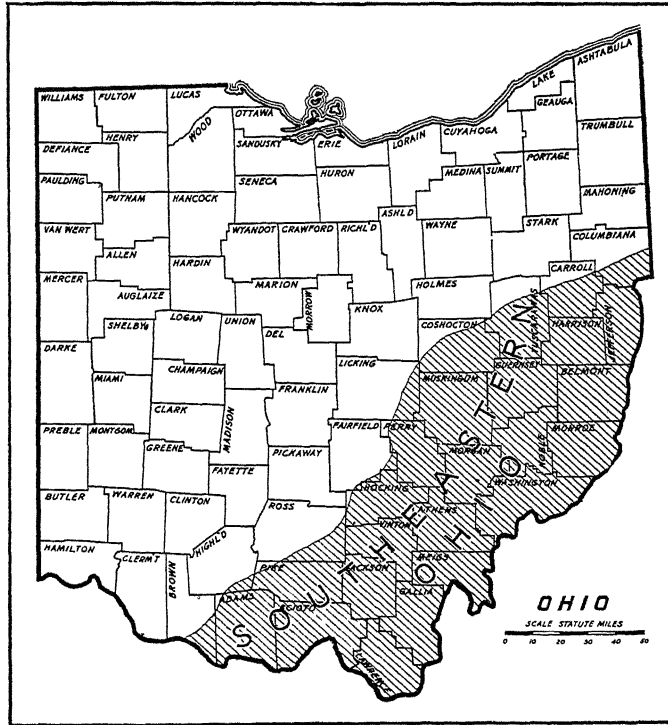


A Plan of Farm Organization for Hill Land Farms in Southeastern Ohio



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Foreword

Many a farmer has failed to make a financial success through failure to work out a system of farm management suited to his locality and conditions. Selection of the wrong enterprises or type of farming inevitably means that the farmer is working against nature and economic laws instead of with them.

In every community there are men who have successfully solved the problem of the proper farm management practices. The wisest policy for the stranger or beginner in farming in a region is to study the methods and system of farming of these successful farmers in order that expensive mistakes may be avoided.

A Plan of Farm Organization for Hill Land Farms in Southeastern Ohio

In the two pictures on page 4 are more than a dozen farms in a locality in the hill lands of southeastern Ohio. From the business records of these farms for 11 years,—records of the crops and livestock produced and of the sales and expenses of each farm,—some of the farms have paid better than others. In fact, there was a wide range in their financial success.

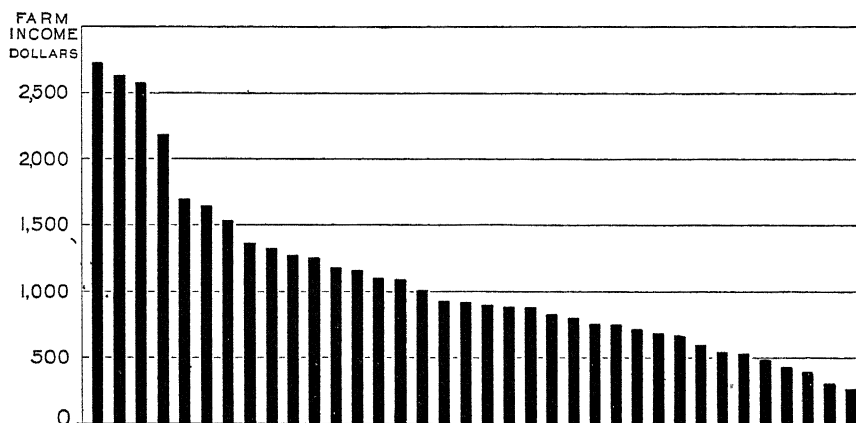


Fig. 1.—How the farm incomes varied on 36 farms in Southeastern Ohio. Each line stands for the income of a farm.

Farm Income is the receipts less the expenses.

Receipts include the value of all products sold from the farm within a year, plus any increase in value of livestock due to increase in growth or numbers of animals, and plus the value of any increased quantity of feed at the end of the year over the beginning.

Expenses include all costs of operating the farm except any charges for the farmer's own labor and for interest on the capital. Decrease in inventory and depreciation are included.

Labor Income, used in Tables 1 and 4, is the farm income less 5 per cent interest charge for the use of the capital.

Throughout the hill land parts of southeastern Ohio are numerous similar farming localities. They differ some in the roughness of the land, in soils, in types of farming, and in accessibility to markets, but the localities are all alike in that some of the farms in each have given more substantial financial returns than others.

WHY SOME FARMS PAY BETTER THAN OTHERS

The reason some farms pay better than others in the same locality is that the better-paying farms have:

1. Sufficient volume of business to warrant a fair return.
2. Systems of farming adapted to their conditions.
3. The systems effectively and efficiently carried out year after year.

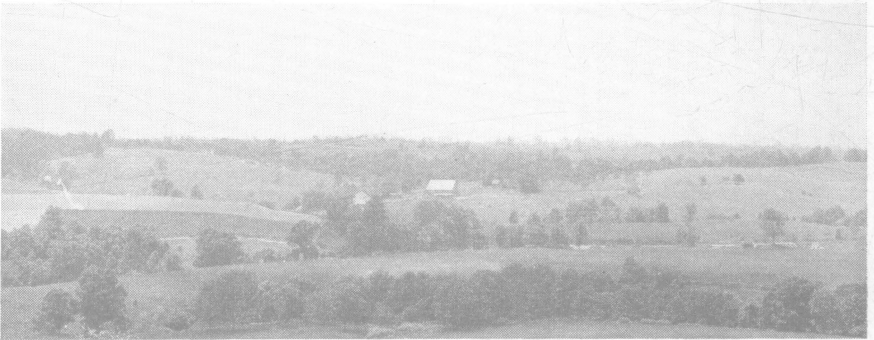
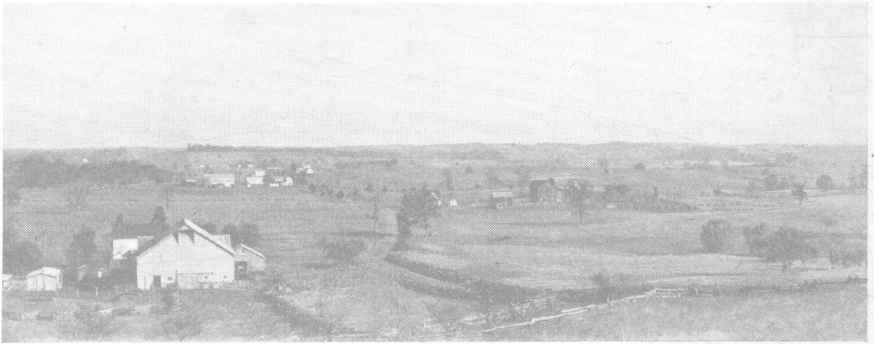


Fig. 2.—Topographic scenes in the hills of southeastern Ohio. In the upper picture, the surface features grade from rolling to hilly, with steep slopes occurring here and there. In the lower picture, the greater part of the surface grades from hilly to steep, with small, more level areas occurring here and there.

Back of the better paying farms are definite plans, or systems, built upon the knowledge and judgment of the farmers, who adhere to the plans as closely as they can according to their knowledge of changing economic conditions.

From the pasture land and suitable rotation land available on their farms, they have established cropping systems with practicable field arrangements. They have chosen livestock systems

fitted to their farms. They have considered how much work a man can do, and how much horse power and machinery are needed. They recognize that it is important to get crop yields higher than the average of the locality. They know that it is essential to have good livestock, and that it receive such care and feed as to return a profit for the feed, labor and capital involved.

PROBLEMS INVOLVED

Before outlining a plan of organization for the hill land farms of southeastern Ohio, some conditions common to so many of them should be noted:

1. They are mostly one-man farms, that is, farms operated by one man with a little additional labor which is usually supplied by members of the family.
2. Much of the land is hilly, or broken, and devoted to pasturage.
3. Only a small percentage of the land is used for growing such crops as corn, wheat, and hay.
4. A large share of the farm receipts is from the sales of livestock and livestock products.

From these conditions arise such questions as—

How much of the land shall I use for growing crops?

What crops shall I grow? Why these?

What kinds of livestock shall I keep to use the pasture and feed crops to best advantage?

How much livestock shall I keep?

Shall I grow all the feed for the livestock?

How may I have a business large enough that I may expect a fair amount of income?

PLAN OF ORGANIZATION

Based upon several years' study of many of the hill land farms in different localities of this part of the state, upon the conditions suggested above, and upon the questions arising from these conditions, a plan is here recommended as an outline for the organization of southeastern Ohio hill land farms. It is recognized that no two farms are exactly alike, that there must needs be more or less variation in the details of the organization of each farm, and that the general plan will result in an occasional misfit. But for all these, the plan offers a general policy for a substantial reorganization on most hill land farms of southeastern Ohio. It offers an opportunity for putting many of these farms on a better paying basis.

The outline of a plan of organization designed to give a business sufficiently large that a fair return may be expected from a one-man farm follows:

1.—Crops

Acres of rotation land.—At least 30.

Rotation.—Corn, wheat, and clover hay.

A small field of alfalfa on farms with land adapted to the crop.

A small acreage of some intensive cash crop, as apples, tobacco, or tomatoes on farms adapted to such a crop and where market conditions are favorable.

Pasture enough for all the livestock.

Raise enough crops to furnish most of the feed for the work animals and other livestock. Purchase some cottonseed meal, oil meal, or the like to supplement otherwise low protein rations.

Arrange the fields so that the rotation and other crop land and a pasture field be as near the farmstead as practicable.

Omit the fencing between rotation fields, between rotation fields and roads, and when adjacent land on two farms is in crops, omit line fences. In other words, fence only the pasture land.

2.—Livestock

Cattle.—At least seven dairy cows, selling the product in the form giving highest returns, raising a few of the heifer calves and vealing the others.

Sheep.—At least 30 head of Delaine or Merino ewes, producing lambs to be sold within the first 15 months.

Poultry.—At least 200 hens, kept mainly for egg production.

Work animals.—Two 1,200- to 1,500-pound animals, unless the crops exceed 40 acres.

3.—Labor

One man with 1 to 6 months of help at chores, or during rush periods, and usually supplied by other members of the family.

4.—Family Living from the Farm

An abundant supply of fruits, vegetables, milk, butter, eggs, and meats supplied largely from the home farm. All or part of the household fuel furnished by the farm.

The Crop Rotation

The 3-year rotation of corn, wheat, and clover hay, or mixed clover and timothy hay, is to be adhered to as closely as practicable,

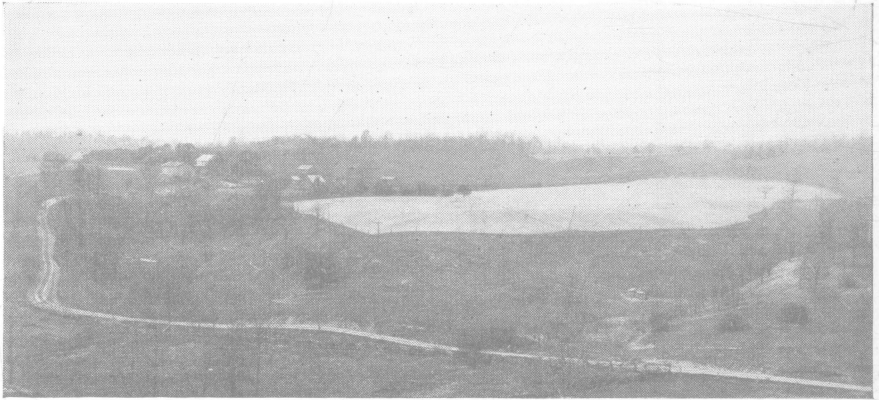


Fig. 3.—Only the better lying land on this farm is used for rotation crops. The rougher land is in permanent pasture.

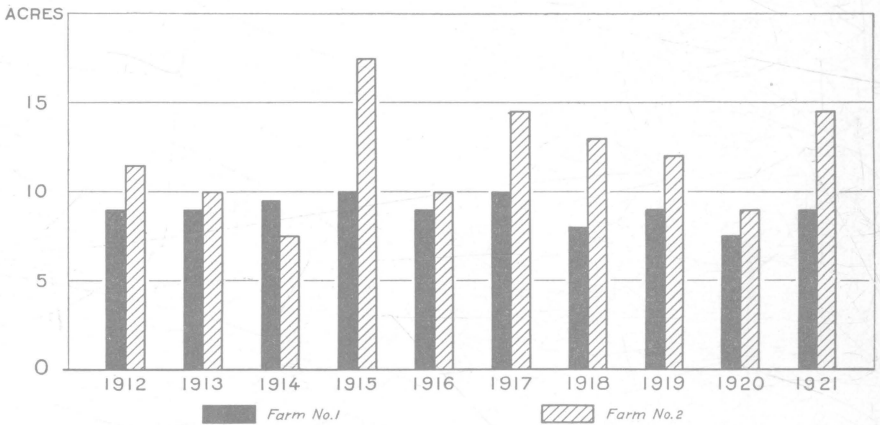


Fig. 4.—The acreage in corn from 1912 to 1921 on two hill land farms in a locality in southeastern Ohio: (1) Represents the acreage in corn on one of the farms having the 3-year crop rotation. The rotation land is in three nearly equal-sized fields. The acres in corn over the 10 years ranged from $7\frac{1}{2}$ to 10 acres, with an average yearly variation of $\frac{1}{2}$ acre. (2) Represents the acres in corn on one of the farms having no definite crop rotation. There was a yearly range from $7\frac{1}{2}$ to $17\frac{1}{2}$ acres, with an average yearly variation of $2\frac{1}{2}$ acres.

and only the more level land used for rotation crops. Aim to produce maximum yields from the usually limited rotation land.

The proportion of the land acreage well adapted to rotation crops to that of the pasture land on a given farm will influence the

proportion of the number of dairy cattle to the number of sheep. In other words, other things being equal, the more crop land the more dairy cows; the more pasture land the more sheep.

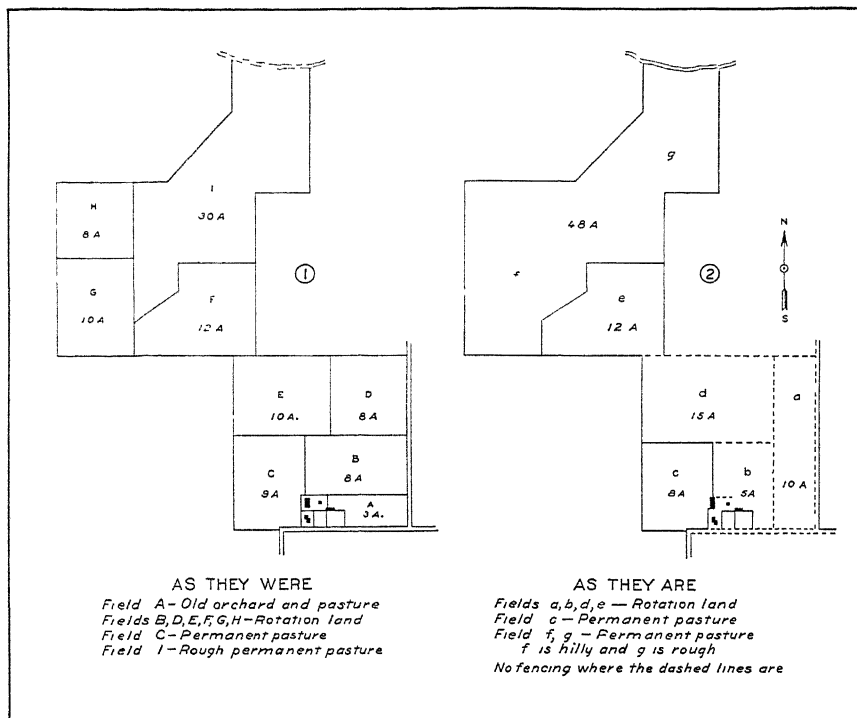


Fig. 5.—How the fields were rearranged for the 3-year rotation on a hill land farm in south-eastern Ohio. (1) As they were. (2) As they are. No fencing where the dotted lines are.

(1) Field A—Old orchard and pasture.
 Fields B, D, E, F, G, H—Rotation land
 Field C—Permanent pasture.
 Field I—Rough permanent pasture.

(2) Fields a, b, d, e—Rotation land.
 Field c—Permanent pasture.
 Field f, g—Permanent pasture
 f is hilly and g is rough.
 No fencing where the dashed lines are

When the present owner bought the farm shown in Fig. 5, the rotation land was in six fields. The cropping system had been a 6-year rotation of corn, oats, wheat, and grass for 3 years. The grass was cut for hay two years and pastured one year. Disadvantages in this system and in the arrangement of the fields were soon apparent. The owner thought that it did not pay to raise oats; he wanted more land for corn; the 6-year rotation was too long, because the third year in grass did not furnish much pasture and the second year often produced a light crop of hay; there was too much fence to keep up and fields G and H were far from the farmstead and rather hilly for cultivation.

He first considered leaving the fields as they were and having two fields for corn, two for wheat, and two for hay each year. This would make more corn than he could tend, not enough pasture for the stock, there would be as much fence as formerly, and fields G and H would still be used for cultivated crops.

He decided to seed fields G and H to permanent pasture and throw them in with field I, thus furnishing more pasture land, avoid cropping the hilly land, which also required considerable extra time in going to and from the fields, and eliminating 100 rods of fence. After removing all the fencing between fields B, D, and E, they were used as two fields of 13 acres each, and without interior fencing. These two fields with field F gave him three fields nearly equal in size for the 3-year rotation, and eliminated 88 rods more of interior fence.

When it became necessary to replace the fencing between field C and what was formerly field E, the fence was placed a few rods over into field C, cutting about an acre from the

Occasionally, in localities which are not readily accessible to a market, and on a farm with practically no land suitable for rotation crops, the grazing of beef cattle may largely replace the dairy cows.



Fig. 6.—Find the land in this picture which is suitable for crop rotation.

permanent pasture and adding to the rotation land. As they went down, the old rail fences were removed from the east side of fields *B* and *D*, the fence row cleared out, the land farmed to the road ditch, and 63 rods of road fence eliminated.

In time, the fencing was also removed from the north side of fields *D* and *E*. Most of this was line fence and, as both farmers were using the adjoining land for crops and neither pasturing it, there was no need for a line fence. The fence row was cleared, the land plowed and each had 35 rods less of fence to keep up.

When a silo was put up on the farm, the need for more corn was felt. Since the old apple orchard and the fence around field *A* were almost gone, the fence was removed and the field thrown in with the rotation land, thereby adding three acres to the crop land and eliminating about 100 rods more of fence.

To save time in hauling silage from field *F* and to have more than 12 acres of corn when field *F* was in corn, the fields took the form shown in Fig. 5 (2). In 1922 field *d* was in corn, field *e* in wheat, and fields *a* and *b* in hay; in 1923 fields *a* and *b* were in corn, field *d* in wheat, and field *e* in hay; and in 1924 fields *b* and *e* were in corn, field *a* in wheat, and field *d* in hay. In other words, there is now a regular rotation of corn, wheat, and hay on fields *a*, *d*, and *e*, while field *b* is in corn two years—the years that fields *a* and *e* are in corn; and in hay one year—the year that field *d* is in corn. With this arrangement there are 15 acres of corn two years in three, and 17 acres the other year.

A summary of the gains for the present over the former system is: Much of the extra time formerly used in going and hauling to and from former fields *G* and *H*, and which amounted to about 40 hours a year, is now devoted to getting higher yields on the present rotation land. With the higher yields and more land in corn, more feed is now grown on the 42 acres than was formerly grown on 56 acres, and there are 2 to 6 acres more pasture land. There are nearly 400 rods less fence on the farm.

Intensive Cash Crops

While corn and hay are not to be sold as cash crops from the hill land farms in any but negligible quantities, there are certain cash crops which may well be worked into the organization plan in limited acreages on farms adapted to their production, and where a satisfactory market may be had. These, sometimes called intensive



Fig. 7.—The growing of truck crops is becoming increasingly important where transportation facilities are adequate.

cash crops, have higher per acre values than corn or hay. Even an acre or two of such crops add appreciably to the volume of business.

In many of the hill land localities apple orchards, larger than needed to furnish the household supply, have been worked into the farm plan by some farmers. In some localities, farmers work in small acreages of tomatoes, and in others, tobacco. Truck crops to the extent of meeting local demand, have been worked in by a few farmers.



Fig. 8.—Forestry has a place on much of the rougher land in southeastern Ohio. The Ohio Agricultural Experiment Station furnishes trees free of charge (except expressage) to farmers interested in reforestation.

The Livestock

The importance of the livestock part of the farm organization plan for the hill land farms of southeastern Ohio is apparent when it is realized that in those localities where farm business records are available, from 63 per cent to 93 per cent of the total farm receipts are from the sales of livestock and livestock products. The size and quality of the livestock part of the business largely determine the returns of the entire business.

The amount of livestock that can be kept on a given farm is largely determined by the amount of feed and pasture that can be produced on the farm, and the relative amounts of feed and pasture largely determine the kinds of livestock that are likely to give the best returns.

Poultry raising, egg production, and dairying represent rather intensive types of livestock farming, while the production of beef and of mutton and wool ordinarily represent somewhat more extensive types in this part of the state. More labor and concentrate feeds are involved with the former type, while more roughage feed and more pasture are involved with the latter type.

Other things being equal, in so far as the conditions on a given farm will permit, the most efficient use of the labor, pasture and feed crops, will determine the types of livestock farming.

Cattle and Dairying.—Dairying, which is an important part of the farm business on many hill land farms of southeastern Ohio, is recommended to be included in the organization plans of more of them. With at least seven cows of good dairy type, so fed and cared for as to produce the equivalent of 250 or more pounds of butterfat annually per cow, dairy products will add materially to the total farm receipts.

The following story of one of the hill land farmers illustrates how many of them work dairying into their farm organization plans:

In the spring of 1922, this farmer had four Jersey cows, a yearling heifer and two heifer calves. Two of the cows were purebred and the others grades. In the spring of 1923, he had five cows, the yearling heifer having freshened in the fall of 1922. In the fall of 1924, he had seven cows, two of them heifers with their first calves. These cows in 1924 averaged 6084 pounds of milk, or 325 pounds of butterfat. The value of the product was \$170 per cow, and the returns for each \$1.00 worth of feed they received was \$2.52.



Fig. 9.—The cows on one of the southeastern Ohio hill land farms where the sales of dairy products are an important part of the farm receipts. This herd and many in this part of the state similar to this one, produce the equivalent of 250 pounds and upwards of butterfat annually per cow.



Fig. 10.—These long yearling steers and heifers are to be sold next year when they average about 1000 pounds. This type of cattle fits in well where dairying is impracticable.

Dairying, as above outlined, represents a more intensive type of livestock farming than is ordinarily represented by beef production in this part of the state. It permits greater volume of business on a given acreage. However, there are farms in the hill land parts of southeastern Ohio with plenty of pasture and limited acreages for rotation crops, with limited amounts of help or distant from market. Under such conditions, the grazing of beef cattle may well be substituted for most of the dairying. In parts remote from market and with sufficient land suitable for the production of most of the concentrate feeds, feeding beef cattle will often prove more satisfactory than dairying.

Sheep, Lambs, and Wool.—There is reason for not including sheep in the farm organization plan of farms in mining and other



Fig. 11.—Typical fine wool sheep found on so many of the hill land farms of southeastern Ohio. (Upper picture) Breeding ewes. (Lower pictures) Some of the lambs on two of the farms.

localities of southeastern Ohio where dogs are a menace, and of farms so limited in size that there is no place for sheep in addition to the dairy cattle.

On the other hill land farms, it is recommended that sheep be included in the organization. The number will necessarily vary with the size of the farm, the proportionate amounts of pasture land and crop land on the farm, the carrying capacity of the pasture and the number of cows best suited to the farm.

Ewes raising lambs which are sold in the early summer, in the fall, or the following spring after clipping have given higher returns per sheep than when sheep are kept without raising lambs, or when the lambs were kept until 2 or more years old before they were sold. In a locality in Washington County from 1912 to 1916, when prices were comparatively low, sheep handled by the former method returned \$1.12 more per head than those handled by the latter method; and in a locality in Morgan County from 1921 to 1923, when prices were much higher, they returned \$1.84 more per head.

Raising and selling lambs in addition to wool production, therefore, deserves the highest recommendation.

The following statement furnished by one of the hill land farmers illustrates how well some farmers do with a few sheep—

“In August, 1921, I bought 29 ewes for \$105.

“In 1922, sold the wool for \$135, and raised 30 lambs.

“In 1923, sold 26 of the 1922 lambs, and the wool from the ewes and lambs for \$500, and raised 34 lambs.

“In 1924, sold the 1923 lambs and the wool from the ewes and lambs for \$800, and raised 28 lambs. See Fig. 11 (Lower right).

“The 34 lambs were sold April 15, 1924. They averaged 75½ pounds and sold for 11 cents per pound: they sheared 11 pounds of wool which sold for 47 cents per pound. The ewes sheared 9 pounds in 1924.”

Poultry and Eggs.—Poultry and egg production on the hill land farms of southeastern Ohio is an important source of income. Most of the poultry are chickens. In 1924 there were 440 farms throughout the state keeping poultry records under the supervision of the Ohio State University Extension Service. With an average flock of 234 hens, the egg production was 138 eggs per hen, with gross receipts for poultry and eggs of \$5.19 per hen. The feed cost including feed for young chickens was \$2.08 per hen.

Flocks of at least 200 hens are recommended for each farm, with enough chicks raised each year to maintain the laying

flock. Egg production of at least 100 eggs per hen should be attained.



Fig. 12.—Sales of poultry and eggs are an important source of income from the hill land farms of southeastern Ohio. (Upper picture) This flock produced over 100 eggs per hen, and \$4981 worth of poultry and eggs were sold from the farm during the 11 years 1912 to 1922. (Lower left) The new poultry house, not quite complete, on a farm from which over \$700 worth of poultry and eggs were sold in 1923. (Lower right) One of the brooder houses on the same farm.

VOLUME OF BUSINESS

In plans for farm organization it is essential that the business be large enough that a reasonable return may be expected from it. This does not mean that the farm must be of large acreage, as there is often a larger volume of business on a 100-acre farm than on one of 200 acres in the same locality. It means that there must be enough acreage of crops and enough livestock to keep the labor fairly well occupied throughout the year,—on a one-man farm, to keep one man with a little additional help at times, efficiently employed most of the year.

Volume of business may be illustrated by some figures from two farms in a locality in southeastern Ohio. Farm A is a one-man farm with large enough business to expect a fair return, while the business on farm B is too small to expect a return sufficient to support a farmer and his family.

	Farm A	Farm B
Acres of land.....	145	90
Acres of pasture.....	95	49
Acres of corn.....	7	6
Acres of wheat.....	6	5
Acres of oats.....	3	—
Acres of hay.....	13	15
Acres of orchard.....	6	—
Number of cows.....	3	2
Number of other cattle.....	7	5
Number of sheep.....	64	10
Number of sows.....	1	1
Number of chickens.....	90	90

The importance of volume of business is illustrated in Table 1 by average figures from one-man farms in several of the localities of southeastern Ohio.

Table 1.—Incomes from one-man farms with large, medium and small volume of business.

	Acres of cereals	Number of animal units	Farm income	Labor income
Large volume of business....	48	17.6	\$ 858	\$ 477
Medium volume of business..	41	10.6	509	219
Small volume of business....	27	8.1	344	150

Note.—Large volume of business includes the one-third of the one-man farms with largest volume of business, etc.

QUALITY OF BUSINESS

Volume of business alone, however, will not suffice for best returns. The business must have quality, that is, the crop yields per acre and the livestock returns per animal must be well above average. With so large a part of the total receipts from livestock and livestock products as is common to southeastern Ohio hill land farms, the livestock returns is a more essential factor than the crop yields per acre. It is, therefore, important that farms return good

yields per acre and have good carrying capacity of the pasture land as illustrated by Table 2, and especially important that good returns are made from the livestock as illustrated by Table 3.

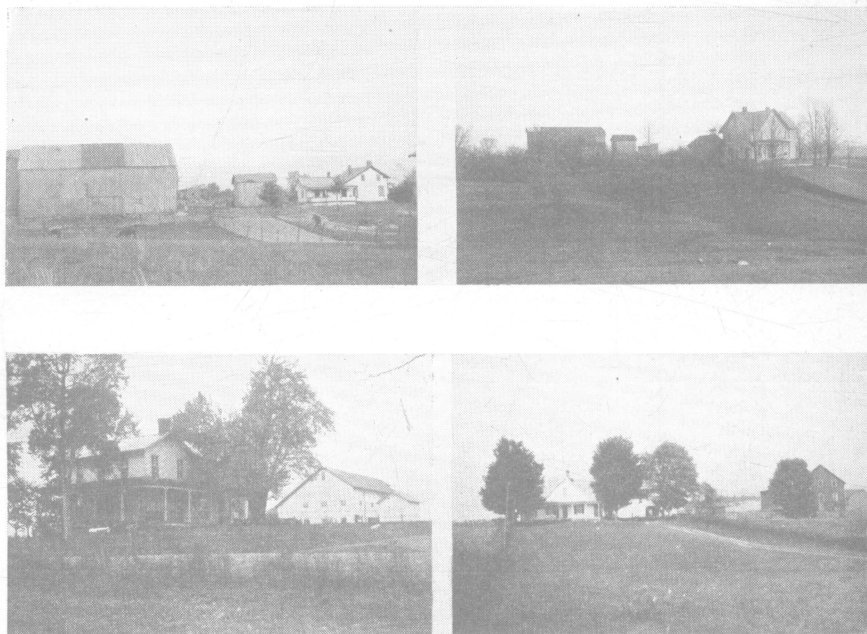


Fig. 13.—Better farm organization and better farm homes go hand in hand.

Table 2.—Average yields per acre of the principal crops and carrying capacity of pasture land in four southeastern Ohio hill land localities.

	Corn	Wheat	Hay	Acres pas- ture per Animal Unit
	Bushels	Bushels	Tons	
On the best paying farms	52	17	1.5	3.4
On the poorest paying farms	41	13	1.1	4.3
Average of all farms	45	15	1.3	3.8

Note.—The best paying farms averaged about one-third higher crop yields per acre than the poorest paying ones, and about one-sixth higher than the average of the locality.

Table 3.—Average returns from livestock in four southeastern Ohio localities.

	Dairy Receipts Per Cow	Receipts Per Sheep	Receipts Per Hen	Receipts Per Animal Unit	Per \$1.00 of Feed
On the best paying farms	\$ 53	\$ 6.28	\$ 2.79	\$ 65	\$ 1.52
On the poorest paying farms . .	34	4.49	2.26	49	1.06
Average of all the farms . .	\$ 50	\$ 5.37	\$ 2.36	\$ 60	\$ 1.28

DETAILS OF ORGANIZATION PLANS

Table 4 gives an outline of the organization plans on a few southeastern Ohio hill land farms. In each instance these farms are among the better paying farms in their locality.

Table 4.—The organization plans on a few southeastern Ohio hill land one-man farms.

Farm No.	Acres of land	Capital	Uses of land and yields per acre		Livestock	Receipts		Expenses		Farm income	Labor income	
			Ac.	Yield.		Total..	Total...					
1	113	\$5916			Head							
			Past...	45	Cows	8	Total..	\$1519	Total...	\$693	\$ 824	\$ 573
			Corn..	12 34 bu.	Other		Butter...	782	Hired			
			Wheat.	9 15 bu.	cattle ..	9	Cattle...	102	labor...	25		
			Oats...	3 33 bu.	Sows	1	Eggs.....	20¢	Concen-			
			Hay...	7 1.5 T.	Chickens. 100		Chickens..	71	trates..	298		
				Horses ...	3	Hogs.....	201	Fertilizer.	76			
2	215	\$6025	Past...	98	Cows	6	Total ..	\$1647	Total...	\$899	\$ 748	\$ 447
			Corn .	11 38 bu.	Other		Cream ..	147	Hired			
			Wheat.	7 11 bu.	cattle .	9	Cattle...	318	labor..	124		
			Hay..	16 1.9 T.	Sheep	20	Wool.....	61	Concen-			
			Apples.	4 31 bbl	Sows	1	Sheep ...	32	trates..	236		
					Chickens. 200		Lambs...	16	Fertilizer.	68		
				Horses ...	3	Hogs.....	149					
						Eggs.....	392					
						Poultry...	67					
						Apples..	345					
3	126	\$8649	Past...	84	Cows	5	Total..	\$1766	Total...	\$828	\$ 935	\$ 568
			Corn..	9 40 bu.	Other		Cream...	302	Hired			
			Wheat.	6 14 bu.	cattle ...	2	Cattle...	85	labor....	81		
			Oats...	6 20 bu.	Sows	1	Hogs.....	88	Hay.....	7		
			Hay...	20 1.2 T.	Sheep	90	Wool.....	564	Concen-			
					Chickens. 250		Eggs.....	354	trates..	212		
				Horses ...	3	Poultry..	38¢	Fertilizer.	48			
						Apples...	88					
4	105	\$6656	Past...	68	Cows ..	4½	Total..	\$1744	Total...	\$657	\$ 1087	\$ 754
			Corn..	3 73 bu.	Other		Cream...	720	Hired			
			Silage.	3 10 T.	cattle..	5	Cattle...	258	labor... 25			
			Wheat.	11 14 bu.	Sows ...	1	Hogs.....	162	Concen-			
			Hay...	16 1.2 T.	Sheep ..	48	Wool.....	279	trates.. 209			
					Chick-ens .130		Lambs....	68	Fertilizer.	47		
				Horses... 2½		Eggs.....	187					
						Poultry...	50					
						Wheat ...	13					
5	140	\$6824	Past...	90	Cows ...	3½	Total..	\$1585	Total...	\$847	\$ 738	\$ 397
			Corn..	10 60 bu.	Other		Cream...	200	Hired			
			Wheat.	6 12 bu.	cattle..	6	Cattle...	193	labor .. 202			
			Oats...	2 13 bu.	Sheep ..	88	Wool.....	403	Concen-			
			Hay...	22 1.6 T.	Chick-ens ..270		Sheep....	127	trates.. 64			
							Eggs.....	300	Fertilizer.	30		
						Poultry...	35					
6	100	\$8203	Past...	42	Cows	3	Total..	\$1518	Total...	\$595	\$ 918	\$ 508
			Corn..	12 47 bu.	Other		Cream....	46	Hired			
			Wheat	11 17 bu.	cattle ..	8	Cattle...	459	labor... 20			
			Hay...	22 1.5 T.	Sows	1	Hogs.....	250	Concen-			
					Sheep	10	Wool.....	25	trates . 57			
					Chickens. 154		Sheep....	18	Fertilizer.	62		
				Horses ...	3	Eggs	251					
						Poultry...	48					
						Wheat...	156					
						Hay....	115					

A List of Publications Suggested for Southeastern Ohio Farmers

FARM ORGANIZATION

- Arrangement of Farm Fields.** Ohio State University Extension Bulletin, Vol. XV, No. 1.
- Labor Required for Crop Production in Ohio.** Ohio State University Extension Bulletin, Vol. XVIII, No. 5.
- Farm Account Book.** Agricultural Extension Service, Ohio State University.
- Rotations.** Bulletin 373 of Ohio Agricultural Experiment Station.

CROPS AND SOILS

- Growing the Right Legume.** Timely Soil Topics No. 64, Extension Service, Ohio State University.
- Alfalfa.** Ohio State University Extension Bulletin, Vol. XV, No. 7.
- Sweet Clover.** Ohio State University Extension Bulletin, Vol. XIX, No. 4.
- Soybeans: Their Culture and Use.** Bulletin 312 of Ohio Agricultural Experiment Station.
- Soybean Hay.** Crop Talk No. 12, Extension Service, Ohio State University.
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