronounced. Along with this expansion, farm expenses have risen enough practically to equal the added farm receipts. Thus net holdings have been increased, temporarily at least by reason of credit, but income-producing ability is scarcely changed. Individual cases have undoubtedly been aided.

In general, net farm income has not changed appreciably. In some areas, apparently losses have been curtailed, while in others the opposite is true. The most significant fact is that *practically all self-sufficing farms are operating with an annual deficit.* Under such conditions the conservation of resources is impossible. The economic and social feasibility of conserving resources, with the pressures of livelihood so forceful, is not great.

ECONOMIC FEASIBILITY OF CONSERVATION ON FARMS OF VARIOUS TYPES

The economic feasibility of a Soil Conservation program depends on how it serves the farm business. Costs must be justified in terms of additional ability to amortize the amount during the life of the improvement. The economic status of the farm business may determine the feasibility of paying for the application of conservation measures, rather than continuing depletion regardless of consequence.

In an effort to appraise the feasibility of the soil- and water-conservation program that has been applied to West Virginia farms, a number of examples, representing the four major types of farms, will be analyzed.[22] The aim is to estimate the abilities of these farms to finance the program that has been planned for them.

SELF-SUFFICING FARMS

By definition, 50 percent of the total production of self-sufficing farms is consumed by the farm family. Production is limited by both quality and quantity of resources; in many cases, too, management is a deterring factor, although land resources would permit a larger business through increasing the intensity of the production program.

The limited size and the rather excessive consumption demands of the occupants have resulted in serious depletion of land. The attempt has been to operate the small farm in about the same fashion that larger commercial farms operate. Inertia, lack of immediately available markets, and lack of knowledge have prevented the general use of enterprises which utilize to the greatest advantage the resource most plentiful—labor.

Improvement in management and organization of the farms is essential to permanent conservation. In some cases, in which resources are not suited to economical agricultural utilization, the job of improvement may be outside the realm of farm management. Perhaps they more accurately fall into the category of social and institutional maladjustments which may be solved only by a redistribution of human and physical resources, so that a more nearly optimum relationship is attained.

Self-sufficing farms have been shown to represent low land values and meagerly equipped business units. The three units to be analyzed here represent a variation in size as well as

[22] The three examples of each type cooperating with the Soil Conservation Service were chosen on the basis of *representative size* only. Actually, the quality of most of these examples is above average because of the fact that most of the farms first planned as cooperating farms were above average, with operators having above-average ability. This condition leads to the opinion that management has not been a serious or unusual obstacle in connection with these plans.

quality (Table 34). Farm No. 1 is situated on limestone soil, while the other two farms are on shale and sandstone soils. Soils, along with location and potential productivity, account in part for the wide difference in investment.

TABLE 34—*Investments in Three Self-Sufficing Farms in West Virginia*

Farm Number	Size (acres)	Investment (dollars) per acre	
		Land	Total
1	57	40	$106
2	78	15	39
3	92	16	24

Cropland consists of from 15 to 24 acres; pasture land likewise is small. In addition the ratio of land suitable for crop production to grazing land is often unbalanced, making it difficult to utilize both in the most economical fashion. In more extreme cases, the total land area available is steep and subject to accelerated erosion (Table 35). Pastures have been neglected on most low-income farms, and severe erosion problems are not uncommon, as in the case of Farms 2 and 3.

The cropping programs of self-sufficing farms are similar to larger livestock farms, consisting of corn, small grains, and mixed hay; more intensive types of production are uncommon. Gardens and vegetable truck are inadequate to meet the needs of the farm families. Little significant change has taken place

TABLE 35—*Slope and Erosion on Three Self-Sufficing Farms in West Virginia*

Farm number	Acreage per farm	Percent of slope		Erosion on[1]	
		Cropland	Pasture	Cropland	Pasture
1	57	6—8	3—13	2—3	2— 3
2	78	12—30	20—40	2—3	3—33
3	92	2—9	15—40	2—3	3—3,6,7

[1] The meaning of erosion symbols are summarized below:
1—No apparent sheet erosion.
2—Slight sheet erosion, less than 25% of the A horizon lost.
3—Moderate to serious sheet erosion 25% to 50% of A horizon lost.
33—Moderate to serious sheet erosion 50-75% of A horizon.
4—Severe sheet erosion over 75% of all A horizon lost. This class includes sheet erosion of the "B" horizon.
5—Very severe sheet erosion, erosion of "C" horizon, parent material, or geological material.
6—Shallow slips, landslides, that have dropped less than 3 feet.
7—Occasional shallow gullies—3 gullies or less per acre, or gullies 100 ft. or more apart laterally.
8—Frequent shallow gullies—more than 3 gullies per acre, or gullies less than 100 ft. apart laterally.
9—Destroyed by shallow gullies—an intricate network of shallow gullies that have dissected the area so thoroughly that the land is destroyed for further use.

over the five-year period in this respect. The major change apparently has been a reduction in corn acreage in favor of hay. The three conservation plans do not call for this shift in relative

importance of various enterprises. The responsibility for these changes rests more likely on the efforts of the Agricultural Adjustment Administration, although the Soil Conservation Service has planned rather generally for increases in grass crops in proportion to grains. Especially has this been true in certain areas where grain crops have been more generally grown.

The livestock programs on the three low-income farms have shown no tendency toward improvement since 1935; rather, a noticeable trend in the other direction is apparent (Table 36). The total number of animal units has declined, and the quality of the programs for small farms has depreciated. Dairy cows, sheep, and poultry, which come nearest to being suitable enterprises for small farms, have declined in number. In the case of Farm 1, sheep and poultry have been discontinued and steers have replaced them—a change in the wrong direction as far as greater economy in the use of resources is concerned.

TABLE 36—*Organization of Three Self-Sufficing Farms in West Virginia*

Farm number	Year	Acreage cropland	Acreage pasture	Crop-yield index[1]	Animal units
1	1935	24	22	135	7.1
	1937	23	23	127	4.4
	1939	21	25	147	7.7
2	1935	19	43	135	12.6
	1937	20	21	109	8.1
	1939	18	23	136	9.1
3	1935	15	74	91	11.4
	1937	23	66	134	.7
	1939	15	74	127	8.6

[1] Average crop yields for State, 1923-1932, equal 100.

The decline in quality of the livestock enterprises may be encouraged by an increased dependence of low-income farmers on public support. All three of the farms illustrated received some public subsidy during the period, including W. P. A. labor, although they are not usually part-time farms.

In accordance with diminished livestock programs, farm receipts have shown a rather definite downward tendency (Table 37). There seems to be a lack of consistency in sources of income; *i.e.*, incomes arise from varied sources in different years.

The apparent shift to more extensive livestock production is consistent with the effort to encourage grass farming. It is rather hard to believe that such a development will bring greater conservation of resources and greater incomes in the long period unless greater intensity is achieved on remaining cropland. Probably small farms will find greater security in more intensive livestock and crop enterprises, which depend more on labor than on extensive land resources. The greatest obstacle in the way of development of such enterprises is lack of managerial

techniques, which can be gotten only through education and supervision.

Farm expenses decreased during the period 1935 to 1939, rather than increased. Limited amounts of fertilizer, lime, and grass seed were purchased, but apparently very little private investment was added to public subsidies for conservation. The decline in expenses was chiefly the result of a smaller total livestock business.

Incomes (Table 37) were low for the entire period and not significantly different, although variation existed. However, it is not feasible that resources may be conserved under the present income status. Not enough annual income is available to satisfy the needs of the farm families. Hence it is likely that resources will be depleted, unless non-farm cash income is continually available.

TABLE 37—*Income on Three Self-Sufficing Farms in West Virginia*

Farm number	Year	Farm receipts[1]	Farm expenses	Farm income	Labor income[2]
1	1935	$355	$365	$—10	$—468
	1937	265	361	—96	—535
	1939	306	252	54	—369
2	1935	287	176	111	— 96
	1937	222	248	—26	—234
	1939	206	184	22	—173
3	1935	456	363	93	—155
	1937	288	194	94	—121
	1939	459	322	137	— 95

[1] Includes A.A.A. payments, which were very small.
[2] Farm income less five percent interest on capital investment.

The cost of the conservation programs shown in Table 38 constitutes outlays of from $5 to $10 per acre. This input must be "short term" (5 to 10 years) investments, except for the small portion devoted to forestry. That is, they must be financed from immediate incomes during the comparatively short life of the improvement. In fact, if the indicated forestry work is to be done by the present operators, it must also be financed currently.

TABLE 38—*Cost of Conservation Program on Three Self-Sufficing Farms in West Virginia*

Farm number	Cost of conservation (dollars)						Total Cost[2]
	Lime	Fertilizer	Seed	Fencing	Forestry	Gully[1]	
1	292	127	60	--	70	--	$549
2	62	30	23	196	59	13	383
3	244	70	15	149	21	96	595

[1] Includes dams, brush mats, diversions, furrows, etc.
[2] Actual costs to farmer as total financier.

Under a five-percent interest rate the annual requirements for amortizing conservation costs over various periods are given in Table 39. Since the life of the bulk of the expenditure is not more than ten years, the annual requirements for amortization exceed the current annual farm income in two cases out of three. In neither of the three cases is it feasible that even the 20-year payments can be paid from meager incomes available for family living.

It is quite evident that conservation, if attained at all through the means of these individual low-income farmers, must be obtained by means of *frugal land use and the investment of much labor in the land.* Fertility practices may have to be "home-made" by the use of manure and green-manure crops. Progress will necessarily be made more slowly and without much cash expenditure.

TABLE 39—*Annual Requirements for Amortizing Costs of Conservation on Three Self-Sufficing Farms in West Virginia*

Farm number	Cost of conservation		Annual payments @ 5 percent		
	Total	Per acre	5 yrs.	10 yrs.	20 yrs.
1	$549	$9.63	$127	$71	$44
2	383	4.91	88	50	31
3	595	6.47	137	77	48

A more suitable farm organization, along more intensive lines, should provide additional cash income for both family living and resource rehabilitation. In fact there will be less pressure to deplete resources if more suitable enterprises were established and more income available. The outlines of the three examples, however, give little indication of greater security and conservation on the small self-sufficing farms.

GENERAL FARMS

The three general farms analyzed here were planned for Soil Conservation during late 1936, and the program was put into effect during 1937. According to data in Table 40 the size of these farms ranges from less than 150 acres to more than 230 acres. Of course, general farms may be of any size. Investments also vary widely depending on location and quality of land and buildings.

TABLE 40—*Investment in Three General Farms in West Virginia*

Farm number	Size (acres)	Real-estate Investment	Land value per acre
1	143	$6,610	$32
2	182	7,240	30
3	235	14,760	50

The three examples apparently indicate a reasonable proportion of both crop and grazing land. There is evidence that cropland has been reduced slightly in the case of Farms 1 and 2. Small acreages of badly eroded lands have been retired to pasture, being spot-planted to trees where very steep. In general the changes that have been made in land use are not sufficient to demand vital alterations in the production program.

The data in Table 41 illustrate the need for erosion-control practices on many farms. Steep pastures (No. 2) often need improved cover and gully-control work to check soil losses. Many farms like No. 3 need erosion control on cropland, although slope is not excessive. Strip cropping is often difficult on the hummocky limestone lands where contours are extremely ir-

TABLE 41—*Slope and Erosion of Crop and Pasture Land on Three General Farms in West Virginia*

Farm number	Percent slope of:		Erosion on:[1]	
	Cropland	Pasture	Cropland	Pasture
1	3—9	3—30	1—2	1— 3
2	3	20—40	1	3—367
3	9—15	15—25	3—337	3—33

[1] Symbols in general use by Soil Conservation Service; refer to footnote on Table 35 for explanation.

regular. The cropping program on many West Virginia farms is geared to the livestock program. Hence it has not been changed materially by the conservation plans, with exception of extremely steep and severely eroded farms.

The short period during which conservation programs have been in operation give little or no indication of effect on crop yields, except as comparatively low-yielding crops have been replaced by higher-yielding types. Alfalfa and clover hays and barley are generally recommended for partial replacement of timothy and wheat or oats.

Diversified livestock programs characterize *general* farms. Beef cattle, milk, poultry, and sheep are the major enterprises.

TABLE 42—*Organization of Three General Farms in West Virginia*

Farm number	Year	Acreage cropland	Acreage pasture	Crop-yield index	Animal units
1	1935	37	46	156	17.7
	1937	36	47	180	17.5
	1939	33	50	181	17.3
2	1935	26	100	141	28.2
	1937	30	96	139	26.0
	1939	27	101	134	30.0
3	1935	53	180	197	50.5
	1937	52	181	166	49.7
	1939	50	182	121	50.2

It should be noted that the three farms are organized rather intensively (Table 42). The acreage of pasture and cropland utilized per animal unit is low. It is important to note the combinations of enterprises that these farms find profitable, according to the land available. Poultry and sheep along with beef cattle apparently are proving very profitable on Farms 2 and 3, and account for a major portion of livestock receipts.

Farm receipts are indicated (Table 43) as increasing from 1935 to 1939 for Farms 1 and 2. This has come about largely through improvement in cattle and poultry enterprises. Crop receipts on No. 1 consist of potato sales, which vary from year to year principally because of price. Appreciably lower receipts in 1939 for No. 3 resulted from a failure to realize a crop of clover seed which is usually grown. In general it is safe to say that the conservation program has not materially changed these production programs. Furthermore, it is reasonable to believe that the improved fertility practices will aid in maintaining present production.

Operating expenses did not change materially during and after the adoption of the Soil Conservation program by these general farms. In fact, the farm expenses indicated do not include any appreciable portion of the cost of the program, inasmuch as it was largely government-subsidized. Otherwise incomes would have been less.

TABLE 43—*Farm Income on Three General Farms in West Virginia*

Farm number	Year	Farm receipts	Farm expenses	Farm income	Labor income
1	1935	$ 686	$ 450	$ 236	$—163
	1937	546	545	1	—432
	1939	919	494	425	— 1
2	1935	1056	535	521	35
	1937	1229	623	606	106
	1939	1304	521	783	273
3	1935	2565	1402	1163	191
	1937	2468	1274	1194	191
	1939	2280	1191	1089	98

There is no apparent indication that conservation has yet affected farm income. Since no appreciable changes were evident in either the cropping or the livestock program, significant changes in income may not be expected. It is probable that continuation of the current level of income may be expected unless changes are made favoring more intensive livestock production.

The costs of the conservation program are indicated in Table 44. Lime, fertilizer, and seed are the major items. Fencing for woodland and stream-bank protection are rather large items which are probably less feasible from the farmer's current standpoint. It is doubtful that farmers can afford to expend

the amounts indicated for stream-bank protection; but the same protection can probably be gotten by more crude and less costly methods.

TABLE 44—*Cost of Conservation Program on Three General Farms in West Virginia*

Farm number	Cost (dollars)						Total cost
	Fertilizer	Lime	Seed	Forestry	Fencing[1]	Gully control[2]	
1	56	136	28	195	147	235[3]	797
2	132	424	91	156	296	177	1276
3	267	564	55	10	--	83	979

[1] Includes fencing for protection of woodland mainly.
[2] Includes all erosion control, i.e., contour furrows, diversions, dams, etc.
[3] Largely stream-bank protection.

In the past, farmers have not realized much income from woodland products. Hence they are reluctant to accept costs that are not directly productive. The economic feasibility of such work depends on the length of maturity of investment and the future demand for woodland products. This may be a potential source of income which merely needs development.

TABLE 45—*Annual Earnings Necessary to Amortize Cost of Conservation on Three General Farms in West Virginia*

Farm number	Cost of conservation		Annual requirement for amortization at 5%		
	Total	Per acre	5 years	10 years	20 years
1	$ 797	$5.75	$184	$104	$ 64
2	1276	7.01	295	166	102
3	979	4.16	226	127	78

The annual requirements for amortizing investments for conservation are indicated in Table 45. The amount of the annual payments depends on the length of period, which in turn depends on the life of the improvement and on the rate of capitalization (interest rate). The amount of these payments does not appear prohibitive but represents an appreciable percentage of annual income. However, if the conservation program prevents a future diminution of income equal to or greater than the cost of the program, or if future incomes are enhanced by reason of these measures, the expenditure will be justified.

Whether incomes are enhanced as a result of Soil Conservation depends largely on the initiative of the farm operator to take advantage of added pasture and grass crops and increased grain production. If the quality and amount of livestock are not added to the business as the result of additional facilities, there is no reason to expect additional income, since livestock is the salable commodity.

DAIRY FARMS

The three dairy farms described in the following tables are characterized by varying land valuations as well as by differences in size. Farms 1 and 3 are situated on limestone soils, although in different ends of the State, while Farm 2 consists of sandstone and shale soils. All, well situated, are producers for fluid-milk markets.

TABLE 46—*Size and Investment in Three Dairy Farms in West Virginia*

Farm number	Size (acres)	Investment per acre	Total investment
1	140	$44	$82
2	250	24	37
3	348	50	67

TABLE 47—*Slope and Erosion on Three Dairy Farms in West Virginia*

Farm number	Percent of slope:		Erosion on :[1]	
	Cropland	Pasture	Cropland	Pasture
1	20—35	20—40	2—337	2—3
2	0—17	3—30	2— 3	1—3
3	7—15	10—35	3	3

[1] Refer to Table 35 for meaning of symbols.

Slope and erosion of both pasture and cropland is rather extreme on Farm 1 (Table 47). In the three cases, 3-erosion[23] was rather common. Contour strip cropping and pasture improvement were needed badly in all cases and, as indicated in the discussion of the conservation program, are a part of the plan on these farms. It will be important to bear in mind these physical characteristics as the production program and the cost of conservation are reviewed.

It is significant that all three farms have a sizeable acreage of cropland (Table 48), with pasture acreage accounting for the major difference in size of farm. During the five-year period from 1935 to 1939, Farm 1 exhibited a change to slightly less crop acreage. On the other hand, the other farms increased crop acreage in 1938 and 1939. The three farms had turned to a more definite policy of protecting woodland.

Little change in crop production has taken place over the five-year period, or since the Soil Conservation program has become effective, except for the increased production of alfalfa hay. Dairymen usually appreciate the benefits of high-quality feed to a much greater extent than other livestock producers. Hence better clover and alfalfa hays have been possible through lime and fertilizer amendments to soil fertility.

[23] Refer to Table 35 for explanation of erosion symbols.

TABLE 48—*Organization of Three Dairy Farms in West Virginia*

Farm number	Year	Acreage cropland	Acreage pasture	Crop-yield index	Animal units
1	1935	52	80	131	24.6
	1937	54	71	143	30.9
	1939	47	78	160	32.0
2	1935	41	92	169	20.7
	1937	34	104	181	21.2
	1939	46	92	180	23.8
3	1935	40	259	157	30.1
	1937	40	256	190	32.8
	1939	48	248	163	50.7

Crop yields reflect the improvement resulting from better fertility practices. While *general* farms did not show yield improvement, probably because of their laxity in effecting and taking advantage of the recommended fertility program, *dairy* farmers have rather definitely improved their yields. Significant increases in the yields of both corn and hays have been realized. Furthermore, the superior yields of alfalfa over mixed hays are important inasmuch as a great many farmers have been discouraged in the production of this crop, principally because they made a failure of seedbed preparation.

In accord with enhanced crop yields and possible similar improvement in the quality of grazing, the livestock program has been expanded on all three farms (Table 48). The size of the dairy enterprise in 1939, compared to that of 1935, indicates a marked increase in productivity. Here again, little change is indicated in the organization of the enterprises—merely an expansion of existing production.

To what extent this expansion has been due to the work of the Soil Conservation Service is conjectural, but inasmuch as it follows directly the noted improvement in crop production, the program has undoubtedly made an important contribution.[24]

Expectedly, in view of the expansion in dairy production, farm expenses exhibit a general increase. General production expenses increased along with the expenditures for lime, fertilizer, and seed. Since governmental subsidy accounted for a large portion of the costs of soil amendments, the full cost is not included in Table 49. Only the farmer's contribution is indicated. However, since such improvement need not be made all at one time, it is probable that conservation, fully farm-financed, will be no more than shown, after reinvestment covering past depletion is completed.

Farm receipts, likewise, reflect the improvement shown in the production program. Although these specialized dairy producers pay major attention to the welfare of the dairy enter-

[24] The subsidies of the Agricultural Adjustment Administration for fertility practices undoubtedly have also facilitated this improvement.

prise, they employ other enterprises such as sheep, poultry, and potatoes, in order to make the most economical use of all available resources. Such combinations of major and supplementary production intensify the production program in a manner that tends to make possible the greatest total net income.

Income is the final measure of the success of any program. The increase in income denotes a more profitable farm business in 1939 than existed on these three farms in 1935. The improvement must be shared by the conservation program and the management which took advantage of increased soil productivity by intensifying production. The more important fact is that these farms embodied potential productivity which was liberated through the indicated practices. Thus greater economy in utilization of fixed resources makes possible a production program more nearly in line with efficient management of land, labor, and capital.

The cost of the program as outlined in the *agreement* is summarized in Table 50. Lime and fertilizer are the major items, with gully and sheet-erosion control an important item on Farm 3. These costs appear rather high when viewed in a

TABLE 49—*Income on Three Dairy Farms in West Virginia*

Farm number	Year	Total receipts	Total expenses	Farm income	Labor income
1	1935	$1635	$1176	$ 459	$—505
	1937	2150	1418	732	—171
	1939	2652	1832	820	—135
2	1935	1623	1521	102	—454
	1937	2080	1667	413	—157
	1939	2612	1448	1164	571
3	1935	2589	1312	1277	— 62
	1937	3537	1623	1914	559
	1939	4470	2487	1983	530

single year. However, the initial reinvestment is less than six dollars per acre, even on the seriously eroded No. 3 farm.

Assuming that a large portion of this initial cost will last at least ten years, the amortization requirements (Table 51) do not appear excessive. Perhaps the arbitrary interest charge of

TABLE 50—*Cost of Conservation Program*[1] *on Three Dairy Farms in West Virginia*

Farm number	Expenditures[2] (dollars)						Total cost
	Lime	Fertilizer	Seed	Forestry	Fencing	Gully control	
1	254	90	79	--	114	79	$616
2	158	64	39	74	83	115[3]	533
3	896	510	96	40	58	328	1928

[1] The three farms were placed under agreement during the winter months of 1936-37.
[2] Expenditures by both farmer and Soil Conservation Service.
[3] Stream-bank protection $69 and contour furrows $46.

5 percent is too high. If so, annual costs may be reduced accordingly.

In this appraisal it is assumed that certain costs will necessarily be duplicated oftener than every ten years, and some less often. Hence, ten years appears to be a reasonable period for amortization. These matters considered, it is quite reasonable to say that the improvement shown for the three examples

TABLE 51—*Amount Required Annually to Amortize Costs of Conservation Program on Three Dairy Farms in West Virginia*

Farm number	Cost of conservation		Annual amortization payment @ 5%		
	Total	Per acre	5 years	10 years	20 years
1	$616	$4.40	$142	$ 80	$ 49
2	533	2.13	123	69	43
3	1928	5.54	445	251	154

justifies, in general, the costs of the conservation program. Considering the original investment in the land, the income-earning ability, and the efficiency of all factors, the program has apparently been responsible for appreciable enhancement in future income of these dairy farms.

BEEF-CATTLE FARMS

The three specialized beef-cattle farms selected for this case analysis represent beef-cattle production in various sections of the State. Farms 1 and 2 are located on limestone soils while No. 3 consists of shale and clay soils. Beef-cattle production is an extensive type of farming, requiring large areas of land and a rather large investment. However, the investment varies widely, as indicated in Table 52, and is not a true measure of size or of productivity.

TABLE 52—*Investment on Three Beef-Cattle Farms in West Virginia*

Farm number	Acreage per farm	Investment in land per acre	Total Investment per acre
1	354	$27	$40
2	360	57	71
3	552	15	20

The cropland of these three farms is not excessively steep. With good practices and strip cropping all tilled land may be protected against erosion in an acceptable manner. Grazing lands, on the contrary, are quite steep in all three cases—a situation common to many farms of this type (Table 53). Furthermore, severe sheet and gully erosion was an acute problem at the time conservation plans were drawn. Depletion of

fertility during many years of grazing had reduced soil cover to sparse broomsedge and briers over some areas. Thus long slopes were permitted to shed rainfall very rapidly.

These large farms usually consist of the better land in the respective counties and include sufficient suitable cropland for a large livestock enterprise. Data in Table 54 indicate a marked decrease in cropland and a similar increase in grazing land during the five-year period for Farms 1 and 2. Farm 3, on the other hand, increased the acreage of cropland by more intensively utilizing some of the low-lying pasture. This seems to be in accord with good land use and the needs of a larger livestock enterprise.

TABLE 53—*Slope and Erosion on Three Beef-Cattle Farms in West Virginia*

Farm number	Percent of slope:		Erosion on:	
	Cropland	Pasture	Cropland	Pasture
1	7—20	25—40	2—3	3—36
2	2—15	15—35	3	3—37
3	1—15	15—50	0—2	3—467

These farmers have exhibited rather definite interest in improving farm woodland by protecting it as much as possible from grazing. Often it is not possible to protect all woodlots, particularly if such areas surround the water supplies for livestock.

The cropping program, as in the case of dairy farms, has not been altered materially on these farms since 1935. The reduction in acreage of land devoted to crop production consisted of retiring a portion of eroded hay lands to pasture; in the case of Farm 2, high-quality mixed hay was substituted for low yielding oats. In general, corn acreage was increased slightly, which is contrary to the conservation plan.

It is interesting to note that, unlike dairy farmers, these beef-cattle producers have not grown alfalfa. The reason for this lies probably in the fact that dairy farmers seek a higher quality of feed. Beef cattle do not need the high-protein feeds that are required for milk production.

Crop yields (Table 54) indicate improved fertility practices and possibly higher-quality production since 1935. Although weather causes yields to vary widely between years, it will be recalled that weather conditions were more favorable to higher yields in 1935 than in 1939. Furthermore, this evidence of higher yields on beef-cattle farms in 1939 than five years earlier is not so apparent for farms as a whole. Those farmers following a rather intensive program of fertility improvement evidently were able to produce significant results.

Substantiating the above claims for higher crop yields and possibly higher pasture yields, the livestock program has been expanded as much as 92 percent on Farm 3. Whether the indi-

cated expansion was entirely possible through improvement in grazing and crop yields is not known. It is certain, however, that the change is in accord with greater economy in the utilization of resources. This should result in appreciably higher incomes as the program is stabilized at a higher level.

Fluctuations in price of beef cattle result in incomes which do not follow directly the volume of physical production. Recalling the prices paid for beef cattle in the respective years, the fluctuations in income (Table 55) are easily explained. Considering price changes, however, there is no doubt but that the expansion in the business of these farms will provide a continuity of higher net incomes.

TABLE 54—*Character of Three Beef-Cattle Farms in West Virginia*

Farm number	Year	Acreage cropland	Acreage pasture	Crop-yield index	Animal units
1	1935	65	280	135	55.7
	1937	42	303	177	63.1
	1939	46	299	258	78.5
2	1935	101	242	133	49.8
	1937	94	249	164	56.2
	1939	76	267	161	56.9
3	1935	54	341	144	47.7
	1937	93	302	174	77.3
	1939	92	303	197	91.5

Farm expenses following the larger production programs were higher. In general, the increase in expenditures was for producing and handling greater quantities of livestock. Only slightly more was expended for the conservation program, inasmuch as it was largely a public subsidy. Hence, if the actual farm costs of the conservation program were included, incomes would be reduced accordingly.

The cost of the program on Farms 1 and 2 was largely for lime and fertilizer applications to both crop and pasture land (Table 56). In the case of Farm 3, large expenditures were made

TABLE 55—*Income on Three Beef-Cattle Farms in West Virginia*

Farm number	Year	Total receipts	Total expenses	Farm income	Labor income
1	1935	$6450	$5326	$1124	$ 165
	1937	7729	6097	1632	589
	1939	5963	4982	981	— 69
2	1935	3894	3289	605	—1237
	1937	6132	4721	1411	—467
	1939	4143	3108	1035	—505
3	1935	1780	1604	176	—678
	1937	3204	2032	1172	457
	1939	3271	2355	916	62

for tree planting, fencing woodland, and erosion control. These are long-time investments, but if the private land operator is to make them he must carry the burden of the expenditure and pay for it out of current income. The annual payments would depend on the length of credit period and on the interest rate obtainable.

Although the cost per acre is not large, it is doubtful that individual farmers, in general, could be persuaded that the cost of large tree plantings and fencing woodlands is to their best interests, unless a return can be shown within a reasonable length of time. Investments in forestry are long-time interests, exceeding the life span of more than one generation in many cases.

TABLE 56—*Cost of Conservation Program on Three Beef-Cattle Farms in West Virginia*

Farm number	Expenditures (dollars)						Total cost
	Lime	Fertilizer	Seed	Forestry	Fencing	Erosion control[1]	
1	512	149	56	83	23	149	$ 972
2	740	413	130	66	132	204	1685
3[2]	312	195	39	803[3]	438	455	2247

[1] Includes diversion ditch as a major item.
[2] Agreement approval for this farm was made on the basis of a cost estimate of $5,082.76.
[3] Largely tree planting (72 acres) in rough portions of pasture, and wildlife plantings.

Farms 1 and 2 should encounter no difficulty in amortizing the cost of the prescribed program for the respective farms. In the case of Farm 3, it is entirely possible that the addition of a $4.07 per acre to land worth only $15 may be profitable. If

TABLE 57—*Amount Required Annually to Amortize Costs of Conservation on Three Beef-Cattle Farms in West Virginia*

Farm number	Cost of conservation		Annual amortization payment @ 5%		
	Total	Per acre	5 years	10 years	20 years
1	$ 972	$2.74	$225	$126	$ 78
2	1685	4.68	389	119	135
3	2247	4.07	519	292	180

the 90 per cent expansion in the livestock program can be attributed largely to the rehabilitation of production, the indicated costs are not excessive and should be profitable even over the immediate short period of time. If considered from the standpoint of an estate to be passed on to future generations, the expenditure can undoubtedly be justified. However, such large expenditures on low-quality land must be made on the basis that the area has a permanent comparative advantage in production, and that all aspects of the program contribute to the future productivity of the farm.

RESUME OF ECONOMIC FEASIBILITY

In general, the economic feasibility of the Soil Conservation program as planned for farms in West Virginia depends on the degree of economy attained in taking advantage of land resources by utilizing them to full capacity. Poor management and lack of foresight may mean the failure of a farm business with Soil Conservation in the same way that it fails without conservation. Hence farmers must recognize their best interests over a long period of time simply because of the possibility of depletion.

Whether farmers will pay for a conservation program and maintain such practices and measures that cost a portion of gross earnings, depends on their actions as economic individuals instead of exploiters of a short period. Of course, it will be essential that measures designed to achieve conservation be economically feasible if they are to be permanent, assuming economic and rational business activity.

The difficulty of conserving resources on small low-income or self-sufficing farms has been pointed out. The initial cost was shown to be as much and more per acre than is true of commercial farms. Pressure on the meager resources prohibits the leaving of anything in the soil that can be removed. A "time preference" for consumption forces exploitation. There are several solutions: (1) Redistribution of resources, or man—land ratio adjustment, may make possible farm units of a size that will produce a livelihood and permit conservation. (2) Changes in types of production, so that excess labor is employed both in earning a subsistence livelihood and conserving resources instead of depending on commerical production, may be an alternative for small farms. A change in philosophy of those who depend on the soil may be essential. (3) Public development of farm forest homesteads and other non-agricultural employment may permit those farmers situated on sub-marginal lands a chance to conserve resources. (4) Education of many people regarding the nature of resources and their best interests should prove helpful. Inertia, ignorance, and lack of appreciation for resources are difficult problems to overcome. This is particularly true in the Appalachian Region, where many seek small units of cheap land when other sources of livelihood fail, often hoping and *waiting* for another chance. In other words, they have no long-time interest in farming and perhaps are justified in their stand when forced to depend on lands not suited to agricultural production.

Old age is another factor which often deters conservation when children and kinsfolk are not sincerely interested and dependent on the land. A farmer 50 to 70 years of age who seeks a subsistence on a small unit of cheap land is not easy to convince that he should spend five or ten dollars per acre for conserving resources.

Most *general* farms will find economically feasible those parts of the conservation program which contribute to agricultural production, if the farms are operated in an economical fashion. Many general farmers operate a rather unorganized type of business, shifting from one enterprise to another. Better farm organization will undoubtedly give importance to certain resources. Recognizing this importance they will see the benefit of more productive land and will give it greater attention.

Dairy farmers are probably the most conscientious soil conservers of all types of farmers. Their business usually is intensely organized, prices are more stable, and they are constantly aware of the desirability of hay and pasture of good quality. Comparatively high incomes and generally well equipped farms have encouraged them to make better use of the conservation program than many farmers of other types.

The examples illustrated the results on three *beef-cattle* farms. Conservation had apparently permitted expansion in production which was needed in order to realize a higher return on investment. If cattle producers are willing to take the responsibility of expanding their enterprises in accordance with additional hay they realize through the improvement of meadows, they should not find the additional costs burdensome, but rather a means to higher incomes.

There are, however, certain features of past Soil Conservation programs which are not at present economically feasible for individual farmers regardless of type.

(1) Stream-bank protection, as demonstrated, has been excessively expensive. Because of the relatively small areas affected, farmers will not find it economically feasible to accept and use these demonstrations. Extensive stream clearance and straightening jobs will fall in the same category. Furthermore, the desirability of hastening the removal of excessive water from the small streams is doubtful. The reverse may be more desirable in order to prevent damaging floods farther down stream.

(2) Extensive wildlife programs are not feasible for most West Virginia farms. In order that investments for this or any other purpose be feasible for inclusion in conservation plans on individual farms, there must be some way for the farm business to realize a return which will justify them. Neither society nor private operators can afford to make investments which have such limited value in present and future production. Farming units cannot be expected to subsidize this type of development unless the private operator is given some method of charging for hunting and sporting privileges sufficient to justify the costs involved.

A further question arises concerning desirability of spending large sums for the purpose of supplying cover and food for wild birds and animals in West Virginia. Abundance of these essentials is assured by the very nature of land cover and

present land-use patterns. There is little logic in burdening farms, having a comparatively small acreage of cleared land, with expensive installations of wildlife areas. Correct land use and cooperation with nature (which costs little) in the protection of wildlife is a more feasible course to follow under existing conditions.

(3) The feasibility of building hundreds of rods of fence to protect large forested areas is not within reach of most farmers. Future incomes are extremely uncertain from forest products, and the need for such protection to large, dense forest areas is questionable. Small farm woodlots and new plantings for farm use are excepted. All farmers will undoubtedly find it economically desirable to protect and manage a small woodlot. Forest investments are long-range investments and should depend on capital that is free for that purpose. Specialized forestry should not be dependent on incomes from agricultural enterprises, whether the costs are justified or not.

(4) Extremely expensive masonry dams and waterways for diversion ditches represent other types of demonstrations which are not economical investments, particularly on land which is used extensively. Again, capital expenditures for improving and conserving land must be justified in terms of added earning ability. Only where land is very scarce and valuable can large investments for conservation be justified.

On the other hand, there are a number of valuable practices which farmers can use, with little or no cash outlay. They merely require management in the use of the land. Strip cropping is a good example. Sod waterways are useful in cultivated areas where excessive accumulations of surface water would otherwise cut a gully. Pasture rotation to prevent close grazing may be useful in preventing sheet erosion. Many other managerial practices requiring little or no cash outlay can be applied to farm lands.

Still others, requiring comparatively small expenditure like cover crops, pasture treatment, land-use adjustments, and legume rotations, may be justified in terms of immediate benefits to the farm business. Pasture treatment, for example, increases grazing capacities and permits larger and more productive livestock enterprises. Even here, however, recommendations for treatment must be preceded by careful study of benefits expected in relation to cost of treatment. It is entirely possible that many steep and rough pastures in West Virginia cannot be economically treated. *Potential income is the measure of feasibility.*

Not all recommended Soil Conservation practices which require only small labor and cash outlays are justified. For example, contour furrows have been found to be practically useless except in special cases. Because of a very limited lateral

movement of water from the furrow channel[25] and the difficulty in establishing a cover on subsoil turned up, the benefits to grazing capacity are negative or negligible on important West Virginia soils.

It has been found that contour furrows, without a liberal treatment of lime, fertilizer, and seed, actually decreases grazing capacity. Experimental evaluation also has indicated that a treatment similar to that applied to contour furrows will yield about the same benefits if applied to pasture land not contoured.[26] Since the objective of pasture conservation is to establish a desirable grazing cover and in this way retard erosion, it appears to be more feasible to do so by fertility treatment rather than to waste valuable time and labor for installing contour furrows. This is particularly true since a great many farmers have failed to obtain a desirable cover in furrow channels and on the berms, thus greatly reducing grazing capacities and probably accelerating erosion.

There are instances where contour furrows may be a distinct help. They may be used to check sheet erosion on sloping lands having very sparse cover until seed and fertilizers have had sufficient time to establish adequate cover for doing the desired jobs. Even in this case, care must be exercised to prevent their use on land too steep to allow quick stabilization of the loose berm, with a channel deep enough to be effective. The prevention of surface run-off and the conservation of water tables may justify the use of contour furrows in some instances. Special uses of this nature, however, have not been major objectives in the use of this practice.

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[25] Browning, G. M., and Milam, F. M., *The Lateral Movement of Water In Relation to Pasture Contour Furrows,* Proceedings of Soil Science Society of America, vol. 5, 1940.

[26] Smith, R. M., *The Vegetation Pattern on Several Well Established Contour Furrow Systems In West Virginia,* Proceedings of the Soil Science Society of America, vol. 6. 1941. Schaller, F. W., *The Downward Movement of Lime and Superphosphate In Relation to Permanent Pasture Fertilization,* Proceedings of the Soil Science Society of America, vol. 5. 1940.

PLANNING FOR CONSERVATION

In the planning of farm units a number of circumstances must be recognized. First, the character of the people has much to do with the management of land resources. The age of farmers may determine to a considerable extent their ability to visualize the need for conservation and their willingness to replace customary practices with improved methods. The *average* age of farmers in each of the six areas was 55 years; 65 percent of all operators were over 60 years of age. In addition, a very large proportion of the employable sons of farmers were working at non-farm employment.

Secondly, many of the present farm units consist of land which cannot be made to produce commercially. Isolated, steep, and rough lands cannot compete with lands of better quality on which machinery can be used effectively. Care must be exercised in the administration of any program for agricultural improvement in order to direct the available labor and capital resources to lands that will respond to treatment sufficiently to justify the costs of the program.

Third, the available resources for achieving conservation should be expended in the location and for the purpose which represent the greatest need and the highest return. As long as pastures and cropland in the State are in urgent need of improvement, there will be no justification for making large expenditures for developments such as wildlife which, at best, produce a very low return per unit of cost.

Fourth, it should be clear that low incomes are the most common cause for soil depletion and neglect. The size of units and poor management are the usual causes of low income. *It is entirely possible that there are too many farm units in West Virginia.* Inasmuch as the physical resources of many areas are suited only to extensive livestock production, operating units must be enlarged to allow for higher incomes—and, in turn, conservation. It will be useless to expend funds for conservation until such adjustments are made. Subsidy of the present small units will be of temporary relief only. The same may be said of land which is not suited to agriculture.

In other cases where poor management is the cause of low income and depletion, corrections should precede the expenditure for rehabilitation. Adequate farm planning must provide the internal adjustments in the farm business essential to profitable operation. To make this possible: (1) Sufficient acreage of crop and grazing land should be available to justify the labor and management involved. (2) Attention should be given to more intensive enterprises, particularly for farms under 200 acres in size, according to the quality of resources

available. Alternative enterprises should be evaluated in terms of income-producing ability. (3) Combinations of enterprises are needed on many farms as a method of attaining the highest net income. Many smaller and larger farms should find it profitable to combine an intensive enterprise such as poultry, dairy, or sheep with beef cattle in order to make more economical use of available labor and other resources. (4) Producers in general should give greater attention to more salable products per acre. Grazing lands carry too few animal units. This may require soil amendments for raising carrying capacity; but such reinvestment will enable the more economical use of the land.

It will be necessary that public agencies aiming to achieve conservation eliminate the *causes* before permanent results may be expected. Their efforts must be directed, to a greater extent, to the problem of small farms and poor management, rather than to a superficial program of problem subsidies. It has been pointed out that major emphasis has been given to the establishment of a program of physical improvement on commercial farms in past conservation efforts. On the other hand, it is likely that the most urgent problems have been avoided. Certainly, compulsory land-use regulations authorized by the Soil Conservation District Law are not applicable until agriculture is in position to receive them as practical contributions to the individual farm business. The necessary internal and external adjustments in land use and farm organization must precede public compulsion of any type.

SUMMARY AND CONCLUSIONS

This study concerns the economic feasibility of a definitely planned program of soil conservation on privately owned farm lands which has been demonstrated by the Soil Conservation Service. Data for five successive years (1935-1939) covering approximately 900 farms in six areas of West Virginia have been studied to determine (1) changes in land use, cropping practices, and livestock programs as a result of the conservation plans; (2) some problems of management associated with conservation on farms of various types; and (3) the economic feasibility of the adoption of indicated soil conservation plans by self-sufficing and by commercial farmers.

The work of the Soil Erosion Service, beginning in 1933, and that of the Soil Conservation Service from 1935 through 1940 has been of a demonstrational nature. Various means of conserving soil and water resources, including changes in land use and types of crops, engineering devices, contour cultivation, and fertility practices for improving soil cover have been demonstrated. Beginning in 1940, Soil Conservation Districts have been established to facilitate public and private initiative in achieving conservation.

In general, the program of the Service has not altered greatly the agriculture of the various areas, although some noteworthy changes have taken place during the 5-year period. The extent of change has varied widely according to type of farm. In fact, a negligible number of the predominant small low-income farms were cooperating in the Soil Conservation program. Beef-cattle, dairy, and general farms cooperating were larger and more nearly commercialized than those not cooperating.

Farms cooperating in the planned conservation programs reduced their cropland, particularly corn and wheat acreage, from 1935 to 1939. The same was true of non-cooperators to a slightly less degree. For example, cooperating *general* farms reduced cropland about three percent, while non-cooperators made a similar reduction of two percent. The same cooperators reduced corn acreage from 10.0 to 8.0 acres per farm, while non-cooperators made a reduction from 8.5 to 7.1 acres. Non-cooperating dairy farms failed to reduce corn acreage, while cooperators made an average reduction of 4.3 acres (12.3 to 8.0 A.). Appreciable expansion in the acreage of alfalfa was noted for dairy, beef-cattle, and general farms. Cooperating dairy farms expanded alfalfa acreage from 2.14 to 6.14 acres per farm, while no increase was noted for non-cooperators. In general, cooperating farms appeared to be increasing the quality of their cropping program a bit more than those not cooperating. In this connection it is impossible to isolate the effects of pro-

grams administered by the Soil Conservation Service, the Agricultural Adjustment Administration, and other agencies. This is particularly true since the larger and more productive farms cooperating with the S. C. S. represented the more aggressive farmers who were taking advantage of services rendered by other agencies. Small *self-sufficing* farms cooperated in none of the public programs to any appreciable extent.

Soil-fertility amendments have been emphasized by all agricultural agencies, and largely by reason of public subsidies the acreage of both crop and pasture land treated with lime and fertilizer has been greatly increased. For example, the acreage of pasture fertilized per *beef-cattle* farm was increased from 0.6 to 3.4 acres, and the acreage limed was tripled. It is of interest that a large portion of the lime that might have been applied to grazing lands was applied to cropland. The acreage of cropland limed was increased seven to tenfold from 1935 to 1939.

The number of livestock on farms was increased on both cooperating and non-cooperating farms during the period. Animal units on cooperating beef-cattle farms were expanded from 83 to 93 per farm, while an expansion from 61 to 70 was noted for non-cooperators. This is consistent with the general increase in livestock on farms throughout the State during the past decade.

It is exceedingly difficult to attribute directly the increases in livestock and the changes in income to the program of the Soil Conservation Service, because of the large number of uncontrolled factors involved. Furthermore, the period of five years is too short to be certain of definite trends in agricultural development. The value of enhanced productivity as a result of the rejuvenation of resources depends on the extent to which farmers take advantage of business opportunities.

The greatest problem of soil conservation in West Virginia is the small size of farm units and poor management. Low incomes as a result of small farms, and lack of intensity in business organization, discourage and prohibit conservation. Consumption requirements are greater than net income; hence resources are exploited. Although present investment in conservation may produce more in the immediate future, the current program does not appear economically feasible to the low-income farmer.

Three self-sufficing farm plans indicated a cost for conservation ranging from $4.91 to $9.63 per acre. The greater portion of this cost represented investment in fertilizer, lime, gully control, and fencing. This means that the investment in land resources has been increased, requiring more intensive operation if a reasonable return is to be made possible. Yet self-sufficing farms in the six areas failed to realize a positive farm income during the period 1935-1939. Since no radical

changes in size of units or production are contemplated, the costs of conservation are not justified for these farms.

Commercial dairy, beef-cattle, and general farms have greater ability to contribute to conservation and the rehabilitation of resources from annual income. Some practices, however, including elaborate stream-bank protection, woodland fencing, forest plantings, and wildlife installations are questionable investments. The economic feasibility of any investment depends on the relationship of input to output; and the above are not justifiable in light of present incomes from these sources. Conservation practices directly related to the improvement of agricultural production are feasible for commercial farms. Several of the most useful practices require little or no cash outlay.

Four major conclusions might be derived from this study: (1) The various agencies seeking to aid conservation should adapt their programs to fulfill the most urgent needs of the several types of farming; let them differentiate between self-sufficing and commercial units in particular. The causes for depletion and exploitation must be removed before subsidies for fertility practices and similar programs will give permanent improvement. (2) Many farm units are too small and of such low quality that exploitation is inevitable as a result of subsistence pressure. Such units need to be enlarged or relocated; and the production program of many units, both large and small, must be more intensively organized so as to produce a volume of income sufficient to satisfy family, capital, and conservation needs. (3) Less attempt to make conservation a type of public works and direct subsidies, and more effort toward teaching farmers the nature of their resources and how to manage them without burdensome cash outlays, would probably result in greater understanding and appreciation of the land and in more permanent soil conservation. (4) It would be unreasonable to compel the application of land-use measures under the police power authorized by the Soil Conservation District Law unless the measures are economically feasible in terms of the farm business to which they are applied.