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E. C. Weitzell

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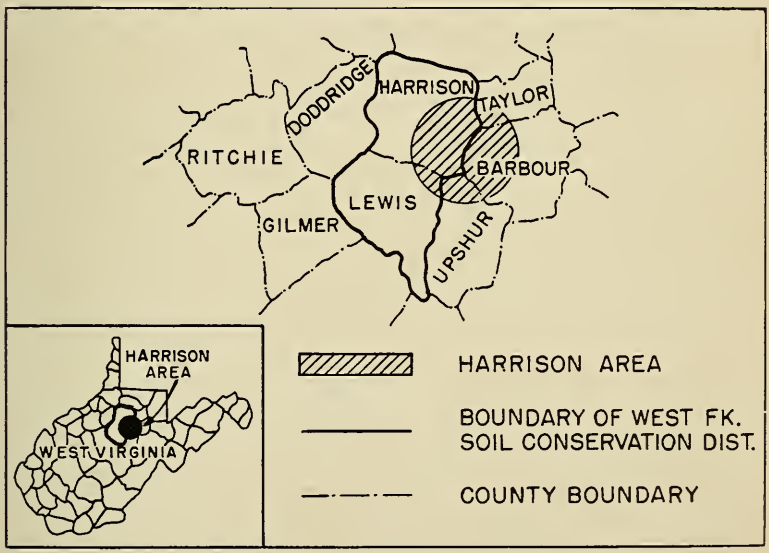

WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION
MORGANTOWN

C. R. ORTON, DIRECTOR

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

CONTENTS

FARM MANAGEMENT FOR SOIL CONSERVATION IN THE HARRISON AREA

by E. C. Weitzell*

Land Management involves two possible goals. *First,* the available resources may be exploited in order to maximize production for a short period, at the expense of future production. *Second,* resources may be utilized by efficient methods in the interests of continual optimum production. The second goal is consistent with conservation. The salient requisite of conservation is a system of land management that will sustain agricultural and human resources, without excessive reduction in present incomes. Incomes for any given period, as a factor in conservation, should be that production which leaves the resources in such a state as to permit an expected income for the future in amount equal to, or greater than, that of the present.

The stability and security of the farm people depends largely on the ability of the land to produce. The ability of land to produce depends on current and periodic replenishment of depleted resources which represent productive ability. Whether depleted resources are rejuvenated in accordance with a desired level of productivity depends on the ability and desires of the farm operator and the economic feasibility of the cost.

Small farms, uneconomic farm organization, or poor management may be returning very low incomes to many farmers. A current and pressing demand for income forces them to consume more than net income. Thus, resources are exploited and depleted, and future productive ability is sacrificed.

There is a need, under such circumstances, to plan farms so as to overcome the deficiency in incomes to that extent possible. The small low-income farm presents the problem of acquiring more land, or intensifying production on present holdings. Uneconomic farm organization must be corrected by changing or recombining enterprises in order to make more efficient use of available resources. Poor management may be corrected by education, supervision, and the cultivation of greater interest in the land.

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In many cases farmers must be shown that the exploitation of resources, because of personal desires, or for reasons beyond the control of the individual, reduces immediate future income as well as that of the distant future. It must also be realized that, following a certain amount of depletion, a reinvestment must be made in order to rejuvenate productivity. Otherwise the resources will be worthless. This rejuvenation process is the deterring "cost" of conservation. However, where land has been depleted, it is essential that such reinvestment be made in order that human support and utilization be continued.

Whether the cost of replacing depleted productive ability is economically feasible, or not, depends on two major factors: (1) the ability of the operator to sacrifice current income, considering the pressing needs of livelihood; and (2) the value of the output (future income) in relation to input (present cost), due cognizance being given to interest charges. For example, if the annual cost of conserving grazing lands is $1.60 per acre, the cost must be justified in terms of additional income from grazing livestock. Furthermore, it is this justification that better farm management must make possible; otherwise conservation cannot be a reality.

OBJECTIVES

The objectives of this study are: (1) to determine some of the more important factors which need to be considered in planning improved farm management practices for soil conservation programs; and (2) to determine changes that have been brought about by a definitely planned soil and water conservation program.

The success of a conservation program on privately-owned farm lands depends, to a major extent, on the proper cognizance and planning of the farm business. It is pertinent that the effect of the conservation program on the elements of the farm business be observed carefully in order that improvements in conservation planning may be made intelligently.

The data upon which this report is based cover the three-year period from June 1, 1935, to May 31, 1938, including three production seasons. The data are organized so as to illustrate change, or lack of change, in factors which have a direct relationship to land management and soil conservation.

PHYSICAL AND HISTORICAL SETTING

The Harrison Soil Conservation area (officially known as Camp Work Area SCS—CCC—WVA—7)[1] is located in the south-

[1]The portion of this original area situated in Harrison and Lewis counties is now included in the West Fork Soil Conservation District, which was organized June 24, 1940. The portion lying in Barbour and Upshur Counties is now a part of the Tygarts Valley Soil Conservation District.

eastern portion of Harrison County and the adjoining counties of Barbour, Upshur, and Lewis (Fig. 1). Three tributary watersheds of the West Fork River constitute the area. This entire drainage basin empties into the Monongahela River, and thence the Ohio River at Pittsburgh.

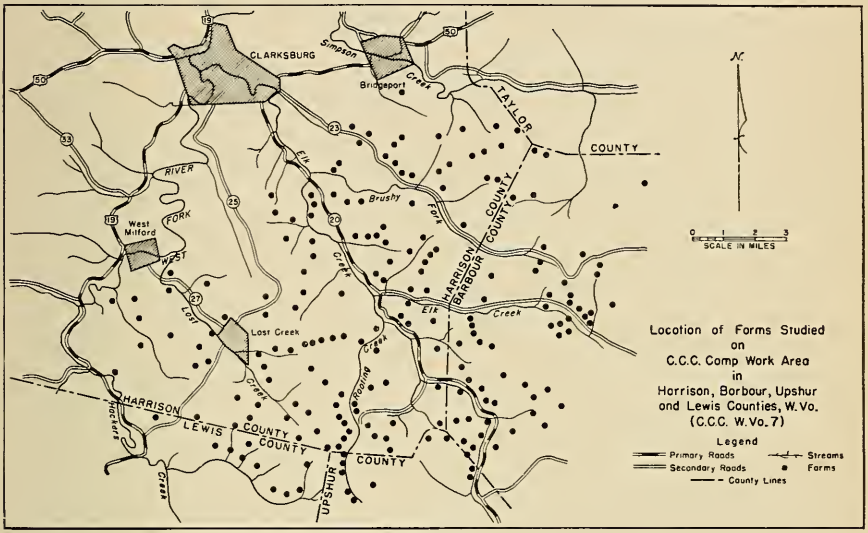

FIGURE 1

This territory was selected as a demonstration area by the Soil Conservation Service in 1935. Subsequently, programs were developed for about 85 farms, with the aim of demonstrating methods of land use and systems of management which would aid in retarding erosion, soil depletion, and water run-off.

Topography and Soils

The topograhy of the area is rather rugged, ranging in altitude from 1000 to 1800 ft. above sea level. The land is dissected by valleys ranging in depth from 500 to 600 ft. The hillsides, many of which have a slope of 30 percent or more, are generally devoted to pasture. Patches of woodland are frequent on the steeper and rougher land. Cropland is generally confined to the valley and terrace soils, which have much less slope. Some farmers, however, are obliged to utilize steep land for crop production.[2]

[2]Refer to West Virginia Agricultural Experiment Station Bulletin 284 for classification of land in Harrison County according to slope as follows:

Slope	Percent of land area
0-12%	13.4
12-25%	18.6
25-40%	65.9
Over 40%	2.1

The soils[3] consist principally of five important types and may be classified as follows:

1. Residual upland soils:
   (a) Dekalb silty clay loam (recently being mapped as **Gilpin**)
   (b) Westmoreland silty clay loam
   (c) Meigs clay loam
2. Sedimentary bottom and terrace soils:
   (a) Elk silt loam
   (b) Huntington silt loam

The upland soils consist to a major extent of the Dekalb and Westmoreland loams. The former is of shale and sandstone derivation, while Westmoreland is derived partially from limestone. These soils generally occupy the hillsides and are used for producing pasture and hay. Bluegrass seeds naturally on the Westmoreland soil, and where not pastured too heavily, or eroded badly, it provides excellent grazing.

Meigs clay loam is generally confined to the ridge tops, extending downward on the slopes in some places. This land is generally too steep and rough to be of much value for agriculture and is low in fertility.

The Elk and Huntington silt loams occur, as a small portion of the area, along the larger streams. Elk soils consist of benches above the Huntington first bottoms. Because of the nearly level topography of the former and the high productivity of the latter, both are generally devoted to the growing of crops.

The greater part of the Harrison area has been found to be subject to moderate sheet erosion, with only occasional gullies on land poorly managed.[4] Principally because of steep slope, most of the area has been classed as "below average" to "inferior" cropland but "good" to "average" pasture land.[5]

Climate

The annual amount of rainfall did not vary greatly from an average of 45 inches during the three years. It may be noted (Fig. 2) that only a small portion of the total annual rainfall came during the growing seasons. The growing season of 1936 received four inches less rainfall than during 1935, and three inches less than during the same period in 1937. Lack of rainfall was responsible for poor growing conditions during 1936. Ex-

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[3]Adapted from **Soil Survey of the Clarksburg Area**, by Charles N. Mooney and W. J. Latimer, U. S. D. A., 1912.

[4]**Reconnaissance Erosion Survey of West Virginia**, U. S. Dept. of Agriculture, 1934.

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

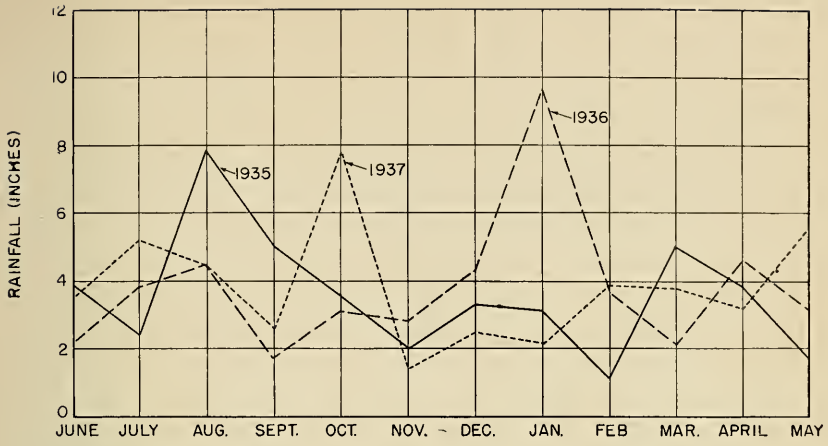

FIG. 2—Monthly Precipitation for the Harrison Area (Reported by U. S. Weather Bureau), Years 1935, 1936, 1937

cessive rainfall during short periods causes serious erosion problems on both sloping and valley land.

Markets

The Harrison area is served by excellent rail and highway facilities. The Baltimore and the Pittsburgh livestock markets are within convenient distance. In recent years local livestock auctions and local cooperatives have furnished a convenient market for much of the livestock produced. Nearby industrial communities furnish a potential market for perishable agricultural commodities.

In order partially to explain wide fluctuations in farm income from year to year, it is pertinent to note the variations in market price for the major commodity sold. Starting in 1935, prices paid to farmers for meat animals rose steadily throughout the year. They remained steady through 1936, and early in 1937 livestock prices again began to rise. By August and September such prices were 138 percent of the 1909-1914 base level (Fig. 3). During this period of less than three years, prices rose from an index of 80 to an index of 138 percent of the base-price level. This fact accounts largely for an increase in farm income from 1935 to 1937.

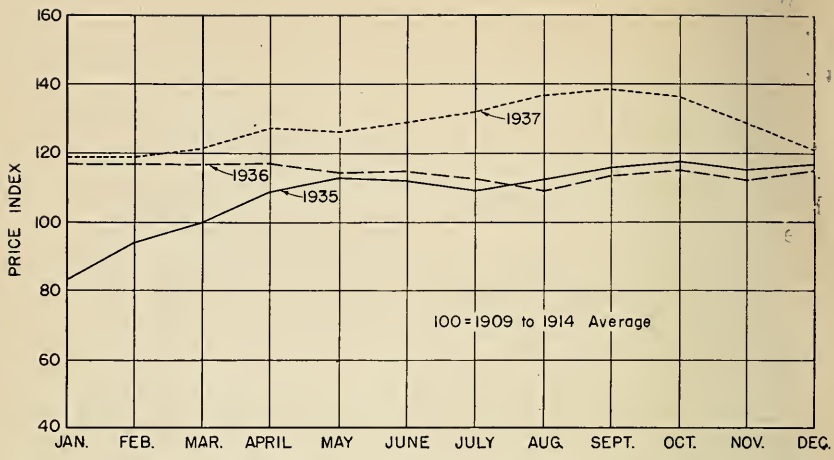

FIG. 3—Monthly Price Index for Meat Animals Sold by West Virginia Farms, 1935 to 1937[1]

[1]Adapted from **Agricultural Situation**, Bureau of Agricultural Economics, U. S. Department of Agriculture, Washington, D. C.

Historical Background

The agricultural settlement of the Harrison area began about 1770 and continued at a moderate rate until 1800, when many settlers came from Maryland and Virginia to this area.

The mineral resources including sand, coal, oil, and gas were discovered. In coincidence with the extensive development of these resources, many foreign laborers came to the new industrial communities. Income of land-owners was greatly augmented by royalties and rentals from gas and oil resources during the period subsequent to 1890. Consequently, less attention was given to agriculture. The exhaustion of some of these resources and the dissipation of the profits later resulted in the necessity for greater dependence on farming for a portion of the livelihood of many families, but the effect of these resources is still evident.[6]

The early agriculture of the area consisted chiefly of growing corn and wheat for food. As the steep land was partially depleted by these crops it was generally retired to hay or pasture, and new land was broken. Much of the abandoned crop land seeded naturally to bluegrass which, as pasture, formed the basis for the important livestock farming in the following years.

The greater portion of the steep land is used for pasture, while the valleys and terraces are used for the production of hay, corn, and other crops. However, it is not unusual to cultivate slopes which erode badly. Erosion, soil acidity, and neglect have decreased the value of much land. Many acres produce only

[6]Chas. N. Mooney and W. J. Latimer, **Soil Survey of the Clarksburg Area**, U. S. D. A., 1912.

broomsedge and other undesirable vegetation, and small areas have been practically destoyed by erosion.

GENERAL ECONOMIC ORGANIZATION OF AGRICULTURE

This study is based on farm business records obtained from 200 farms for 1935 and 1936. For the third year (1937) five farms dropped out, leaving 195 in the survey. According to Table 1, the survey covered approximately 41,000 acres of land, 86 percent of which was owned by the operators. The greater part of the remainder was cash-rented.

Table 1—Land tenure on farms in the Harrison Area, 1935-1937 (3-year average)

Item	Acreage owned	Acreage cash rented	Acreage share rented	Acreage rented out	Total acreage operated
Total acres	35,464	5,704	447	505	41,110
Acres per farm	179	29	2	3	207
Percentage of total	86	14	1	1	100

More than one-fifth of all farmers had purchased or were renting additional land each year in order to adjust the size of their operating units in accordance with other available resources. A smaller number decreased the acreage operated by leasing land to neighbors. Rented land is usually contracted on an annual basis.

The average size of all farms surveyed was about 208 acres, variation in size between years being due to the amount of land rented. Approximately 60 percent of all farms were under 150 acres in size, and about 15 percent of all farms were larger than 300 acres.

CHARACTER OF FARMING

The detailed farm business analysis which follows is organized on the basis of types of farming. This organization facilitates the analysis of factors which affect farm earnings. Second, it enables comparison of the operation and returns to farming of different types. Third, it may be possible to determine the reaction of different types of farm organization to changes in practices which are recommended in the soil-conservation program. The existing types of production, the actual needs of the farm families, and the resources available will determine in large measure the feasibility of changes in prevailing practices. Thus, the success of a soil-conservation program depends partially on these factors.

Approximately 44 percent of the farms were classed as *general* farms; i. e., no single enterprise accounted for as much as 40 percent of the value of the total production. On the other hand, *specialized beef-cattle* farms constituted about 30 percent of all farms but occupied more than 60 percent of the land,

being more than three times as large as general farms. *Self-sufficing* farms accounted for slightly less than 20 percent of all farms, but because of their small average size, this type represented a much smaller proportion of the land area. About 7 percent of the farms were classified as *dairy* farms, but the majority of these were not completely specialized (Table 2).

Table 2—Types of farming in the Harrison Area, 1935-1937[1]

Item	Year	Number of farms of each type				
		General	Beef	Self-sufficing	Dairy	All farms
Number	1935	79	65	43	13	200
	1936	92	60	33	15	200
	1937	92	56	36	11	195
Percent in each class	1935	40	32	22	6	100
	1936	46	30	17	7	100
	1937	47	29	18	6	100
Average size (Acreage)	1935	117	408	92	148	208
	1936	135	391	79	138	203
	1937	127	450	72	145	211

[1]In classifying farms according to type the procedure followed was adapted from **Types of Farming in the United States**, by F. F. Elliott, Census of Agriculture, U. S. Department of Commerce, 1933.

It is clear that, in general, this is a beef-cattle-producing area with some farms branching into supplementary enterprises. The self-sufficing farms are small general farms and are sometimes called low-income or subsistence farms, on which 50 per cent or more of the total production is consumed by the occupants.

Investments

The value of investments varied between farm types, according to data in Table 3. The average amount invested in self-sufficing farms was less than $4,500, while the large beef-cattle farms represented investments in excess of $20,000. General and dairy farming involved investments of from $7,000 to $11,000 respectively.

From the standpoint of income-producing ability it is quite evident that beef-cattle farms have a possible advantage over all other types relative to the utilization of investment. A larger percentage of the total investment is represented by land and livestock than is true of either of the other types. Whether this is an advantage depends principally on economy in use of the land. Self-sufficing farms possess decidedly less productive investment in livestock and have a larger proportion of their total capital invested in comparatively unproductive buildings. General and dairy farms utilize capital in about the same manner except for the fact that dairy farms maintain more expensive barns than are generally necessary for other types. Thus some tangible indication of the comparative income-earning capacity of the four different types of farm organization is already apparent.

Table 3—Average investment in farms of different types, Harrison Area, 1935-1937 (3-year average)

Nature of investment	Investment by type of farm				Average for all farms
	General	Beef	Self-sufficing	Dairy	
Average total investment	$7,813	$22,429	$4,439	$10,576	$11,779
Percent in land	50	57	54	48	54
Percent in livestock	15	22	9	13	18
Percent in buildings	35	21	37	39	28

LAND UTILIZATION

Land use determines the type of farming, the sources of income, and ultimately the relative profitableness of farming. In like manner the misuse of land jeopardizes the income from farming. Land use is guided by many interrelated factors, including those of a physical, economic, and social nature. Consequently it is important that appropriate consideration be given to a determination of the most advantageous use that might be employed on any given tract of land.

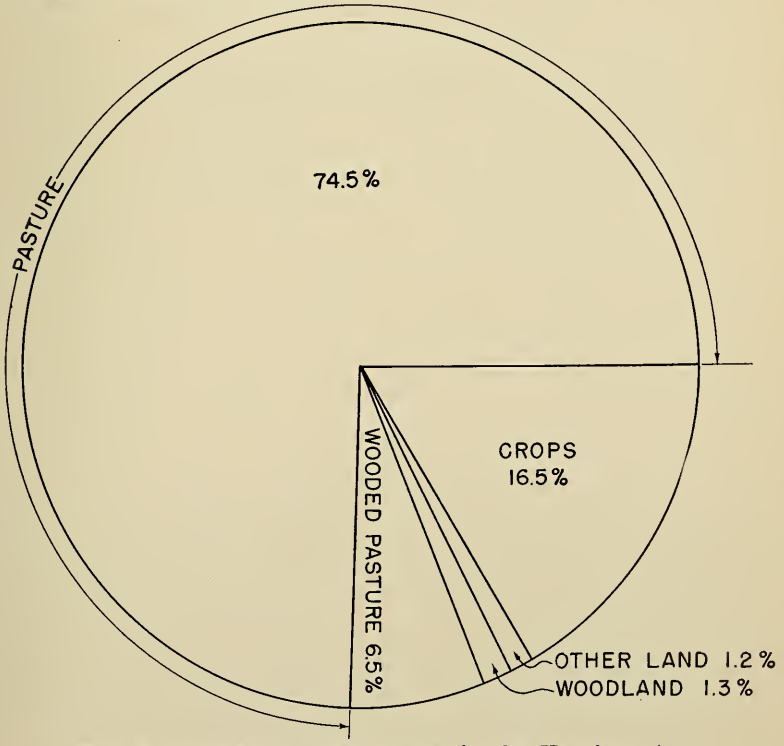

FIG. 4—Land Use on 200 Farms in the Harrison Area (Three-year average)

Practically 80 percent of all land was devoted to pasture in the Harrison area, 74 percent being permanent pasture (Fig. 4). Crops occupied 16 percent of the land in farms, or about 33 acres per farm. According to data presented in Table 4, a slight tendency to decrease crop acreage and to increase pasture acreage is apparent.

Table 4—Land use according to type of farming, Harrison Area, 1935-1937

Use	Year	Average for each type of farming				Average all farms
		General	Beef	Self-sufficing	Dairy	
Cropland (acres)	1935	26	55	21	34	35
	1936	26	53	19	34	34
	1937	27	55	18	31	34
Open pasture (acres)	1935	80	316	59	101	153
	1936	95	306	53	92	151
	1937	88	359	47	103	159
Percent cropland	1935	22	14	23	23	17
	1936	20	14	24	25	17
	1937	21	12	24	21	16
Percent pasture	1935	68	77	65	68	74
	1336	70	77	67	67	75
	1937	69	80	66	71	76

Although the average area of beef-cattle farms exceeded 400 acres, it may be noted that the percentage devoted to crops was less than for any other type of farm. The percentage used for pasture was greater to about the same extent. This fact denotes a less intensive use and the possibility of maintaining a perennial cover having greater erosion resistance than is possible with more intensive farming. A significant characteristic in connection with the self-sufficing and smaller general farms is the fact that the productive unit is exceedingly small and, because of this, must be utilized intensively if it is made to produce sufficient grains and other staple commodities for maintenance of the farm family. Whether this is physically possible on these small farms is a question, particularly when considered over a long period of time.

CROP PRODUCTION

Typical of livestock farming in West Virginia, hay and corn occupy, on an average, about 74 percent and 15 percent, respectively, of the 34 acres devoted to crop production per farm. Practically all farmers produce corn and forage for livestock. Most of the hays consist of mixed clover and timothy, although an appreciable acreage is devoted to soybeans and grain hays. Alfalfa has not been grown generally in this area, but recent conservation efforts have encouraged a few farmers to seed this legume for hay. Likewise the production of soybeans, corn, and oats on sloping land has been discouraged.

Erosion Resistance

Approximately 65 percent of all crops grown are erosion-resistant or sod crops (Fig. 5). This fact, together with the fact that few harvested crops are grown on the steeper hillsides, indicates a comparatively slight erosion problem resulting from cropping practices. On the other hand, crop land is subject to damaging sheet erosion in some instances.

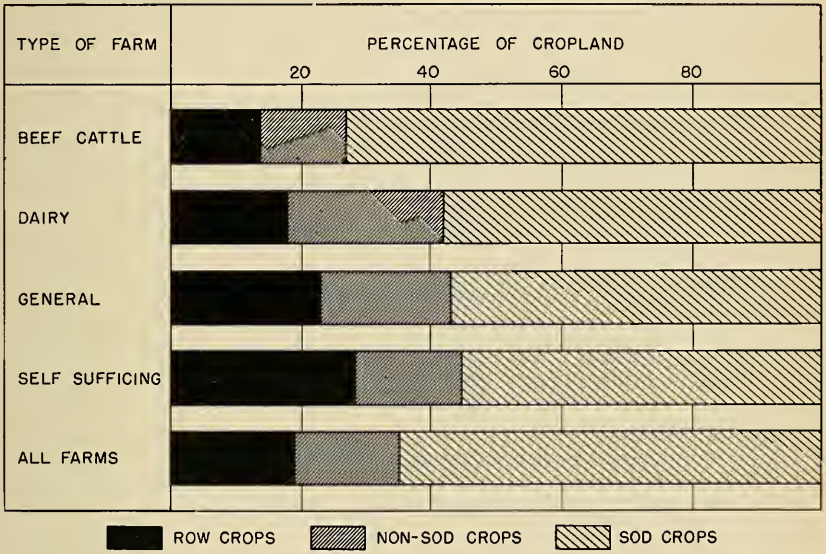

FIG. 5—Comparative Erosion Resistance of Crops Grown in the Harrison Area by Type of Farm (Three-year Average)

It may be noted that semi-erosion-resistant small grains were increased slightly from 1935 to 1937, while erosion-resistant forage crops decreased about the same amount. This may have been due to an attempt to establish seedings of alfalfa and other legumes with the aid of small grains as nurse crops.

The acreage of non-erosion-resistant row crops remained about constant during the period. It has not been necessary to reduce these crops on most of the better farms because of the fact that such cultivated crops are generally grown on land subject to less severe erosion. Data in Table 5 indicate that on self-sufficing and general farms, 10 to 15 percent more of the land was devoted to row crops than was true of beef-cattle farms. On the other hand about 20 percent more of the area on beef-cattle farms was devoted to forage or sod crops. This further typifies the possibilities for conservation in connection with livestock production.

Furthermore, a tendency to reduce the percentage of row crops on all types, except beef-cattle and self-sufficing, was noticeable. In the latter case the reverse tendency was true, and an increase in the percentage of non-erosion-resisting and semi-erosion-resisting crops was noticeable from 1935 to 1937.

Table 5—Comparative erosion resistance of crops on different types of farms, Harrison Area, 1935-1937

Type of crop	Year	Percentage of crop area by type of farm				Av. percentage all farms
		General	Beef	Self-sufficing	Dairy	
Row crops	1935	23.8	14.5	27.2	19.8	19.3
	1936	22.7	12.1	28.0	18.4	18.0
	1937	22.0	14.2	28.5	17.8	19.4
Non-sod crops	1935	19.5	11.8	15.8	23.7	15.2
	1936	20.8	11.7	15.4	22.0	16.9
	1937	19.7	14.3	17.7	23.3	17.0
Perennial sod crops	1935	56.7	73.7	57.0	56.5	65.5
	1936	56.5	76.2	56.6	59.6	65.1
	1937	58.3	71.5	53.8	58.9	63.6

Crop and Pasture Yields

Crop yields were appreciably in excess of average yields for the entire state in each of the three years (Table 6). Yields for 1936 were 20 percent lower than for either the preceding or the following year. Lack of moisture materially reduced both crop and pasture yields in this year.

Table 6—Average yields of major crops, Harrison Area, 1935-1937

Crop		Yield per acre		
		1935	1936	1937
Corn—Grain	bu.	42.3	38.0	42.9
Silage	T.	9.8	7.9	9.1
Wheat	bu.	17.6	16.8	16.2
Oats	bu.	24.0	16.0	24.9
Mixed hay	T.	1.2	.8	1.1
Clover		—	1.2	—
Alfalfa		2.0	1.2	2.3
Soybeans		1.8	1.4	1.7
Wheat hay		1.6	1.2	1.6
Oat hay		1.1	.6	1.1
Yield index[1]		133	98	125

[1]Average yield for State from 1923-1932=100.

A very small percentage of the forage grown consists of perennial legumes. Both mixed and grain hay yields are entirely too low. On the other hand alfalfa, although grown by only a few farmers, appears to yield practically twice the tonnage obtained from mixed hays. Soybean and wheat hay is grown by a large number of farmers as a supplement to mixed hay, with reasonably good yields.

The fact that yields are considerably above the average for the state further illustrates the relatively high productivity of land used for crops. However, care should be exercised to prevent

possible depletion in the future. Present conditions are the result of gradually shifting crop production from the sloping hillside land to positions on the more fertile soils. In many instances crops were grown on the hillsides until erosion and depletion rendered the practice prohibitive. Consequently, pastures now occupy most of what formerly was cropland.

Possibly the soil-depleting aspects of intensive cultivation on small farms, together with the limitation imposed by small acreage, are reflected in the low crop yields for self-sufficing farms. According to data in Table 7, beef-cattle and general farms possessed a decided advantage in higher crop yields in comparison with dairy and self-sufficing farms. Pasture land, likewise, was utilized very inefficiently on self-sufficing farms. In view of the fact that much of the present pasture land was previously cropland, the large acreage now used per grazing unit reflects the high degree of depletion and the present low productivity of many pastures.

Table 7—Indices of production and utilization according to type of farm, Harrison Area, 1935-1937

Nature of index	Year	Index for each type of farm				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Crop yield index[1]	1935	138	137	109	128	133
	1936	99	99	101	82	98
	1937	125	129	113	116	125
Open pasture per animal unit (acres)	1935	4.2	5.2	7.1	4.0	5.2
	1936	5.0	4.6	6.0	4.3	4.9
	1937	5.0	4.9	6.9	4.4	5.1
Cropland per animal unit (acres)	1935	1.5	.9	2.5	1.3	1.2
	1936	1.4	.8	2.2	1.6	1.1
	1937	1.5	.8	2.5	1.3	1.1

[1]Based on average yields for West Virginia from 1923-1932=100.

The comparative low crop yields of these dairy farms are due to several factors. Dairy farms are not large, being about 145 acres in size, and have been farmed more intensively than either general or beef-cattle farms. More animal units have been maintained per 100 acres, and a larger percentage of the land has been devoted to crops. Although comparatively high incomes have been realized, fertility and soil-conserving practices have been neglected—in some cases to a greater extent than on livestock and general farms. The problem in this connection is to maintain productivity by fertility amendments and soil-conserving practices rather than to farm less intensively.

Pasture land represents the most important resource of this area. All farms, whether general, dairy, or livestock farms, depend on grazing. The hill pastures of this area, although steep, in general may be readily improved. However, as in most other areas of the state, practically no effort has been made to replace

the fertility withdrawn by successive years of grazing and by earlier cropping practices. Broomsedge and other weeds have replaced the bluegrass and other more desirable pasture grasses over appreciably large areas. Consequently, definite need prevails for improvement in the management and treatment of pastures if the livestock industry is to be maintained on a reasonably profitable basis.

A pasture survey in 1915[7] indicated that the carrying capacity of Harrison county pastures was about one two-year-old steer to 3.6 acres. A similar survey[8] made in 1935 indicated that 5.0 acres were used for each animal unit. This latter figure checks with census data for 1934 and with additional survey data for 1937, which indicate an acreage use of 5.2 and 5.1, respectively, for each animal unit pastured. If these data can be assumed to be comparable they illustrate the possible decrease in pasture yields as a result of continuous grazing without the aid of practices for maintaining soil fertility.

Agronomic investigations have shown that 99 percent of all pastures in Harrison County were in need of at least one ton of pure, finely ground limestone per acre.[8] It has been pointed out that these pastures had a stand of only 20 percent desirable species, which is entirely too low considering the potential productivity of the soils if limed and fertilized.

The above data illustrate inefficiency in the use of land. The fact that approximately five acres of land are utilized to pasture each animal unit is sufficient evidence that pastures are of very low quality, or they are not stocked to present capacity. It is quite possible that both conditions exist. However, from the data available it can be concluded that land is not being utilized to the best advantage. The acres suitable for pasture should be improved and used in an efficient manner. Land which is now being used as pasture but which should be forest undoubtedly can be utilized over a long period to greater advantage if the latter use is established.

Fertility Practices

Proper fertility practices have been generally lacking on West Virginia farm land. Insufficient additions to soil fertility have been made to compensate for the depleted productive ability resulting from excessive cropping and accelerated erosion. Pastures have been thought to be indestructible, and no effort was made to replenish fertility necessary for profitable grass production.

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[7]Cook, I. S., **West Virginia Pastures.** W. Va. Agr. Exp. Sta. Bul. 177, 1922.
[8]Pierre, W. H., et al., **West Virginia Pastures.** W. Va. Agr. Exp. Sta. Bul. 280, 1937.

Data in Table 8 indicate a decided increase in the amount of fertilizer used and the acreage treated per farm. An appreciable increase in the amount of lime used also may be noted. The real significance of these data concerns the increase in the acreage of pasture that was limed and fertilized. Although comparatively few farmers limed or fertilized in either year, the practice is spreading.

Table 8—Application of fertilizer and lime to crop and pasture land, Harrison Area, 1935-1937

Item	Year	Cropland			Pasture		
		Number reporting use	Acres treated per farm	Pounds applied per acre	Number reporting use	Acres treated per farm	Pounds applied per acre
Fertilizer							
16-20 percent Phosphate	1935	104	3.8	242	3	.1	197
	1936	118	5.5	289	7	.5	258
	1937	111	4.8	258	7	.4	320
Complete Fertilizer	1935	92	2.4	270	—	—	—
	1936	92	2.5	268	—	—	—
	1937	106	3.8	279	—	—	—
Lime	1935	30	1.1	3,018	4	.1	2,947
	1936	67	2.7	4,086	13	.8	4,807
	1937	70	3.3	3,663	8	.5	4,019
Manure	1935	[1]	—	—	—	—	—
	1936	187	3.7	18,627	5	.2	12,810
	1937	184	4.0	18,339	3	.1	14,133

[1]Data not available.

In general, the majority of the pasture land in this area is in need of greater attention than has been accorded it in the past. Recent unfavorable growing conditions have accentuated the problem of pasture production, bringing into relief the necessity of conservation.

Fertility practices were seriously lacking on farms where they seemed to be needed most. Small farms of a self-sufficing nature, having very limited resources, apparently employ few practices for maintaining soil fertility. It may be noted in Table 9 that practically all types except self-sufficing exhibited a strong tendency to increase the acreage limed and fertilized per farm from 1935 to 1937. The encouragement given by the Agricultural Adjustment Administration and the Soil Conservation Service and by other agencies has undoubtedly had considerable influence on the increased use of these fertility practices.

Table 9—Acreage treated with lime and fertilizer on different types of farms, Harrison Area, 1935-1937

Treatment	Year	Acreage treated per farm for each type				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Treated with lime	1935	.9	2.3	.1	1.7	1.2
	1936	2.3	6.9	.5	3.2	3.5
	1937	2.1	8.7	.3	6.5	3.8
Treated with fertilizer	1935	6.7	8.3	3.3	4.4	6.3
	1936	7.7	12.8	3.4	6.9	8.5
	1937	6.9	16.5	3.6	7.1	9.0

Practically no fertilizer was applied to pastures, with the exception of a few general and beef-cattle farms. Nor was lime generally applied to pastures. Pastures had received such fertility treatment only in scattered cases before 1935.

Operators of small low-income farms seem to be handicapped greatly in maintaining soil fertility. *First*, they are forced to use a large percentage of their land for non-sod crops which permit accelerated erosion and depletion. *Second*, the small number of animal units maintained furnish only a small quantity of manure, which often is not utilized judiciously. *Third*, they lack the necessary resources with which to purchase commercial fertilizer and lime.

LIVESTOCK PRODUCTION

In evaluating the livestock farming of the Harrison area it is essential to keep in mind the requisites of profitable livestock production. Pasture and forage of high quality are essential. A large percentage of the cattle produced are grass fattened for late summer and early autumn markets. Thus it is evident that profitable livestock production is directly dependent on the use and management of land. The ability to maintain economically a large number of animal units per farm will, in a large measure, determine the volume of farm income.

Data in Table 10 present the animal units of various types kept on farms for the three-year period. Approximately 62 percent of the 30 animal units maintained per farm was represented by beef cattle. An increase of 13 percent in the average number of steers per farm may be noted between 1935 and 1937. This increase denotes a general expansion of beef cattle enterprises after the depression years from 1932 to 1934. During this period the financial security of many farmers was jeopardized, and beef-cattle enterprises were contracted. Most of the general livestock enterprises remained about stable, while poultry appeared to be expanding slightly.

Table 10—Animal units on 200 farms, Harrison Area, 1935-1937[1]

Type	Animal units per farm			Percent of total		
	1935	1936	1937	1935	1936	1937
Dairy cows and heifers	4.3	4.6	4.6	14.4	14.7	14.6
Beef cows and heifers	3.2	3.0	2.5	11.0	9.6	8.0
Steers	15.0	16.7	17.0	50.8	53.9	54.1
Bulls	.3	.4	.3	1.1	1.1	.9
Calves	1.1	.9	.8	3.7	2.8	2.6
Horses and colts	2.4	2.4	2.5	8.0	7.9	7.9
Swine	.6	.5	.6	1.9	1.7	2.0
Sheep	2.0	1.8	1.8	6.8	5.9	5.6
Poultry	.7	.7	1.3	2.3	2.4	4.3
Total	29.6	31.0	31.4	100.0	100.0	100.0

[1]According to beginning inventories.

Considering the average size of the respective types of farms, the number of animal units maintained was much above the average for the state. Self-sufficing and some general farms maintained a rather small number of animal units, mainly for producing meat and livestock products to be consumed by the farm family.

Despite the fact that numbers of livestock (with the exception of beef cattle farms) changed but little from 1935 to 1937, the value of livestock per farm increased appreciably in this period, principally because of higher prices (Table 11). An average increase may be noted of 12 animal units per farm on beef-cattle farms. General and dairy farms did not change in organization markedly over the three-year period. These data imply that the resources of dairy, general, and self-sufficing farms, both physical and economic, are such that organization and practices are not readily altered in response to higher prices. Thus they lack the ability to adjust in order to produce more economically, but by reason of greater flexibility of capital resources, beef-cattle farms seem to have greater ability to take advantage of changes in the price level. It should be noted, however, that dairy production is not subject to the sharp fluctations in market prices that characterize beef cattle production.

Table 11—Animal units and value of livestock on farms of various types, Harrison Area, 1935-1937

Item	Year	Number and value per farm				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Number animal units	1935	17.5	61.1	8.4	25.0	30.2
	1936	19.0	66.8	8.7	21.5	31.8
	1937	17.6	73.1	6.8	23.5	31.7
Value of livestock per farm	1935	$1036	$4291	$396	$1308	$1974
	1936	1106	4649	493	1222	2076
	1937	1194	5921	419	1446	2423

SOURCES OF INCOME

In general approximately 92 percent of the gross farm receipts in the Harrison Area is obtained from livestock and livestock products (Fig. 6). This fact indicates the great importance of pasture and forage to these farmers. Field crop production is usually incidental to some type of specialized livestock production.

The major sources of receipts varied, depending on type of farm. Specialized beef farms obtained from livestock 93 percent of their total farm income, of which 91 percent was receipts from the sale of steers. On the other hand general farms depend on the sale of livestock to the extent of only 50 percent of their total receipts, while on dairy farms 82 percent of their gross

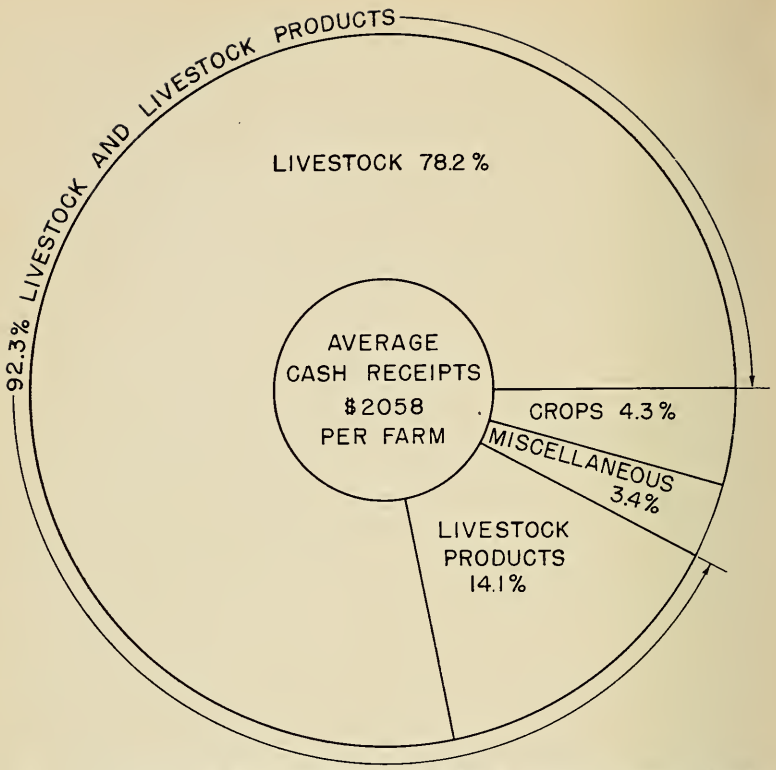

FIG. 6—Sources of Farm Receipts for Farms in the Harrison Area (Three-year average)

income came from livestock products. Self-sufficing farms, as a rule, depend on the sale of those few products available in excess of that consumed by the farm family.

Crops were a comparatively unimportant source of direct income, except on general and self-sufficing farms. For these types, crop sales constituted from 15 to 20 percent of all farm receipts. Such income was generally obtained from truck, berries, and small fruits, and not from field crops. In this way available family labor is utilized more effectively in producing a larger supplementary income than would be possible with less intensive production.

It may be noted that the volume of gross receipts (Table 12) was increased on all types of farms during the three-year period. However, gross income did not increase in the same proportions on all types. Beef-cattle farms increased total receipts by 60 percent, while comparable figures for dairy farms were increased by

less than 20 percent during the same period. The volume of receipts for general and self-sufficing farms also was subject to less fluctuation than was true of beef-cattle producers.

Table 12—Sources of receipts by type of farm on 200 farms, Harrison Area, 1935-1937

Source	Year	Amount (dollars) per farm				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Livestock:	1935	$379	$3,773	$ 92	$ 332	$1,417
	1936	490	4,084	112	400	1,499
	1937	489	5,702	131	313	1,908
Livestock products:	1935	213	145	59	1,850	264
	1936	238	144	51	1,705	289
	1937	237	235	66	2,242	318
Crops:	1935	155	30	30	41	80
	1936	141	48	36	29	87
	1937	155	57	43	42	100
Miscellaneous farm sources:	1935	24	7	19	11	16
	1936	97	66	26	36	71
	1937	73	280	28	56	123
Total farm receipts:	1935	771	3,955	199	2,233	1,778
	1936	965	4,343	226	2,170	1,947
	1937	955	6,275	257	2,652	2,449

If the three years covered by these data can be assumed to be representative, it may be concluded that dairy farming has been the most uniform producer of a reasonable volume of receipts annually. Receipts on beef-cattle farms fluctuate rather widely, depending on supplies and prices in other states, while the limited dairy production has a ready local market which is not affected by outside influences to so great an extent. Because of the rather wide fluctuations in beef-cattle prices, heavy risks are assumed by many farmers when they invest cash in feeder cattle. It has been observed that in a few cases farmers are maintaining breeding herds, and producing their own feeder and fattening cattle. By this method of production the risk of annual cash outlays is largely eliminated.

FARM EXPENSES

In the cases of general and dairy farms, 50 to 60 percent of total farm receipts was paid out as expenses, while on beef-cattle farms slightly less than 30 percent of gross receipts was required for general expenses (Table 13). Self-sufficing farm expenses exceeded average total receipts by one-third to one-half. It should be noted, however, that about one-third of the total expenses for self-sufficing farms represented family labor other than the operator's. This fact indicates a greater labor supply than is being utilized fully on these small farms. In general, labor represented about 41 percent of all farm expenses, 30 percent of which was hired labor. The remainder represented family labor exclusive of the operator.

Table 13—Current farm expenses for 200 farms, Harrison Area, 1935-1937

Expenses	Year	Amount and percent for each type of farm				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Total current expenses: (dollars)	1935	$464	$1,153	$274	$1,186	$694
	1936	557	1,270	348	1,295	792
	1937	494	1,487	248	1,361	783
Percent labor	1935	41.7	48.5	50.3	35.5	45.4
	1936	40.5	39.7	47.1	26.7	38.9
	1937	37.3	43.4	39.3	29.4	39.9
Percent feed:	1935	17.2	14.9	15.6	33.4	17.6
	1936	23.8	16.9	18.2	43.8	22.5
	1937	19.6	9.9	18.3	40.7	16.3
Percent seed:	1935	2.9	2.0	2.9	.9	2.2
	1936	3.5	3.1	3.6	1.9	3.1
	1937	2.9	2.2	2.9	.9	2.3
Percent lime and fertilizer:	1935	5.2	3.2	3.4	1.5	3.5
	1936	5.9	5.8	3.1	2.7	5.3
	1937	5.8	7.3	4.8	3.1	6.4
Percent taxes:	1935	9.1	13.6	9.3	3.5	11.0
	1936	8.2	13.6	7.8	3.3	10.2
	1937	8.3	12.7	9.8	3.0	10.2
Percent other:	1935	23.9	17.8	18.5	25.2	20.3
	1936	18.1	20.9	20.2	21.6	20.0
	1937	26.1	24.5	24.9	22.9	24.9

This emphasizes the fact that self-sufficing farms should not be judged strictly by the criteria used for evaluating commercial farms. Small farms producing on a self-sufficing basis, with a comparatively large supply of available labor, should be evaluated in light of the ability to satisfy home consumption needs. They cannot be expected to engage in extensive types of enterprises on a profitable commercial basis. Such crops and livestock as are produced in excess of home consumption may be considered of secondary importance yet necessary for a supply of needed cash income. Both types of production are essential to family maintenance, but undoubtedly more attention should be given to *production for use.*

In accordance with the increase in use of fertilizer and lime a noticeable increase in expenditures for these improvements from 1935 to 1937 was evident. Because of the few farms making such improvements the averages per farm seem small. However, such improvements on the low-income farms are burdensome, and represent a handicap because of the small amount of cash available for capital maintenance. On the other hand, the future security of the farm people depends on production. Sooner or later, expenditures for capital maintenance must be made if present production levels are to continue.

In general, farm income appeared to be climbing during the 3-year period. Livestock farming suffered greatly during 1934, when prices were low. In addition, financial and feed resources were not available to maintain producing stock. During 1935 and succeeding years, crop and forage production was more favorable, and higher livestock prices made it possible to operate at a level more nearly "normal."

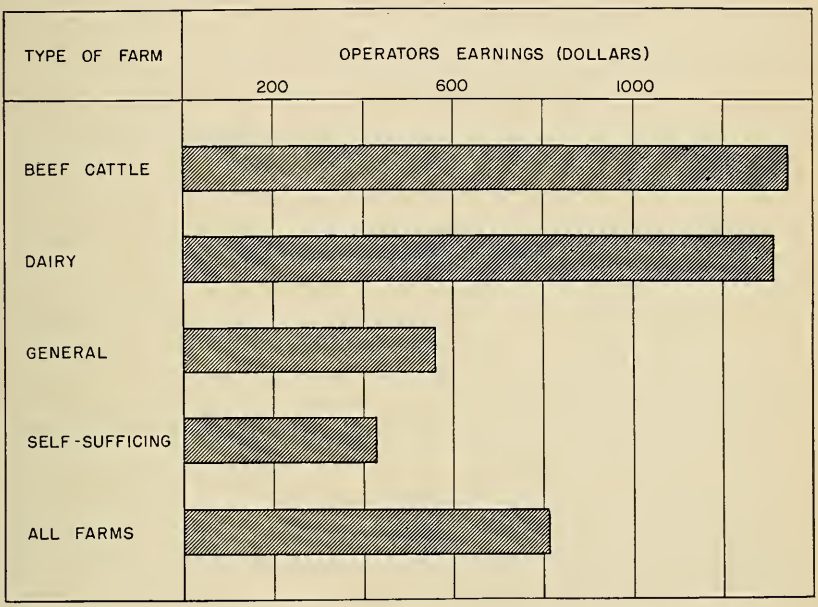

FIG. 7—Average Operators' Earnings in the Harrison Area by Type of Farm (three-year average)

Figure 7 illustrates the fact that average *operator's earnings* exceeded $1,150 annually for beef-cattle and dairy farms; but it is important to note that the fluctuation of earnings between 1935 and 1937 was $1,755 and $292, respectively (Table 14). This denotes the greater risk involved in beef-cattle farming because of price fluctuations. The appreciably smaller earnings of general and self-sufficing farms fluctuate but little from year to year.

On the basis of *farm income* per acre of farm land, dairy production returned practically twice that of beef-cattle farming. Using the same criterion, beef-cattle farming was about twice as profitable as general farming. Dairy farms may be expected to return a higher *labor income,* over a period of years, than any other type of farm in this area. A lower average investment and

Table 14—Financial summary of farm business on 200 farms of different types, Harrison Area, 1935-1937

Item	Year	Average income according to type				Average for all farms
		General	Beef	Self-sufficing	Dairy	
Farm Income	1935	$ 171	$ 447	$-113	$ 790	$ 240
	1936	347	1,312	-130	570	575
	1937	207	1,461	-112	922	548
Interest on Capital (5%)	1935	388	1,064	215	558	582
	1936	407	1,106	231	460	592
	1937	384	1,228	223	574	607
Labor Income	1935	-217	-617	-328	232	-342
	1936	- 60	206	-361	110	- 17
	1937	-177	233	-335	348	- 59
Non-Farm Income	1935	196	366	267	151	264
	1936	235	420	276	239	298
	1937	246	1,124	246	204	496
Perquisites (Food, Fuel, and Rent)	1935	453	502	489	540	483
	1936	464	500	509	486	483
	1937	548	700	532	683	596
Operator's Earnings	1935	432	251	428	923	405
	1936	639	1,126	424	1,032	764
	1937	617	2,057	443	1,235	1,033
Family Earnings	1935	514	345	528	988	494
	1936	727	1,222	542	1,091	857
	1937	677	2,100	600	1,280	1,089

more uniform demand for a commodity less affected by general price fluctuations provide greater assurance of labor income to dairy farming. To what extent this type of production could be expanded without exceeding the demand of local markets is not known. However, the introduction of condenseries and dairy product manufacturing may furnish additional demand in the future. On the other hand, beef-cattle producers may minimize their susceptibility to price fluctuations and losses by following the cow/calf type of production.

Non-farm income from mineral royalties and operator's work off the farm are very important on many farms. Some operators devote much time to work outside the farm business, and others are retired businessmen who have incomes aside from their farming pursuits.

FARM BUSINESS ANALYSIS

In the following analysis[9] certain elements of profitable and unprofitable farming are pointed out. Many interrelated factors determine the comparative economy of farm units. Hence it should be recognized that no single feature of management will determine profit or loss in all cases. The size of the unit, enterprise organization, and the efficiency in combining the factors of production are major considerations. The significance of these

[9]This analysis is made on the basis of three-year averages, except where otherwise designated.

elements of farm operation will vary with the different types of farming.

BEEF-CATTLE FARMING

Beef-cattle farming is the most extensive type of farming employed in the Appalachian Region. Because of this extensity, size of the unit is an important factor in the determination of profitableness. Both the volume of income and the efficiency of factor utilization depend directly on size of business.

Size of Business

Size of business may be measured according to several factors, including acreage in farms, number of animal units, and volume of receipts. The size of farms is important only insofar as the land is utilized. Thus pasture area, crop acreage, or number of animal units may be more important measures of size, depending on the varying degrees of intensity in land utilization.

It is apparent from the subsequent presentation that size of farm and available pasture and crop acreage are limiting factors on less than one-fifth of the specialized beef-cattle farms. Unlike certain other areas, sufficient land area is available, particularly land suitable for pasture.

The salient limitations in connection with profitable beef-cattle production appear to be management factors. The management of land as well as the direction of the production and marketing of livestock varies widely within this small area.

The data in Table 15 illustrate the fact that large business units have the potential capacity of producing higher incomes than is true of smaller units. On the other hand large units stand to lose more if not managed to advantage, or if circumstances beyond the control of management are adverse. Thus farms of 420 acres and over earned an average operator's labor income of $1,842 in 1937, when prices were high. The same farms returned a labor income of minus $1,158 in 1935, when cattle prices were much lower.

Table 15—Relationship of farm acreage to income on 59 beef-cattle farms, Harrison Area, 1935-1937

Acreage range	No. of farms	Average investment	Average farm income	Percent earned on investment	Average labor income		
					3-year average	1935 average	1937 average
20-159	12	$ 8,262	$ 79	.9	-$334	-$ 403	-$ 98
160-299	20	12,062	390	3.2	- 213	- 289	- 306
300-439	12	20,793	610	2.9	- 506	- 711	- 741
440-over	15	50,131	3180	6.3	673	- 1158	1842

The data show that larger farms returned higher incomes over the three-year period, but incomes were not proportionately higher in accordance with larger business units. Farms with an

average investment of $20,000 and 53 animal units returned only 2.4 percent to operator's labor and capital, while other farms with an average investment of $12,000 and 35 animal units returned 3.2 percent.

Table 16 presents data which illustrate the importance of pasture acreage. Sufficient grazing area of high quality is essential to the maintenance of the number of animal units that can be managed efficiently. Over the three-year period the farms utilizing larger areas of pasture for the production of a greater number of salable animal units returned the largest earnings to labor and capital. Here again, however, earnings are not consistently larger in proportion to larger business units.

Table 16—Relation of pasture acreage to income on 59 beef-cattle farms, Harrison Area, 1935-1937

Pasture acreage	Animal units	Crop acreage	Farm income	Labor income	% retd. on investment			No. of farms
					3-year avge.	1935	1937 avge.	
0-149	24	26	$ 216	-$247	2.3	.3	3.5	19
150-299	41	38	506	- 238	3.4	2.5	3.2	20
300-over	133	99	2,476	259	5.5	2.3	7.3	20

The direct dependence of income on number of animal units is illustrated in the above table. First, high incomes are dependent upon the efficient management of a sufficiently large number of animal units to make a reasonable return to the operator and fixed capital. Second, not all farms with a large number of animal units are profitable. Other factors, in addition to size, are equally or more important in beef-cattle farming.

Organization

The organization of profitable and unprofitable farms differs only in degree or in size of enterprises; not in type. Only slight variations in the proportions of the land utilized for various purposes were observed, according to data in Table 17. About 11.0 percent of the cropland was devoted to corn, 3.0 percent to wheat, and 76.0 percent to hay. The remaining 11.0 percent consisted of miscellaneous crops.

Table 17—Organization of less profitable and more profitable beef-cattle farms, Harrison Area, 1935-1937

Labor-income class	Percent of all land		Average number livestock				
	Pasture	Cropland	Dairy cows	Beef cows	Steers	Sheep	Chickens
20 Highest	80.4	12.0	3.3	4.6	68.5	21.2	52.8
20 Lowest	77.6	13.1	3.6	3.9	49.2	18.3	75.2

There was slight indication that the more profitable farms were keeping more beef cows for breeding purposes and about 20 more steers than the less profitable. The latter did not specialize

so strictly in beef cattle as was true of farms returning higher incomes.

Sources of receipts were about the same for all farms, with the exception that the less profitable farms seemed to depend to a greater extent on a variety of small enterprises than did the more profitable. According to data in Table 18, higher profits accrued to farms receiving a greater percentage of their total receipts from steers. The less profitable farms had a greater percentage of receipts from livestock products, miscellaneous receipts, and non-farm income.

Table 18—Sources of receipts on more profitable and less profitable beef-cattle farms, Harrison Area, 1935-1937

Labor-income class	Percent of cash farm receipts from:					Amount of non-farm income
	All livestock	Steers	Livestock products	Crops	Other	
20 Highest	95.6	79.2	2.1	.8	1.5	$723
20 Lowest	91.6	69.3	4.0	.4	4.0	797

Less profitable farms had 17 percent more of their total investment in land and 15 percent less in livestock than was true of the more profitable farms. This is an indication that the less profitable farms were not being operated at maximum intensity; i.e., fixed capital was not being utilized fully enough to justify the overhead expense involved.

Comparative Economy

The prices for animals of various ages also varied to unusual extent between farms. This may be the result of difference in quality of animals, the time of marketing, or other factors. Prices received for three-year-old steers varied in excess of $35 per head during the year 1937. Variations in excess of $10 per head were noted in 1936. Prices received for one- and two-year-old steers varied more than $20 in some cases.

Comparison of the economy of production on 20 farms having the highest incomes with 20 having the lowest incomes (Table 19) shows wide variation in the intensity of operation. Both groups were constituted of farms having an average of about 390 acres of pasture and about 60 acres of cropland. The more profitable farms maintained an average of 21 animal units in excess of the number maintained by the less profitable farms. This resulted in a difference of 1.3 acres of pasture utilized per animal unit. It is

Table 19—Comparison of production economy on beef-cattle farms, Harrison Area, 1935-1937

Labor-Income Class	Acres of pasture	Number animal units	Acres pasture per animal unit	Crop yield index	Ratio of expenses to receipts	Farm income	Labor income	
							5-year average	1937 average
20 Highest	394	89	4.8	128	69.8	$2,620	$1,423	$2,983
20 Lowest	385	68	6.1	117	98.1	84	-1,317	-2,016

undoubtedly true that pastures of the less profitable units were of lower quality than the more economical units. The problem, then, is to improve pastures to the extent that they can support a number of animal units large enough to justify the labor and investment involved. If this is not done, conservation will not be possible unless a change in use is made. In some cases land is probably overcapitalized and can not be expected to produce a justifiable income.

The importance of the matter of intensity lies in the fact that expenses and costs of maintaining the less intensive units were about two-thirds as much as that of the profitable farms, and receipts were only half as large. The costs of maintaining extensively utilized farm units do not decrease proportionately with decrease in intensity. Thus the ratio of expenses to receipts was 69.8 for the more profitable farms and 98.1 for the less profitable.

These findings are again substantiated by a cross examination of data in Table 20. It may be noted that income is directly correlated with the number of animal units maintained and with intensity in the use of pasture and cropland. It is entirely possible that a few of these beef-cattle farms are too large in relation to management capabilities. The risk involved in investing to a full capacity of steers may deter farmers from utilizing the available land to the greatest advantage. A change in production methods that would reduce risk might eliminate such handicaps. The maintenance of a breeding herd for production of beef cattle is one way to minimize risks. This would eliminate the need for annual investment in grazing stock at market prices.

Table 20—Relation of intensity in the utilization of pastures to farm income on 59 beef-cattle farms, Harrison Area, 1935-1937

Pasture acreage	Animal units			
	1-30	31-60	61-90	91-over
	Average Farm Income:			
0-149	$79	$514	$ ...	$ ...
150-299	-35	492	1,143	...
300-over	..	-31	-215	5,464
	Pasture Land per Animal Unit:			
0-149	5.3	3.7	...	...
150-299	8.2	5.5	3.9	..
300-over	.	8.0	5.6	4.9

In Table 21 the various factors are arranged according to the ratio of expenses to receipts for the various farms. Here again it is clearly evident that size of business and intensity of resource utilization are requisite to reasonable returns. The more profitable farms maintained more animal units per acre of pasture at less cost than the less profitable farms. In addition, the quality of the animals produced was much higher as indicated by the variation in price per head within the several groups. The lower prices for cattle sold from less profitable enterprises may indicate that the

quality of pasture was low. This leads to the conclusion that improvement in the quality of grazing is necessary. Methods of improving and conserving pasture productivity are essential.

Table 21—Comparison of beef-cattle farming according to ratio of expenses to receipts, Harrison Area, 1935-1937

Character	Ratio of expenses to receipts				
	41-60%	61-80%	81-100%	101-120%	121-140%
Number of farms	2	19	26	11	1
Acres in farms	1,485	339	456	323	145
Acres in pasture	1,255	262	360	235	119
Acres cropland	115	50	61	41	21
Animal units	312	56	69	39	23
Farm income	$14,882	$1,069	$ 719	-$ 436	-$ 206
Labor income	11,418	107	- 510	- 1,355	- 946
Current expenses	4,660	934	1,334	1,299	581
—per animal unit	15	17	19	39	23
Prices received per 3-yr. steer (1937)	144	124	130	120	104

Labor costs varied from 18 percent of all current expenses on the more profitable farms to 60 percent on the less profitable farms (Table 22), most of which represented cash wages. It appears that unless all resources, including labor, are not utilized more intensively, these high labor costs are not justifiable. In the case of the inefficient small farms it is evident that insufficient resources are available for beef-cattle farming. Expenses were high and the quality of animals produced was unusually low. Larger numbers of animals units offer no assurance of higher incomes. The quality of animals must be high also.

Table 22—Importance of various items of farm expense according to ratio of expenses to receipts on 59 beef-cattle farms, Harrison Area, 1935-1937.

Item of expense	Percent of total current expenses according to ratio of expenses to receipts				
	41-60%	61-80%	81-100%	101-120%	121-over
Feed	27.6	12.8	11.9	11.3	15.0
Lime and fertilizer	6.5	4.7	4.8	9.9	1.7
Seed	.8	1.4	1.7	2.6	1.0
Labor[1]	18.0	46.4	47.1	47.5	59.7

[1]Includes family labor.

The high percentage of total expenses represented by labor indicates the desirability of using it to greater advantage by maintaining and improving land and in producing a large volume of salable commodities.

In summary, it has been shown that the size of the producing unit must be large enough to justify the fixed costs involved in extensive beef-cattle enterprises. This means that small farms which are capable of maintaining a relatively small number of cattle are uneconomical for this type of production. It also means that land used for an extensive enterprise such as grazing should not be ex-

pected to make a return of sufficient amount to justify the use of land which is too highly capitalized. Since land in this area is relatively highly capitalized it is essential that it be maintained in such a condition as to provide a maximum grazing capacity at all times. The outstanding need on those farms of an acreage suitable for beef-cattle enterprises is the production of a greater number of animal units per acre and per unit of overhead cost.

GENERAL FARMING

General farms are those which produced less than 40 percent of their total farm receipts from any single source and did not classify as self-sufficing. General farms depend on several sources of income and may vary widely in detailed characteristics.

Size of Business

Unlike a majority of the beef-cattle farms, scarcity of land is a limiting factor on many general farms. More than half of them were under 120 acres in size, possessing less than 22 acres of cropland and less than 70 acres of pasture. Consequently the volume of income is definitely limited unless the comparatively small acreages are utilized in a more intensive manner than has characterized most livestock farming.

Data presented in Table 23 indicate that the size of general farms determines, to a large extent, the volume of income. About one-fourth of the general farms are entirely too small for more than a self-sufficing income in this area. The amount of crop and pasture land available was about 17 and 36 acres, respectively, on the smaller farms.

Table 23—Relation of pasture acreage and other factors to income of 94 general farms, Harrison Area, 1935-1937

Pasture acreage	No. of farms	Av. Invest.	Total acreage	Crop acr'ge.	Animal units	Total receipts	Total expenses	Farm income	Labor income
1-50	25	$ 5,092	63	17	12	$ 647	$ 557	$ 90	-$165
51-100	39	6,364	110	23	14	938	780	158	- 160
101-over	30	11,460	206	35	29	1,590	1,155	435	- 138

With practically 75 percent of the total farm receipts coming from various types of livestock, it is obvious that the volume of production must be small. Comparatively extensive enterprises require greater size in order to justify the labor and capital involved.

It is apparent from data in Table 24 that the number of animal units maintained does not have a direct relationship to income in all cases. There is, however, a distinct relationship between the two, but not enough to justify livestock farming on any except the largest general farms. The greater the number of animal units maintained, the larger the gross income, to be sure; but unless

a number of animal units large enough to justify the time of a manager and the capital involved is maintained there can be no reasonable return to capital and labor.

Table 24—Effect of number of animal units and other factors on income, 94 general farms, Harrison Area, 1935-1937

No. animal units	No. farms	Average investment	Crop acreage	Pasture acreage	Animal units	Farm income	Labor income
1-8	18	$ 4,525	15	52	5.7	$100	-$126
9-16	40	5,919	22	68	12.5	110	- 186
17-24	17	8,407	31	95	20.1	278	- 142
25-32	6	10,021	33	147	28.5	281	- 219
33-over	13	15,218	39	164	47.8	681	- 80

It is probably too often true that small farms within a grazing area endeavor to follow the same type of farming that is practiced in connection with large, extensive grazing ranches. It is generally not profitable to operate in such a manner because of the fact that physical production is limited to less than that necessary to result in a desirable economic ratio between expenses and receipts. Consequently the volume of income is insufficient fully to compensate all factors of production.

On the other hand it should be noted that not all small general farms are conforming strictly to livestock farming. Data in Table 25 point out that the most profitable general farms have found it possible to increase their volume of business by more intensive production. Farms with the highest labor incomes were smaller by 18 acres than those with the lowest incomes, having $3,000 less invested and 12 acres less pasture. The number of animal units maintained was practically identical. Thus size of business in such cases ceases to be measured in land area or in number of animal units alone. It becomes a matter of more intensive organization.

Table 25—Comparison of various size factors relative to high and low incomes of 60 general farms, Harrison Area, 1935-1937

Labor-income class	Av. investment	Total acreage	Crop acreage	Pasture acreage	No. animal units	Total receipts	Total expenses	Farm income	Labor income
30 highest	$6,825	130	28	89	19.4	$1,476	$863	$613	$272
30 lowest	9,909	148	27	101	19.1	866	945	- 79	- 574

Organization

There was practically no difference in the percentage of total investment represented by land on the most profitable general farms as compared with the least profitable. From the standpoint of farm organization it is significant that the more profitable farms had 7 percent less of their total investment in livestock than was true of the less profitable (Table 26). This fact immediately indicates that the smaller, more profitable farms depended on sources of income other than on livestock.

Table 26—Physical organization of 60 general farms according to highest and lowest labor incomes, Harrison Area, 1935-1937

Labor-income class	Percentage of investment			Percentage of land		Percent cropland in		
	Land	Buildings	Livestock	Cropland	Pasture	Corn	Wheat	Hay
30 highest	50.8	18.8	15.7	21.6	68.5	14.9	3.6	60.2
30 lowest	51.1	12.3	22.8	18.2	68.1	11.9	1.2	59.1

The farms returning the highest labor incomes maintained about 4 percent more of the land area in crops than was true of the farms returning the lowest labor incomes, and about the same proportion in pasture. Only slight differences in cropping practices prevailed within the two groups.

The slightly smaller farms appeared to be organized more intensively in the production of small fruits and truck crops, particularly strawberries (Table 27). They appeared to be utilizing available labor to a greater advantage in producing cash crops in addition to practically the same livestock production that existed on the lower-income farms.

Table 27—Sources of receipts on 30 more and 30 less profitable general farms, Harrison Area, 1935-1937

Labor-income class	Percentage of receipts from various sources				Amount of non-farm income
	All livestock	Livestock products	Crops	Other	
30 highest	45.4	22.2	25.7	6.7	$152
30 lowest	62.4	25.9	6.6	5.1	316

It was noted in connection with beef-cattle production, and again on many general farms, that land was being utilized too extensively. The effort made toward partial solution of this problem seems to be present in connection with the higher-income general farms. It is a matter of producing a greater volume of income from both crop and livestock enterprises by utilizing labor and land more intensively. It is entirely feasible that more intensive utilization may result in sufficient income to maintain land at a higher fertility level and to return a greater payment to labor and capital.

In some cases greater intensity might be attained by adding a small herd of dairy cows for the production of milk. In cases where sour cream is now being produced, the type of production might be shifted to milk for condenseries, if the market is available. Many farms of less than 150 acres may find it desirable to combine a sizeable poultry flock with a small dairy herd.

The objective of each farmer should be to combine the several possible enterprises (i.e. dairy, poultry, beef cattle, sheep, and crops) in such a manner as to make the most efficient use of land and labor for the production of the highest income. In some cases single enterprises may be best, while a combination of two or more enterprises may be necessary for the greatest efficiency on other farms.

Comparative Economy

It is probable that very few general farms approach either an optimum or a maximum production from the standpoint of all factors involved. Consideration should be given to the possibility of decreasing costs by combining the available resources so as to produce a greater net return. Fixed small areas of reasonably good agricultural land should be devoted to uses more intensive than grazing, by which available labor can be employed more economically. Land and labor are wasted if not utilized at the maximum economic intensity, depending on the relationship of prices and expenses. Seven percent more labor, in addition to the operator's, was available on the lower-income general farms than on the more profitable ones. Labor must be combined with other factors for the production of a greater volume of commodities if it is to earn an income.

The intensity of pasture utilization is indicative of the prevailing degree of economy in the use of land for livestock production. Table 28 indicates that the smallest farms, possessing the largest number of animal units, were the highest income producers. It is not merely pasture that produces income. Only by more economical production of livestock can farms become more profitable, when a grazing type of enterprise is employed.

Table 28—Association of high and low incomes with intensity of pasture utilization on 94 general farms, Harrison Area, 1935-1937

Acres utilized per animal unit	Average pasture acreage	No. of farms	Number animal units	Av. pasture land per animal unit	Total receipts	Total expenses	Farm income
1.5—3.4	74	6	27	3.0	$1,588	$866	$722
3.5—5.4	88	40	24	4.4	1,201	964	237
5.5—7.4	81	18	15	6.2	766	661	105
7.5—over	96	28	11	10.6	943	753	190

It may be noted from Table 29 that high crop yields and the grazing of more animal units per acre of pasture were associated with high incomes. High yields of both crops and pasture result in higher incomes. In turn, higher incomes enable the return to the land of sufficient capital to replenish and maintain fertility.

Table 29—Relationship of number of animal units, crop yields, and pasture load to income of 94 general farms, Harrison Area, 1935-1937

Animal units	No. of farms	Pasture acreage	Average animal units	Crop yield index	Acres of pasture per animal unit	Farm income
1-8	18	52	6	110	10.4	$100
9-16	40	68	13	117	6.2	110
17-24	17	95	20	123	5.3	278
25-32	6	147	29	113	5.7	281
33-over	13	164	48	134	4.3	681

The matter of the intensity of land use may be determined by the ability of pastures to support a large or a small grazing

load, or it may be the result of decision on the part of the farmer to produce a small number of livestock. In either event income is reduced. There are two remedies: (1) improve fertility and thereby increase carrying capacity and (2) adjust the number of animal units or the labor input to the available fixed resources according to existing physical and economic advantages.

Higher incomes have undoubtedly been attained on some small general farms by combining livestock and truck crops. The cross-examination in Table 30 points out again that only the largest general farms were reasonably successful with livestock enterprises as the main source of income. More intensive use of labor and other resources in producing berries and truck crops on the smaller general farms appeared to insure higher incomes. A greater volume of net income from a fixed capital investment should be the goal.

Table 30—Relationship of number of animal units maintained and size of farms to income of 94 general farms, Harrison Area, 1935-1937

Animal units	Income[1]	Acreage in farms			
		20-79	80-119	120-159	160-over
1-8	Farm income	$ 82	$ 73	$277	$ —
	Truck receipts	196	76	438	—
	Livestock receipts	255	279	194	—
9-16	Farm income	130	141	- 83	151
	Truck receipts	49	115	2	7
	Livestock receipts	573	565	352	460
17-24	Farm income	—	36	409	317
	Truck receipts	—	29	414	61
	Livestock receipts	—	718	811	931
25-32	Farm income	—	—	712	66
	Truck receipts	—	—	642	29
	Livestock receipts	—	—	951	993
33-over	Farm income	—	—	—	761
	Truck receipts	—	—	—	185
	Livestock receipts	—	—	—	1,759

[1]Truck receipts represent strawberries, raspberries, and other vegetable sales. Livestock receipts were those derived from any and all kinds of livestock, including livestock products.

SELF-SUFFICING FARMING

Self-sufficing farms are those from which 50 percent or more of the total production is consumed on the farm. They may sometimes be referred to as subsistence or low-income farms. In general, they are small general farms and have a number of small enterprises.

Size of Business

More than 70 percent of all self-sufficing farms were under 100 acres in size, and more than 55 percent were under 70 acres. Therefore the types and volumes of production are limited. Be-

cause of the type of farming followed in most instances, size of the physical unit is a very important factor in determining volume of income.

Since livestock is the major source of income, even on the small self-sufficing farms, the acreage of tillable and pasture land available is a major determinant of volume of production. Data in Table 31 indicate that the acreage of pasture and crop land available is closely associated with the number of animal units that may be maintained. Animal units, in turn, produce the income.

Table 31—Size of farm business as a factor in determination of income on 35 self-sufficing farms, Harrison Area, 1935-1937

Acreage in farms	No. of farms	Average investment	Total acreage	Crop acreage	Pasture acreage	Number animal units	Total receipts	Total expenses	Farm income
20-59	13	$4,262	44	14	26	5	$255	$455	-$200
60-99	12	3,257	90	20	44	8	346	492	- 146
100-over	10	6,039	134	24	92	13	462	429	33

However, even the largest self-sufficing farms possess such small livestock enterprises that the relative profitableness may be affected by a number of factors. The significant fact is that very small farms are endeavoring to follow an extensive type of farming on a very small amount of land. There may be factors which prohibit many types of intensive organization. The quality of land available, the abilities of the farmers, and the location, are determinants. However, it is a fact that poultry, strawberries, and truck crops can be produced on small acreages in most parts of this area, and good markets are available. The production of such enterprises would utilize the labor available to greater advantage than the extensive types of production now employed.

In fact, it probably is not a matter of eliminating the present livestock production, since most of the present small number of livestock are needed to supply the household with food. The need is greater volume of cash income. Small enterprises which may be undertaken on small areas of land should be introduced in order to utilize to greater advantage the labor and physical resources available. In many cases the present investment in land may be large enough. The increase in the size of business should be the result of an increase in volume of production by the addition of intensive types of enterprises.

Organization

There were only slight differences in the organization of the self-sufficing farms, except the distribution of investment. The proportion of the investment representing land was 20 percent greater on the more profitable farms, and the proportion representing livestock was 5 percent greater. Because of the fact that

practically all such small farms depended on livestock to a major extent, the ones having the best livestock producing resources were returning the largest volume of receipts. Pasture and hay land were available in greater proportions on the more profitable farms.

Data in Table 32 illustrate the proportion of receipts from various sources. Although the less profitable farms depended to a greater extent on crop sales, the difference in actual amount was small. The reason for more or less profit rests with other factors. It probably is worth noting that the group of lowest incomes received an average non-farm income of $320, while the higher-income farms received only $162 from non-farm sources. Higher non-farm incomes in many cases have encouraged neglect of farming pursuits.

Table 32—Sources of receipts on 35 self-sufficing farms, Harrison Area, 1935-1937

Labor-income class	Percentage cash receipts per farm from:				
	Livestock	Livestock products	Crops	Misc.	All sources
17 highest	54.7	25.5	6.4	13.4	100.0
18 lowest	55.1	19.8	18.4	6.7	100.0

Comparative Economy

The most significant distinction between the more and the less profitable farms was in the utilization of resources. Greater economy was associated definitely with the larger units, which were able to utilize labor to a greater advantage, according to data in Table 33.

Table 33—Relationship of economy of operation to other factors on 35 self-sufficing farms, Harrison Area, 1935-1937

Factor	Ratio of expenses to receipts					
	40-60	61-80	81-100	101-120	121-140	141-over
Number of farms	3	2	6	8	2	14
Size of farm	122	86	99	71	67	65
Acres pasture	98	55	64	41	53	41
Acres crops	18	21	18	20	14	20
Animal units	13	12	9	8	8	6
Farm income	$277	$140	$ 37	-$ 57	-$104	-$335
Labor income	16	- 90	- 130	- 289	- 226	- 578

Labor expenses represented half of the total expenses of the least profitable farms, and expenses were practically twice as large as those of the most profitable units. Labor expense alone, on farms having the lowest incomes, was practically equal to total expenses on those producing the largest incomes (Table 34). These facts definitely indicate that there is labor available for greater intensification on most small farms. In many cases low fertility is a contributing factor, while in other cases low income is due to lack of intensity. Data in Table 35 indicate that there

Table 34—Relation of various factors to higher and lower incomes on 35 self-sufficing farms, Harrison area, 1935-1937

Labor-income class	Farm income	Labor income	Ratio of expenses to receipts	Labor as a percentage of total expenses	Total receipts	Total expenses
	dollars	dollars	percent	percent	dollars	dollars
17 highest	44	-113	88	41	360	316
18-lowest	-265	-547	180	50	330	595

is sufficient land used for crops but that crops are low-yielding compared with other types of farms in the area. Crops of an extensive, low-yielding type are grown. In general, erosion and depletion characterize most cropland and large areas of pastures. The number of acres required to maintain an animal unit was large. Consequently the incomes per acre of both crop and pasture land are very low.

Table 35—Relationship of number of animal units to other factors on 35 self-sufficing farms, Harrison Area, 1935-1937

Number animal units	Pasture acreage	Crop acreage	Animal units	Pasture acreage per animal unit	Crop index	Total receipts
0-4.9	45	16	3	14.1	99	$252
5-9.9	46	17	7	7.3	104	310
10-over	80	24	13	6.5	119	427

With low incomes it is almost impossible to improve or purchase land for extensive production. When capital is available it should be utilized for gradually improving the available land for more intensive use.

DAIRY FARMING

Although dairy farming is not of general importance in the Harrison area, it is probably important as a growing enterprise. It has been stated in the preceding discussion that dairying is the most stable type of farming practiced in this area. Fluctuations in the general price level and in over-all production do not affect these local markets materially. Consequently there may be future expansion of this enterprise which is not evident at this time.

Dairying is a more intensive type of production involving more labor than beef-cattle farming. The return per animal unit is larger, and income is more uniform. Generally less acreage is required, but a greater percentage of the investment is represented by buildings and equipment. The average investment in dairy farms was less than half that of beef-cattle farms, principally because of size.

It is quite possible that enterprising farmers with farms slightly small for extensive beef-cattle production, but with sufficient productive crop and pasture land for a small herd of dairy

cows, may find this type of farming profitable either alone or in combination with other enterprises. More judicial use of surplus labor and greater volume of income have accompanied efficient management of this type of production. However, judging by the present condition of dairy farms in this area, it is important that farmers following this type of production give greater attention to fertility practices and soil-conserving measures. Adequate, high-quality pasture and hay and high crop yields are essential to the success of dairy production. When land is used more intensively, the cost of soil maintenance will rise slightly. Dairy farmers should endeavor to reduce commercial feed costs by attaining a more self-sufficing feed program. In many instances this can be done by producing hay and pasture of higher quality.

THE SOIL CONSERVATION PROGRAM

The program of soil conservation planned for the Harrison area is outlined below. The data presented do not represent actual accomplishments, but merely a summary of the plans for individual farm programs. These farm plans were set up in the form of five-year cooperative agreements between the farmers and the Soil Conservation Service. The work was inaugurated August 23, 1935.

The report of "*operations*"[10] indicates that plans have been prepared for 85 farms consisting of 14,483 acres. Erosion-control plans were completed for 13,254 acres, providing for the utilization of all land, whether for crops, pasture, or woodland, in a manner that will check erosion.

Crops

The reduction in the acreage of crops planned for this area was only 1.5 percent. It has been pointed out in the preceding discussion that most of the land now used for crop production is bottom and terrace soil. Consequently the land devoted to crops was in general utilized properly, except in so far as more adaptable crops might be produced in place of those now grown. Thus the problem is to grow crops better adapted to local needs, and also to check erosion and maintain the soil.

Acreage of clean-tilled crops, mainly corn, was to be reduced 21.4 percent (Table 36). Semi-erosion-resisting small grains and soybeans were to be reduced 14 percent, while the acreage of erosion-resisting hay land was planned to be increased 8.1 percent.

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[10]Adapted from final Report of Operations, Camp Area SCS—WVA—7. This area was placed on maintenance, December 11, 1937.

Table 36—Land use on 85 farms before and planned in Soil Conservation Agreements, Harrison Area

Item	Before agreements (acres)	Planned by agreements (acres)	Percentage change planned	
			Decrease	Increase
Cropland	2,700	2,657	1.5	—
Clean-tilled crops	500	393	21.4	—
Semi-erosion-resisting	520	447	14.0	—
Erosion-resisting	1,680	1,817	—	8.1
Pasture land	10,596	9,714	6.5	—
Woodland	100	1,158	—	1,058.0
Wooded pasture	552	221	59.9	—
Other lands	735	733	.2	—
Total	14,483	14,483	—	—

The principal changes in cropping practices included the planning of contour tillage for 1,232 acres and strip cropping for 776 acres. Cropland was to be fertilized and limed to the extent of 547 acres, 417 of which were seeded to mixed legumes and alfalfa. In a few instances, engineering structures, including diversion terraces, were installed on critical areas to remove excess water. In some cases cropland was retired to pasture which required the building of fences to protect crops from grazing.

Pasture

The acreage of permanent pasture was planned to be reduced 6.5 percent, the reduction representing very steep or seriously eroded areas, which should be retired to woodland. This figure represents the net reduction. A small acreage of cropland was to be retired to pasture. At the same time pasture land was to be retired to woodland. Thus gross changes planned were somewhat larger than the net changes shown here.

Approximately 1,000 acres of pasture land were planned to be treated with lime and fertilizer, and 300 acres were to be seeded. Grazing and management plans were written for more than 9,400 acres. These included pasture-rotation plans, seasonal grazing schedules, and mowing plans.

About 175 acres of pasture were planned to be contour furrowed for (1) control of sheet erosion and (2) water retention; and more than 2,650 rods of fence were constructed to facilitate the management of pastures. Seriously eroded areas were provided protection by 20,240 linear feet of diversion ditches. Gullies were treated and planted to trees to prevent further destruction.

Woodland

The acreage of woodland was planned to be increased from 652 to 1,379 acres, or 210 percent. The major portion of this increase was to come from the retirement of seriously eroded pasture

land. The woodland pastured was to be reduced from 552 acres to 221. More than 530 acres of land were planned to be treated and planted to trees after being retired from pasture or meadow. In order to protect woodland against grazing, 10,630 rods of fence were constructed.

Woodland cutting and management demonstrations have been carried out in behalf of educating farmers in the best methods of caring for farm woodlots.

Every phase of a proper land use program has been included in the plans. The objective is to make the best possible use of all land through the medium of the most satisfactory erosion-control practices. In this manner the productivity of the soil is to be maintained or improved.

PROGRESS TOWARD ATTAINING LAND-USE GOALS

In presenting the soil-conservation program the planned changes in land use were indicated. It has also been pointed out that only very slight changes in land use have actually taken place in the area as a whole, according to records obtained for 200 farms. In order to isolate the actual circumstances on farms for which cooperative plans have been written, 17 farms were picked at random for scrutiny. From these the *planned* land use was summarized, and from practice records obtained for these farms the reported *actual* land use was summarized for comparison.

The data in Table 37 indicate that the planned reduction in cropland has been accomplished. However, the land withdrawn from crops appears to have been utilized for pasture without at the same time reducing pasture acreage in favor of woodland. The diversion of steep land to woodland is probably the part of the conservation plans most difficult to accomplish. In general, farmers have been reluctant to fence and plant trees on any part of their land which offered potential grazing. This diversion may be made gradually as the better grazing land is improved and as the advantages of proper land use and farm woodlands are recognized.

Table 37—Land use on 17 farms in the Harrison Area as PLANNED compared to reported ACTUAL USE, 1935-1937

Land Use	Acreage per farm in 1935	Planned acreage per farm for 1937	Reported actual acreage per farm for 1937	Planned acreage per farm for 1940
Cropland	39.8	36.4	35.9	36.0
Pasture	136.4	134.4	139.4	134.8
Woodland	10.1	15.5	11.0	15.5
Other	2.1	2.1	2.1	2.1
Total	188.4	188.4	188.4	188.4

Changes noted in the type of crops grown were encouraging from the standpoint of conservation. Table 38 presents evidence that oats is being replaced by wheat to a large extent. This is desirable from the standpoint of an all-year protection and value of output per acre. Corn acreage had been reduced slightly. Soybeans were being replaced by perennial legume hays, which is a desirable conservation practice. A tendency to utilize a greater acreage for hay and a smaller acreage for wheat leads to the possibility that greater conservation is actually being accomplished than was planned. This tendency is particularly important. It represents desirable foresight on the part of the farmers in connection with improving the basis for livestock production.

Table 38—Planned cropping patterns compared to reported actual cropping patterns for 17 farms, Harrison Area

Crop	Acreage grown per farm for 1937	Acreage planned per farm for 1937	Reported actual acreage per farm in 1937	Planned acreage per farm for 1940
Corn	6.3	5.9	6.0	5.9
Wheat	1.5	6.9	4.7	4.8
Oats	3.1	1.2	1.4	—
Mixed hay	23.7	17.5	19.6	18.6
Alfalfa	—	.8	.9	3.2
Soybeans	1.7	.6	.1	—
Truck and fruit	3.5	3.5	3.2	3.5
Total	39.8	36.4	35.9	36.0

The summary presented in Table 39 indicates that a more erosion-resistant cropping pattern has been achieved than existed in 1935. Actually a larger percentage of the crop acreage was reported to be utilized for growing erosion-resistant hays than was planned. The acreage of non-erosion-resistant crops is slightly less than that planned. In general it appears that the changes made on this small number of farms toward achieving soil and water conservation are in line with adjustments which will give greater stability to the livestock enterprises.

Table 39—Progress toward attaining an erosion-resistant cropping pattern on 17 farms, Harrison Area, 1935-1937

Type of cover	Acreage per farm in 1935	Acreage planned per farm for 1937	Reported actual acreage per farm in 1937	Acreage planned per farm for 1940
Erosion-resistant	23.7	18.3	20.5	21.7
Semi-erosion-resistant	7.9	10.2	7.8	6.4
Non-erosion-resistant	8.2	7.9	7.6	7.9
Total	39.8	36.4	35.9	36.0

ECONOMIC IMPLICATIONS OF SOIL CONSERVATION

Conservation is a major consideration in farm management. The economy attained in utilizing resources is an important factor in the determination of income and in the possibility of conservation. The need for conservation varies widely between farms. The

applicability of conservation practices to different types of farming is not the same in all cases. Conservation may mean simply the maintaining of soil fertility, or the prevention of soil depletion, on some farms. On others, conservation may necessitate an entire change in land use, farm organization, and sources of income. In any case, however, it means that a portion of the annual output must be returned to the soil to provide humus, plant nutrients, and erosion prevention in order to maintain production.

The need for soil-conserving practices on most farms in the Harrison area has been emphasized in the preceding analysis. Soil resources must be conserved in order that the profitable production of pastures and forage may be continued. Livestock, as a major source of farm income, is dependent on high-quality pastures from comparatively steep land. In addition, certain areas which are subject to unusually severe erosion, necessitating their retirement to forest plantings, may supplement the major farm enterprises as a source of farm income in future years.

ADJUSTMENTS FOR CONSERVATION

Three major types of adjustment appear to be necessary if a reasonable degree of conservation is achieved and maintained: (1) land-use; (2) managerial; and (3) economic.

(1) The primary objective of any program which aims at conservation of land resources is *correct land use.* It is often impossible to conserve resources if the land is not used for the purposes which slope, soil, climate, and economic factors dictate. Within the Harrison area only minor adjustments in land use appear to be urgent. Small areas of steeply sloping land which are now cultivated should be retired to pasture or woodland. In addition very steep pasture should be retired to woodland in order to minimize erosion and to protect the lowlands from floods.

(2) A more important adjustment, requisite to conservation, may be considered as managerial. Land management is a prime factor in the production of agricultural or forest products. Pasture and forest land, as well as cropland, must be managed properly in order to maintain its productive capacity.

Contour cultivation and strip cropping are essential in checking soil erosion and depletion on sloping cropland. Rotation of soil-depleting types of crops with soil-improving legumes and green manure crops is necessary.

Like cropland, it is essential that pasture land be re-supplied with lime and fertilizer elements that are annually removed through the growth of pasture grass, or lost by leaching. In many cases the lack of such managerial practices has resulted in the depletion of productive capacity to the extent that the soil cover became ex-

tremely sparse. Sheet erosion then removed the most valuable topsoil.

Forests, too, must be cared for as a growing crop if wood and lumber are to be available in the future. Protection from fires, grazing, and excessive cutting is requisite to a continual supply of forest products from such lands.

(3) Economic adjustments are closely related to management but are classified separately to emphasize the importance thereof and the interrelationship of one with the other. Economic adjustments refer more specifically, however, to the factors which directly affect the functioning of the farm business.

In order to conserve resources which are being utilized, the methods of utilization must be economical. Enough income must be forthcoming to justify all the expenditures involved, including the soil resources which are utilized. Therefore certain economic factors must be in adjustment in order that labor and capital are properly compensated. In general, these economic factors may be classed under the following heads: (1) *size;* (2) *organization;* and (3) *economy.*[11]

The size of the business enterprise is extremely important when considering any program of conservation. The size of business is a major factor in determining the volume of income, and the volume of income bears a direct relationship to the ability of a farmer to conserve his resources. The maintenance of the farm family must be satisfied along with such other items as are deemed necessary. If this is accomplished satisfactorily without consuming all the farm production, there will be some income available for the maintenance of resources. If the business is not large enough to take care of these items satisfactorily, resources may be robbed and finally destroyed in an effort to produce a *"living."*

Therefore it is essential to give due consideration to the size of the physical unit, as well as to the volume of income produced, when planning conservation programs. The farm should be large enough to employ all available labor and to justify the labor and management involved. The physical size of farms, and the intensity of operation, may affect volume of income in like manner.

In considering size of business, *organization* must not be ignored. The selection and combination of the several enterprises that constitute a farm business will determine the relative degree of intensity. Small acreages might be farmed intensively with a resulting volume of income equal to or more than that derived from a larger acreage which is farmed extensively. If the physical unit is fixed in size, the enterprises then must be determined by their

[11]It may be noted that these were the factors given greatest attention in the analysis of farming in this area.

relative profitableness in accordance with the labor, investment, and other variable resources available.

It is highly important that the farm business be organized in a manner that will produce an income of sufficient amount to satisfy the prevailing needs and to replenish the resources requisite to continued production. For example, if extensive enterprises such as beef cattle are planned for small farms it is likely that the volume of income resulting will be small. The number of animal units maintained will be too few to justify the fixed costs. Likewise, it is even more unprofitable to maintain a large acreage of grazing land with a small number of animal units. In this latter case again the lack of intensity results in producing insufficient income to justify the overhead costs. Depending on the various factors involved, land has a maximum use intensity which should be approached in organizing the production program. If sufficient income is to be expected for conserving resources above that necessary for overhead costs, serious attention must be given to organizing the several enterprises in the most profitable manner.

The efficiency in combining land, capital, and labor depends on the size of business, the combination of major, supplementary, and complementary enterprises, and the quality of management. This latter factor, *management*, is more or less intangible, yet probably one of the most important. The size and organization of the business unit may be suitable, but without efficient direction in utilizing the available capital and labor in producing the maximum net return, the resulting production may be unsatisfactory.

Sufficient proportions of the annual production must be set aside for fertilizing, liming, and replacements. Insufficient capital expended on one enterprise, and too much expended on another, may mean inefficient utilization of resources. The result will be low incomes which sooner or later will force the robbing of resources in order to sustain the farm family. Thus conservation of farm resources will be possible only when these factors are in adjustment with internal and external conditions.

PLANNING FARMS FOR CONSERVATION

It has been emphasized that adequate income is essential to conservation. Without fully providing for the factors influencing income, a plan cannot be said to be a conservation plan. A plan may have as its objective the retardation of erosion yet be seriously lacking in conservation policy, because it will not be followed unless sufficient income is forthcoming.

Good farm management and conservation go hand in hand. After an area has been determined to be potentially good farm land, management is the next logical factor in utilization. Crop-

ping and pasture programs must be suitable to the type of farming to be followed. Where the prevailing type of farming is not suitable, changes should be made to conform with the optimum utilization of the available resources.

APPLICABILITY OF SOIL CONSERVATION

The applicability of a program of soil conservation depends on several factors: *first*, the degree of prevailing erosion and the physical factors involved; *second*, the type of production which is already established; and *third*, the extent to which the occupants of the land are dependent upon small areas of land.

In general, accelerated erosion is not as serious in the Harrison area as in other areas in the state, although some localities are badly scarred with sheet erosion, with occasional gullies. However, the seriousness of the erosion problem is somewhat lessened by the fact that the prevailing livestock type of farming lends itself to conservation practices. Few changes are necessary in farm organization in order to establish erosion-control and fertility-building practices. Pasture and hay crops already occupy most of the land which would be seriously erosible if cultivated. In most instances a good pasture sod has seemed to be the most practicable cover for all except the extremely steep slopes.

It is only on the self-sufficing and small general farms that the conservation program is handicapped. In such cases cropland is limited, and sloping land is cultivated which should have a permanent cover. Small farms have too often been operated without proper attention being given to erosion control and soil depletion. A larger percentage of the land has been devoted to cultivated crops, and this practice has been conducive to serious fertility depletion. Similar circumstances have prevailed on scattered dairy farms which have been utilized more intensively.

In the case of the small farms, income generally has been insufficient to maintain a satisfactory living for the farm families and at the same time return sufficient income to the land for maintenance. Conservation has been neglected in favor of present necessities. Furthermore, a program of conservation is often difficult to establish on such farms because of the family needs for current production. Cropland cannot be retired to less erosive uses without at the same time taking away a portion of the already meager income. In addition, there is generally no cash available with which to purchase fertilizer, lime, and seed for improving either crop or pasture land where it is needed most.

A question arises relative to the possibility of conserving the resources of very small farms in an area where extensive types of farming are practiced. Land cannot be obtained readily, and if

available land is not suitable for some intensive enterprise which can be made to produce a larger income, it is questionable whether some small farms can be conserved and at the same time farmed continuously. In a few instances, land bordering on submarginality might be retired from farming, and the occupants encouraged to seek more desirable land or occupations elsewhere.

A second question logically arises at this point relative to the ability of some farmers to manage larger areas of land successfully. It is entirely possible that some farmers lack the ability to manage an extensive type of business of sufficient volume to support a farm family and to permit conservation. It appears that the only solution in this case is to encourage such farmers to obtain small areas of land which may be farmed more intensively without being subject to serious erosion.[12] This type of farming may be limited to specific locations. Certainly beef-cattle production is not the answer.

INCREASING INCOMES BY CONSERVATION

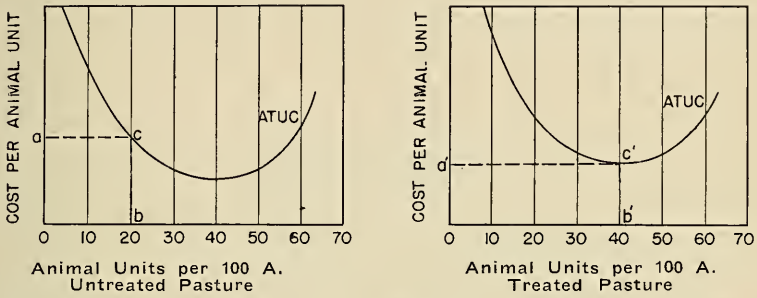
It has been noted that income is essential to conservation. That is, land must be "paid" its cost of maintenance, as a factor of production; otherwise it will be robbed of its resources, and conservation will not be achieved.

On the other hand, land that has been neglected can often be made to produce greater returns to labor, management, and capital, by rebuilding soil fertility and retarding depletion. In so far as low incomes are due to the present state of fertility, which might be improved by proper treatment, a definite benefit should be derived from a sound program of conservation. As has already been emphasized, land and other resources in the Harrison area are being used too extensively. Fixed or overhead costs are excessively high per unit of output. In order to improve this situation a greater number of animal units must be carried per acre of land on large farms, and certain changes must be made in the type of production on small farms.

Figures 8 and 9 illustrate the comparative costs per animal unit maintained on untreated and treated pasture. In general, average total unit costs are slightly higher for treated pasture than for untreated; but the fact that treatment may provide twice the grazing capacity enables the average total unit cost to be reduced materially, if the maximum number of animal units is maintained. According to Figure 8, only 20 units can be carried per 100 acres of untreated pasture at cost a. Figure 9 illustrates the possibility of carrying 40 units on the same acreage at cost a^1,

[12] It appears that less capable farmers may be able to utilize small areas of land more intensively by more intensive use of available labor. This may necessitate supervision and education as to possible types of production and methods.

which is somewhat lower. This treatment permits operation at the point of optimum intensity for utilizing pasture land. Lack of treatment prohibits efficient utilization of capital invested in the land; i.e., the fixed or overhead cost per unit with the lower number of animal units is excessive and does not permit a reasonable return on the capital invested.



FIGS. 8 & 9—Diagrammatical Expression of Possible Costs of Pasture Per Animal Unit on Untreated and on Treated Pastures

Figure 10 further illustrates the necessity of utilizing land to the maximum economic intensity, or as near as possible. Let us assume that the price received per unit coincides with cost a^1. Thus the price received just covers all costs, including a return to land, labor, and capital, at the point of maximum use intensity (40 animal units). However, if the same land carries only half that load, the average total unit costs exceed the selling price by the difference between a and a^1.[13] In this latter case some factors of production will not be paid their maintenance costs. This has generally been true of pasture land when operated at a capacity much less than maximum. Only by operating land at or near full capacity will conservation be possible.

Recent experiments have indicated that the grazing capacity of most West Virginia soils may be doubled by an initial application of 2 tons of lime and 500 lb. of 20 percent phosphate per acre, followed by an additional ton of lime every ten years and 500 lb. of phosphate every five years. The degree of improvement obtained will depend on the quality of herbage before treatment and on the ability of soil to respond to treatment. Furthermore, the amount of the initial treatment may vary, depending on the extent to which soils have been impoverished by constant use without treatment. It should be recognized that pasture treatment in West Virginia involves the rebuilding of resources which have been depleted for 20 to 100 years or more. Hence the initial cost may appear excessive; but if this initial cost, along with the cost of periodic treat-

[13]Assume a constant cost schedule.

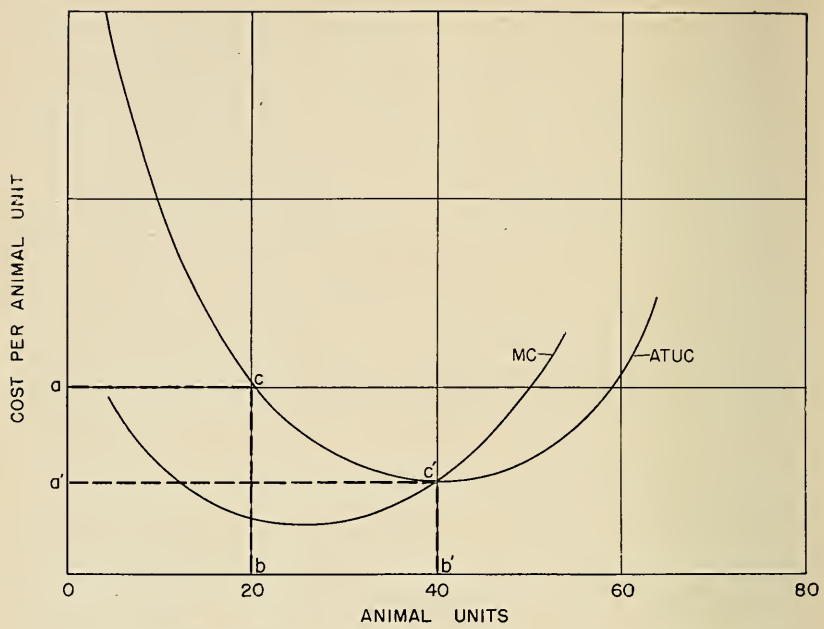


FIG. 10—Diagrammatical Representation of Optimum Intensity Compared with 50% Optimum

ment, is amortized over a period of 20 years, the annual cost is low, considering the potential value of pastures of good quality.

In order to interpret the economic significance of pasture treatment, input/output relationships may be developed from estimates of cost of treatment and the additional income made possible. The initial cost of two tons of lime (2 tons @ $4.00) and 500 lb. of phosphate (500 lb. @ $1.00) is $13.00 per acre. Additional lime (1 ton @ $4.00) and phosphate (1500 lb. @ $1.00 per cwt.) sufficient for maintenance over a 20-year period will cost approximately $19.00.[14] The combined initial and maintenance cost of improving the pasture for 20 years is $32.00, or an annual cost of $1.60 per acre.

If one assumes that 20 steers carried on 100 acres of untreated pasture will gain an average of 300 lb. per season and sell at $9.00 per cwt., the gross return to land, capital, and management would be $540.00.

[14]The amount and interval of treatment following initial application is one ton of lime every ten years and 500 lb. of 20% phosphate every five years. The frequency of treatment should vary according to the rate of depletion and adequacy of initial application.

In contrast, 40 steers carried on the same land, provided that grazing capacity is doubled as a result of treatment, will gain 12,000 lb. at $9.00 per cwt., or a total return of $1,080. The additional cost of treatment is $160.00 per 100 acres; the interest charge for additional investment in cattle and treatment is $105.00. Thus the total gross return to the original capital, land, and management would be $815, or $275 in excess of the assumed return on untreated land. This amount represents an increase of 51% in the annual net income from 100 acres of pasture (Fig. 11).[15]

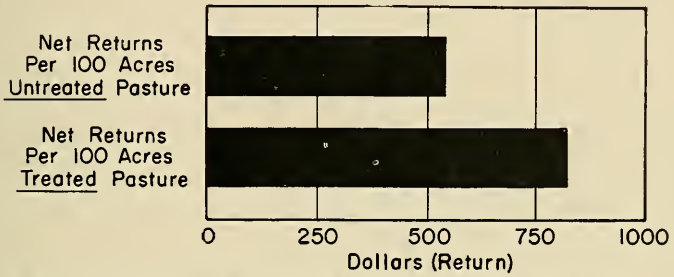


FIG. 11—Comparison of Possible Annual Returns from Untreated and from Treated Pasture

In addition to greater annual returns, the productivity of land is improved and maintained, instead of being gradually dissipated by depletion and erosion. Neglect of treatment resulting in depletion has caused a depreciation of investment in large areas of land which might have been maintained at a high income-producing level. The present need is the allocation of a portion of the annual income to pasture treatment. Because of the burden of the cost of the initial treatment for large areas, it is well for most farmers to treat small acreages each year, depending on resources available; always treating the best land first. The improvement of pastures should be accompanied with a program of livestock expansion in order to make the best use of additional forage. In some cases, particularly on dairy farms, pastures of better quality may result in the purchase of less mixed feeds rather than an increase in the number of cows.

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[15]See Robinson and Pierre, **Response of Permanent Pastures to Lime and Fertilizer**, Bul. 289, W. Va. Agr. Exp. Station 1938.

The data used in this example are consistent with results obtained from various experiments throughout the State and are, in general, consistent with the pasture-treatment recommendations of the West Virginia Agricultural Experiment Station.

Variations in prices received for livestock and costs of lime and fertilizer will make it necessary to alter the returns made possible by treatment.

FACTORS TENDING TO RETARD CONSERVATION

A number of factors were observed in the Harrison area which have tended to retard conservation. (1) The most important factor in this respect probably has been the influence of the ample land resources. Population is not pressing on the land of this area; hence land may be leased at relatively low prices. Many land operators prefer to lease additional land rather than to improve the productivity of land owned. Comparatively large farms which have been held as estates for several generations are still intact and in many cases are not depended on for a livelihood. In most instances land has been operated very extensively, and improvement and conservation have been neglected. Hence many acres of pasture land have deteriorated greatly.

(2) The rebuilding of resources which have been neglected involves the sacrifice of a portion of the current income. Although future income may depend upon present sacrifice, the "time preference" for the consumption of current income is strong. This factor is important particularly on small self-sufficing and general farms on which current income may scarcely cover necessary living and overhead costs. Nothing is available for conservation.

Similar circumstances characterize the larger farms. Since these are operated extensively, the amount of annual income available per acre is in many cases insufficient to cover the carrying charges. Owners having no vision of future productivity are not inclined to make initial outlays for conservation.

(3) Another important factor which has contributed to the neglect of agricultural land is the income from oil and gas leases and from non-agricultural occupations throughout the area. Large tracts are held for their lease values and for expected future values from natural gas and oil. In many instances land so held by absentee landlords, or by resident owners who do not depend upon land for an income, has been neglected, and no provision has been made for conservation of agricultural productivity.

Conservation and improvement of agricultural land in the Harrison area probably will not progress rapidly until there is greater pressure of dependence upon this land for livelihood, or until there develops a realization that the future value of capital investments depends upon present conservation. It does not appear that the importance of conservation will be fully realized until the income from agriculture is sufficient to justify interest in this behalf. Greater interest and dependence on more intensive land operation is needed; or, presumably a clearer knowledge of the potential productive capacity of the land would encourage the improvement and conservation of resources.

SUMMARY

It is the purpose of this study to point out some of the economic factors which should be recognized in farm planning for conservation. The conservation of agricultural resources is an essential part of any land-use program. It should be the central objective in farm management.

The data presented indicate that more than 90 percent of all farm income in the Harrison area is derived from livestock enterprises. In general these enterprises depend largely upon pastures and hay. Thus the maintenance of high-quality grazing for fattening beef cattle is basic to high farm income in this and surrounding areas.

The management analysis of the farms studied indicates several factors which directly affect conservation: (1) The size of business unit and the comparative intensity of factor combination are major determinants of income. Many small general and self-sufficing farms produce such limited income that the farm families are forced to exploit their resources in order to maintain themselves. (2) It also was pointed out that many large beef-cattle farms were operated too extensively, utilizing an excessive acreage per animal unit. Because of this diseconomy, incomes were not forthcoming in sufficient amount to permit needed expenditures for conservation. It may be said that in order for conservation to be currently feasible, the small general self-sufficing farms will be forced to abandon extensive commercial enterprises and to increase income by producing commodities requiring less land and more labor per unit of output. The limited resources must be used more intensively, but by employing proper methods and practices for retarding erosion, a large degree of conservation may be attained.

The large beef-cattle farmers must realize that the improvement and conservation of grazing and meadow lands are essential to maintaining their investment and necessary for earning a reasonable return on labor and capital. They must be able to carry more animal units per acre, in order to reduce per unit costs, if reasonable returns are to be realized. On the other hand, conservation for the larger stock farms will involve no principal reorganization. The major need is the improvement of pasture and meadow lands so that a maximum number of animal units may be maintained per acre.

Specific localities subject to severe erosion will demand changes in land use. It may be advisable to divert certain steep agricultural land to forest use. This may be accomplished without difficulty after the more desirable grazing land is properly improved. In general, however, conservation in this area may be attained with greater ease than in other areas where the land responds less readily to treatment and careful management.