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Success in Farming Rough Land in Southern Michigan
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Success in
FARMING ROUGH LAND
in
SOUTHERN MICHIGAN

●

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PREFACE

Many problems confront the operator of the rougher land areas of southern Michigan. To learn more about these problems and to discover ways of solving them, this study was made in Barry County at the invitation of local farmers and others interested in the welfare of this region.

Farm abandonment has been in process in portions of this county for many years and farm buildings in many instances are not being maintained. If once destroyed, farm buildings are often not replaced. The abandonment of the farms in some parts of the area has been sufficient to reduce seriously the tax base of the governmental units.

The land not now being farmed in this area, mostly of a light sandy nature, has in the past produced good yields of wheat and other crops. Apparently, this type of soil was not very productive except for a few years immediately following the clearing of the land.

In addition to the Land Classes, I, II, III and IV, studied in this report, there is land adjoining the four-township area to the west that may be said to be in Land Classes V and even VI. This area is not in farms but is used mostly for recreation and timber production.

Many questions arise in regard to the agriculture in this entire region. What land should remain in farms? What land should not be in farms? What land should be in public rather than in private ownership? What soil conservation practices should farmers follow to maintain soil productivity and reduce soil erosion? Furthermore, what kind of farm organization and management is needed to provide the highest farm income and at the same time conserve the productivity of the soil on the rough morainic areas of this section of the state? This bulletin, "Success in Farming Rough Land in Southern Michigan," provides information which will serve as a start at least in answering some of the agricultural problems of this area.

E. B. HILL

Head of Farm Management Department

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SUMMARY

Some farmers make a good living operating farms on the rough, hilly land of southern Michigan, while others get little financial return. During 1946 only 42 percent of the 65 farmers included in this study had labor incomes of more than \$100 a month, while 23 percent did not have any net financial return for their labor. The quality and roughness of the land made a difference. Sixty-two percent of the operators on Class I land received more than \$100 a month, whereas on Class IV land only 9 percent received that much for their labor. In fact, 45 percent of the farmers on Class IV land had no labor return. Such a situation is not good when one considers the relative prosperity Michigan farmers as a whole enjoyed in 1946.

Was it all because the land was rough? Hardly! Net incomes from different farms on Class I land ranged from \$700 to over \$12,000 a farm and on Class IV lands, the range was from \$280 in the red to \$2,495 in the black. Thus some farms on Class IV land brought in an income higher than several of the farms on the Class I land.

The higher earnings were largely the result of following good farm management practices. The high-income operators had a relatively large business, raised good quality livestock, and managed it right. The livestock income per tillable acre and per animal unit were higher on the better lands. Dairy product sales per cow averaged \$272 on the farms on Class I land and only \$159 on Class IV land.

Most of the high-income operators got good crop yields, but even on Class IV land, the yields on some farms were twice those on others. The average crop yields on farms on Class IV land were only two-thirds as high as they were on farms on Class I land. Low crop yields is one of the causes of the lower incomes on Class IV land, and the rough, poor quality land is one of the causes of low crop yields. Low yields, and consequently low production, result in lower livestock production and a smaller volume of business, all of which means lower incomes. Most of the idle farms were on the poorer land classes.

Labor efficiency also varied greatly. Productive man work units per man ranged from an average of 329 on Class I land to 158 on Class IV land.

The quality of the soil and the lay of the land certainly make a difference. There are indications that much of the poorer, rougher lands, should not remain in the present type of commercial farms but should be used for other purposes such as specialty crops or recreational areas.

Success in Farming Rough Land in Southern Michigan

by FRANK M. ATCHLEY*

THE SITUATION

Nearly 2,000,000 acres of rough morainic** land are in the major agricultural area of southern Michigan (Fig. 1). This morainic area varies in topography from gently rolling to extremely steep hills. It also varies as to soil type, productivity, texture and moisture-holding capacity; and in income-producing ability.

Some of the soil types in this area are productive and support profitable farming ventures. Other parts of the morainic area would be considered good agricultural land if they were more level. Large portions of the area are farmed in small irregular tracts, are not highly productive and farm incomes are relatively small.

Many of the hills in this area have relatively short, steep slopes, and the valleys frequently are "pot holes" without any surface drainage. Both the hills and the holes are difficult to farm. Occasional valleys are covered with a highly organic soil which, in some cases, has been utilized for truck crops or small fruit plantings.

Much of the rough land is subject to severe erosion and a great deal of the original productivity has been depleted. The major portion of the timber has been removed. Sales of farm timber in the old days kept many of the farmers on the land and made them think they were "making a go of it" when in reality they were just selling off their resources. In addition, many of the farm buildings were constructed largely from timber grown on the farm.

Many fields and even farms are idle or nearly so; in such instances the farm house is usually being used as a rural residence because of the urban housing shortage. Good all-weather roads predominate in most of the area, making markets quite accessible. Most of the land in the area is at present in private ownership. Many of the farms are

*The author wishes to express his appreciation for the cooperation of Harold J. Foster formerly County Agricultural Agent in Barry County and now District Extension Supervisor, Michigan State College, C. A. Engberg, State Soil Scientist, and E. E. Fenton, Soil Scientist of the U. S. Department of Agricultural Soil Conservation Service, and also to the farmers who attended many meetings and spent much time on committees in the townships of Hastings, Rutland, Hope and Baltimore, all of Barry County. Without their cooperation and assistance this study would not have been possible. The author also wishes to express his appreciation for the cooperation of his fellow staff members in the Farm Management Department, particularly Professors E. B. Hill and K. T. Wright.

**These rough land types are merely a series of what the soil scientists call moraines, a moraine being a ridge or series of hills formed by a glacier that melted about as fast as it advanced.

"high priced" from a farming standpoint, if one considers the level of their productive ability.

The 1945 U. S. Census of Agriculture shows that 55 percent of the farms in the county used in this study were smaller than 100 acres.

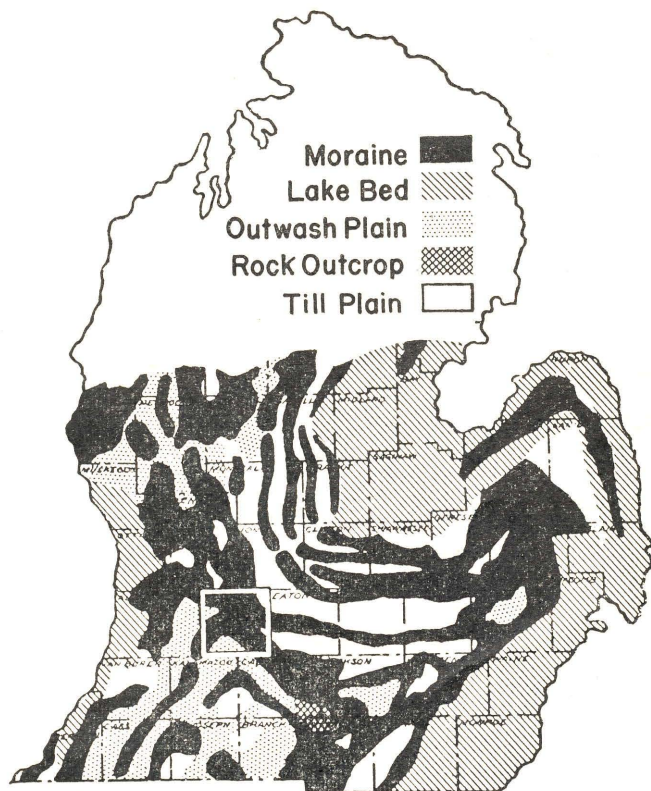


Fig. 1. A general map of the lower peninsula of Michigan showing land formations produced through action of glaciers. The inclosed area indicates Barry County.

THIS STUDY

In order to answer some of the questions regarding the agriculture of this area as indicated in the preface, it was necessary to study the different land classes, the types of farming, the soil-conserving practices, the size and organization of various farm businesses, as well as production practices and methods of operation used on representative farms selected in this area. It was considered desirable to select a small portion of the morainic area for detailed study. After several conferences it was decided to use the four center townships of Barry

County as the problem area; these are Rutland, Hope, Hastings and Baltimore. This area seemed quite representative of the morainic area of southern Michigan.

To provide current information about the farms and farmers, a committee of interested, capable, well-informed farmers was appointed by the County Agricultural Agent for each of the townships within the problem area. Each of the committees met with the project supervisor several times in an effort to get the desired information.

The committees divided the four-township area into four land classes according to the topography of the land and the quality of the soil, the most level and fertile land being designated as Class I and the roughest and least fertile was designated as Class IV. Much of the material in this study will be presented according to these land classes. The committees gave further assistance by providing a list of farmers from each of their townships, from which a representative sample was selected. This group of farmers was interviewed in order to provide the farm data around which most of this study was centered.

ORGANIZATION AND MANAGEMENT

SOILS, TOPOGRAPHY AND PRODUCTIVITY

The soils of the southern Michigan morainic area of approximately 2,000,000 acres consist mainly of Bellefontaine, Hillsdale, Coloma and the hilly phase of Miami. J. O. Veatch of the Soil Science Section, Michigan Agricultural Experiment Station, has described the land in the area in this manner:

The . . . land in this area, in contrast to the plains, is characterized by gently rolling to hilly topography, relief in general of 50 to 100 feet, slopes exceeding in area the level land, and a wide distribution of peat and muck, swamp and lake surface. The soils on the whole are sandy loams and light loams intermediate in fertility, but include a lesser amount of deep sands which are lower in fertility as well as small bodies of stony, cobbly and gravelly loams.

The topography of a considerable portion of this type of land makes it poorly adapted to large, regularly shaped fields and, hence, to modern machinery. Much of the land on the steeper slopes has had its fertility reduced and its value lowered by soil erosion. Certain parts of this morainic area may contain land that is more productive than the Class I or less productive than the Class IV land of this particular

four-township area, but the general relationship between classes should be quite comparable.

Table 1 indicates both the acreages and the percentage distribution of the land classes in the four-township area. The township committee members were inclined to hold a more pessimistic attitude toward the quality of the land in the area than did the personnel of either the Soil Conservation Service or the Soil Science Section of the Agricultural Experiment Station.

TABLE 1—*Acreages and percentage distribution of land classes in the four-township area in Barry County, 1946*

Township	Land class			
	I	II	III	IV
	<i>acres</i>	<i>acres</i>	<i>acres</i>	<i>acres</i>
Hastings.....	5,740	10,540	5,520	1,240
Rutland.....	0	5,500	12,660	4,880
Hope.....	0	1,020	16,550	5,470
Baltimore.....	1,735	6,970	9,385	4,950
Total.....	7,475	24,030	44,115	16,540
	<i>percent</i>	<i>percent</i>	<i>percent</i>	<i>percent</i>
Hastings.....	25	46	24	5
Rutland.....	0	24	55	21
Hope.....	0	4	72	24
Baltimore.....	8	30	41	21
Total area.....	8	26	48	18

The division of the four-township area into the different land-classes is shown in Fig. 2 and is of necessity rather general. For example, there may be individual fields or even farms in Class I that might be in another class if they were not surrounded by Class I land. Certainly all parts of individual farms are not of the same land quality—a land class merely indicates the most predominant land class on the farm.

TYPES OF FARMING

Barry County is the northern-most county in Michigan Type-of-Farming Area 2—"Small Grains and Livestock." The 1945 U. S. Census of Agriculture indicated that 40 percent of the farms in the county produced principally dairy, poultry and livestock products, 14 percent produced principally crops, and 28 percent were general farms. This left 18 percent of the farms as those producing principally for home use.

The four-township area runs quite strongly to livestock, especially dairy cattle, except for the northeast one-quarter of Hastings Township which could be classified more as a small grain area. As a matter of

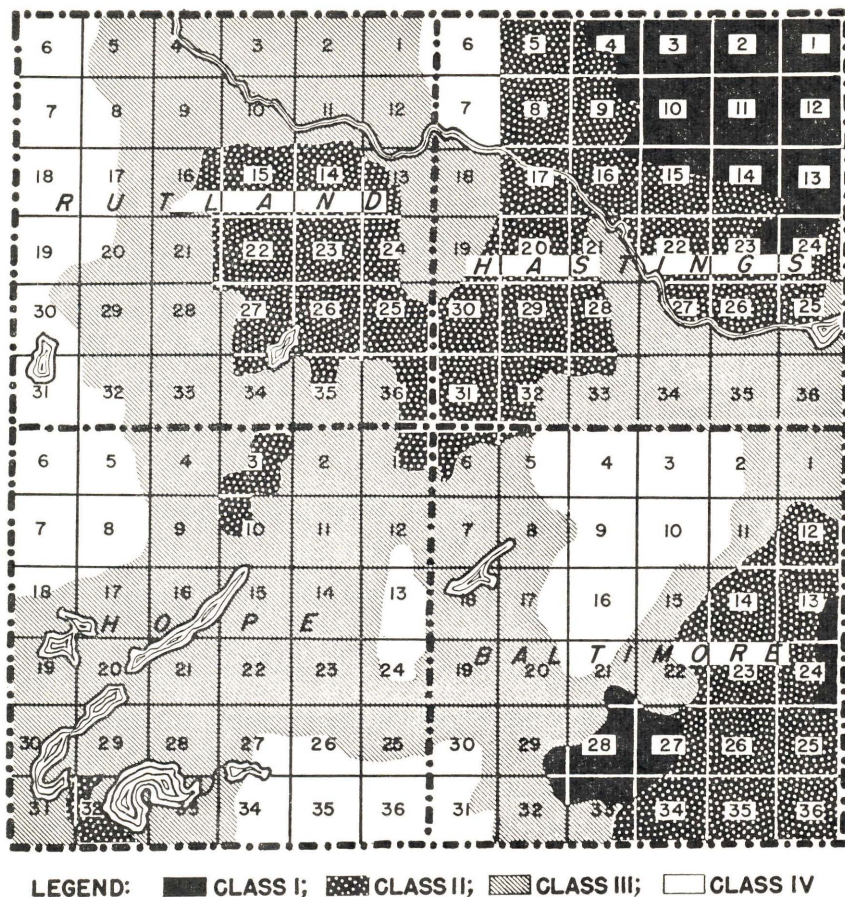


Fig. 2. Classes of land in the four-township area as outlined with the assistance of the farmer committees, Barry County, 1946.

fact, however, that corner of Hastings Township is not really morainic but is largely a till plain. It was included in this study as a check or comparison area and comprises most of the Class I land used in the study.

Size of farm—The average sized farm in the four-township area was 113 acres, while the average farm in Barry County consisted of 110 acres, according to the 1945 Census. Because in this study we were interested only in commercial farms, the non-commercial farms were omitted. This brought the average size of the farms studied up to 162 acres (Table 2). The smallest farms were on Class I land, although these farms were next to the largest in acres of tillable land. The farms on Class IV land had only 94 acres of tillable land, the least of

any of the land classes. Eight farms, however, could possibly be too few to indicate typical size.

TABLE 2—*Relation of land classes to size of farm in the four-township area, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
Acres per farm.....	162	126	177	164	158
Tillable acres per farm.....	103	105	116	99	94
Productive animal units per farm.....	18	24	17	19	14
Productive man work units per farm.....	323	372	341	329	215
Number of men per farm.....	1.3	1.1	1.3	1.4	1.4
Gross income per farm.....	\$4284	\$6537	\$4794	\$4087	\$2378

Farms on Class I land had the largest size of business, as measured by the number of productive man work units* provided on them. Farms that provide the most productive work usually show the highest returns. The gross income figures, which were the highest for Class I farms, declined with the quality of the land in quite the same way that the work provided declined.

There were more men employed on the farms on the poorer land classes—1.4 as compared with only 1.1 on the farms on Class I land. Fewer men farmed more acres and cared for more livestock on the Class I land than those on Class III and Class IV land.

Farm tenure—According to the 1945 U. S. Census of Agriculture, about 11 percent of the farms in Barry County were operated by tenants in 1944. This is in contrast to about 21 percent 10 years earlier. Even so, about 22 percent of the farm land was rented by the operator in 1945. This includes land operated by tenants and the rented land operated by those who operate land in addition to what they own.

Owner-operators, part-owner operators and those operators who for all intents and purposes operated their farms in a manner comparable to owner-operators were the only ones included in the group of farms used in this study. The latter were operating farms which they could reasonably expect to inherit some day. Tenant-operated farms, which were scarce in the area studied, were not included. Detailed tenure information was obtained, however, for one township in the area studied and will be discussed in another section of this bulletin.

*A productive man work unit represents the amount of productive work that will be done by a man working at average labor efficiency in a 10-hour day.

Crops—The four townships comprising the area had about the same proportion of tillable land in row crops as did the county as a whole in 1945. The area, however, had more hay and less small grain, according to the 1945 U. S. Census of Agriculture.

There was some difference in types of farming among the different land classes within the study area. Table 3 indicates that a much greater proportion of the farm land was tillable on the farms located on Class I land than on the farms located on the other land classes. This may be explained by the fact that there was much less non-tillable, "hill and hole" land on the Class I land which, as previously mentioned, was mostly non-morainic in character.

Hay and pasture took up only 38 percent of the tillable area on Class I land and 58 percent on the Class IV land. Small grains and row crops occupied 55 percent of the tillable area on Class I land but only 27 percent on the poorest land. This is much as would be expected—more hay and pasture and less grain on the poorer, rougher lands (Fig. 3). The average crop yield indexes for the different land classes varied from a low of 83 on Class IV land to a high of 127 on Class I land (Table 3). Corn, oats, wheat and hay were the crops used to com-

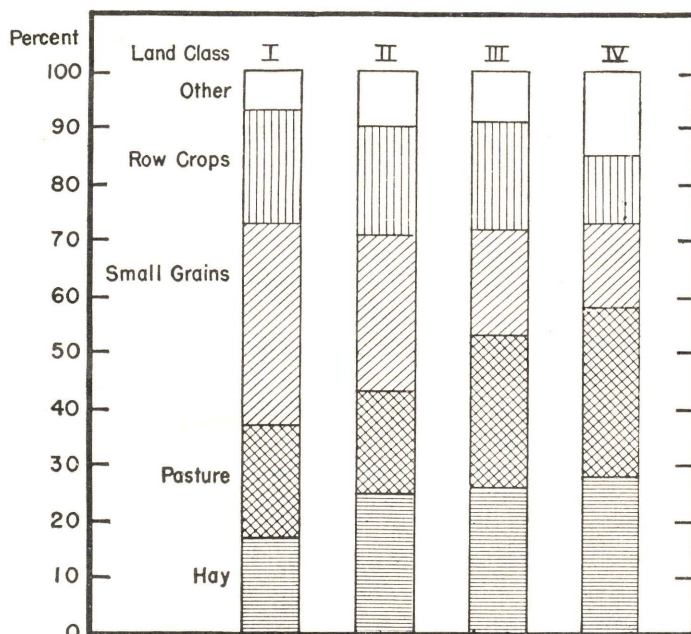


Fig. 3. Percentage of tillable land in various uses by land class in the four-township area, Barry County, 1946.

TABLE 3—*Crop information in the four-township area by land classes, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.	65	8	17	29	11
Acres per farm.	162	126	177	164	158
Tillable acres per farm.	103	105	116	99	94
Percent of farm tillable.	64	83	65	60	60
Percent of tillable land in:					
Hay.	25	17	25	26	27
Pasture.	24	21	18	27	31
Small grains.	23	35	28	19	15
Row crops.	18	20	19	19	12
Crop yield index.	100	127	101	95	83

pute the index, with the area average in each crop equalling 100. The yield indexes declined with the quality of land as would be expected, but one must not overlook the fact that many things other than quality of land have definite effects on crop yields.

Livestock—Returns from livestock and livestock products made up the major portion of the farm income in Barry County in 1946. In the area studied they made up 84 percent of the gross income (Table 4).

TABLE 4—*Livestock factors in the four-township area, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.	65	8	17	29	11
	(total)				
Productive animal units per farm.	18	24	17	19	14
Tillable acres per productive animal unit.	5.6	4.4	6.6	5.0	6.9
Dairy cows—Average number per farm.	9.6	10.6	10.0	9.8	7.8
Sows—Average number per farm.	1.7	1.3	1.2	1.5	.8
Ewes—Average number per farm.	6.5	7.6	5.0	8.2	3.4
Livestock income per tillable acre.	\$35	\$50	\$30	\$37	\$24

The remaining items in Table 4 indicate that the better classes of land supported more livestock per farm and produced more income from livestock for each tillable acre than did the poorer classes of land.

SOIL CONSERVATION PRACTICES

Different people use the term "soil conservation practices" to mean different things. Some think of it as referring only to such items as contour farming, strip cropping, terracing and the use of grass waterways. In this study it refers primarily to the ordinary cultural practices usually considered helpful in maintaining the soil and its fertility, such as crop rotations and the application of manure, lime and fertilizers.

In this study no attempt will be made to list the various rotations. In fact, some farmers said they did not follow any definite crop rotation—they changed crops around from field to field but without any definite plan. The crops grown the first two years of practically all rotations were corn and oats. The proportion of the farms having wheat in the third year of the rotation ranged from about 70 percent of the farms on Class I land down to only 40 percent on Class IV land. A few farmers put their seeding in their oats, thus having hay as the third year of the rotation. The most common procedure, however, was to make the “seeding” in the wheat and then have hay in the fourth year of the rotation. Hay was carried over, of course, to the fifth year in many cases and sometimes longer. A very common practice was to cut hay in the fourth year of the rotation and to use the field for pasture in the fifth, and in some cases the sixth year. There was a definite tendency, as mentioned before, for a larger proportion of the tillable land to be in hay and pasture on the poorer land classes than on the better ones (Table 5).

The conservation practices listed in Table 5 varied considerably, both among land classes and among individual farms within land classes. About two-thirds of the farmers spread barnyard manure on their cropland only and spread none on their permanent pastures. The farmers on the better classes of land, Classes I and II, used fertilizer much more regularly than did those on the poorer classes of land. There was a greater tendency for farmers on the poorer land to use more lime or marl, owing considerably to their ability to get marl as a part of their conservation payment from the federal government.

About two-thirds of the farmers in this study had never plowed under any crops as green-manure, but there was an indication that those on the better lands had followed this practice a little more than those on the poorer lands. More than 4 out of 5 of the farmers in the study had never sown any grass or legume seed in their corn as a winter cover crop.

Very few operators had done anything to improve their permanent pastures. Only 8 percent had applied either lime or fertilizer, while 17 percent had reseeded their pastures in some way. This seemed to be more prevalent on the better land classes for, as one would expect, it would be less difficult to do on the more level lands—less difficult to fit the land and less difficult to keep it from eroding while a seeding was getting established.

There were only 2 farmers in the group of 65 in this study who were cooperating with the County Soil Conservation District, but neither of them had been participating long enough to show any definite results. It seems that there were more conservation practices being carried out on the better classes of land than on the poorer, rougher classes (Table 5).

TABLE 5—*Relation of land classes to conservation practices in the four-township area, Barry County, Michigan, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
	(total)				
Acres per farm.....	162	126	177	164	158
Tillable acres per farm.....	103	105	116	99	94
Percentage of tillable land in hay and pasture.....	50	38	44	53	58
Percentage of tillable land in row crops.....	18	20	19	19	12
<i>percentages</i>					
Operators spreading manure:					
On permanent pasture and cropland.....	34	12	35	45	18
On cropland only.....	66	88	65	55	82
Operators using commercial fertilizer:					
Regularly.....	28	75	47	14	0
Some.....	41	25	47	48	27
None.....	31	0	6	38	73
Operators using lime or marl:					
Regularly.....	25	25	24	21	36
Some.....	63	50	70	69	46
None.....	12	25	6	10	18
Operators plowing-under green manure:					
Regularly.....	4	12	6	3	0
Some.....	31	25	35	28	36
None.....	65	62	59	69	64
Operators seeding cover-crop in corn:					
Have.....	17	12	24	10	27
Have not.....	83	88	76	90	73
Operators who improve permanent pasture:					
By applying lime and/or fertilizer.....	8	0	12	10	0
By reseeding.....	17	25	29	7	18

EFFICIENCY OF OPERATION

High expenses in operating a farm are usually not a common reason for low farm earnings. The most common reason for low farm earnings, is too small a business and not enough gross income. It cost the 65 farmers in the study area \$1,677 in 1946 to operate the average-sized farm of 162 acres if we include only the cash operating expenses* (Table 6). This did not include any allowance for unpaid family labor, the farmer's own labor, or anything for interest on his investment. These three items totaled \$2,408, making the total expense of operating the average farm \$4,085 or \$39.66 for each of the 103 tillable acres. The difference was not more than \$6 an acre between any two of the land classes.

*Machinery and equipment expense also included 10 percent of their estimated value for depreciation.

TABLE 6—*Expenses of operating farms by land classes in the four-township area, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
Acres per farm, total.....	162	126	177	164	158
Acres per farm, tillable.....	103	105	116	99	94
Operating expenses (except labor)					
Feed bought.....	\$420	\$282	\$372	\$536	\$290
Machinery expenses.....	566	670	648	523	479
Improvement expenses.....	190	219	210	186	147
Miscellaneous crop expenses.....	254	419	312	222	131
Taxes.....	79	129	87	72	45
Hired labor.....	62	41	124	53	6
Other cash expenses.....	106	140	113	104	78
Total.....	\$1677	\$1900	\$1866	\$1696	\$1176
Farm labor charge:					
Farmer's own labor.....	\$1078	\$1012	\$1141	\$1045	\$1118
Unpaid family labor.....	464	310	309	579	511
Total labor.....	\$1542	\$1322	\$1450	\$1624	\$1629
Interest on total investment at 5%.....	\$866	\$1025	\$971	\$840	\$660
Total expense.....	\$4085	\$4247	\$4287	\$4160	\$3465
Percent farm labor is of total expense.....	38	31	34	39	47
Expense per tillable acre:					
Operating expenses.....	\$16.28	\$18.09	\$16.08	\$17.13	\$12.51
Labor charge (operator and family).....	14.97	12.59	12.50	16.40	17.33
Interest on investment.....	8.41	9.76	8.37	8.48	7.02
Total.....	\$39.66	\$40.44	\$36.95	\$42.01	\$36.86
Expense per \$100 income*.....	\$73.00	\$49.00	\$68.00	\$79.00	\$108.00

*Calculated by dividing total of operating expenses and labor charge by hundreds of dollars of gross income.

The average operating expenses ranged from \$1,900 on Class I land to \$1,176 on Class IV land. The total labor charge per farm was higher on the poorer classes of land. This indicates that although the farmers on the poorer lands were able to keep their other operating expenses relatively low they were not so successful in keeping the home-supplied labor at a minimum. Since the labor rate used for the operator and his family was the same on all farms this merely indicates that both the farmer and members of his family spent more time operating even fewer tillable acres on the poorer land classes. Table 6 indicates that family labor—the farmer and his family—was the most important expense item on these farms. The percentage varied from 31 percent on the best land to 47 percent on the poorest. The second most important expense item was interest on the investment followed by machinery expense.

It cost as much or slightly more to farm poor land than it did to farm good land (Fig. 4). The difference in gross income is the variable causing the "expense per \$100 of income" to be 120 percent higher



Fig. 4. Expenses per tillable acre of land by land classes in the four-township area, Barry County, 1946.

on the poor land than on the good land. Furthermore, the expense per tillable acre on Class IV land was \$8 more than the gross income.

Crop yield indexes varied from an average of 127 on the farms on Class I land to 83 on the farms on Class IV land (Table 7). The average

TABLE 7—Factors indicating efficiency of farm operation by land classes in the four-township area, Barry County, 1946

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
Acres per farm.....	162	126	177	164	158
Productive man work units per farm.....	323	372	341	329	215
Number of men per farm.....	1.3	1.1	1.3	1.4	1.4
Crops:					
Crop yield index.....	100	127	101	95	83
Crop expense per tillable acre.....	\$2.47	\$4.00	\$2.70	\$2.25	\$1.39
Livestock:					
Dairy product sales per cow.....	\$213	\$272	\$211	\$213	\$159
Livestock income per tillable acre.....	\$35	\$50	\$30	\$37	\$24
Livestock income per productive animal unit.....	\$195	\$223	\$202	\$191	\$162
Index of livestock income per productive animal unit.....	100	114	104	98	83
Labor and machinery:					
Productive man work units per man.....	244	329	266	237	158
Labor charge per tillable acre*.....	\$15.58	\$13.00	\$13.62	\$17.04	\$17.36
Labor charge per productive man work unit*.....	\$4.97	\$3.66	\$4.62	\$5.10	\$6.76
Machinery investment per tillable acre.....	\$19.37	\$20.23	\$19.31	\$19.45	\$18.18
Gross income per man.....	\$3245	\$5784	\$3745	\$2961	\$1748
Total farm:					
Years for gross income to equal investment....	4.0	3.1	4.0	4.1	5.5

*Labor charge includes that for hired, family and operator's labor.

of all farms in the study was used as a base of 100. The crop expenses per tillable acre ranged from \$4 on Class I land to less than \$1.50 on Class IV land in a manner similar to the crop yield index. It is evident that good seed, fertilizer and lime increased expenses on the better land classes, but they in turn helped to raise more crops, as shown by the yield index.

Livestock efficiency may be indicated in several ways. Dairy product sales per cow averaged \$213 for all the farms in the study and ranged from \$272 per cow on the farms on Class I land to \$159 on the Class IV land. This may be a result of more efficient dairy management, better feeding or just better cows on the farms on the better land. The livestock income from each tillable acre was also highest on the better classes of land. In a similar manner the income from each unit of productive livestock ranged downward from the farms on the good land to those on the poor land. The range was similar to that of the crop yield indexes (Fig. 5). Was it all efficiency in the management of livestock? Perhaps it was the efficiency of the animal itself, brought about by better breeding. Whatever it was, the returns from each unit of livestock on the farms on the good land were more than they were on the farms on the poor land.

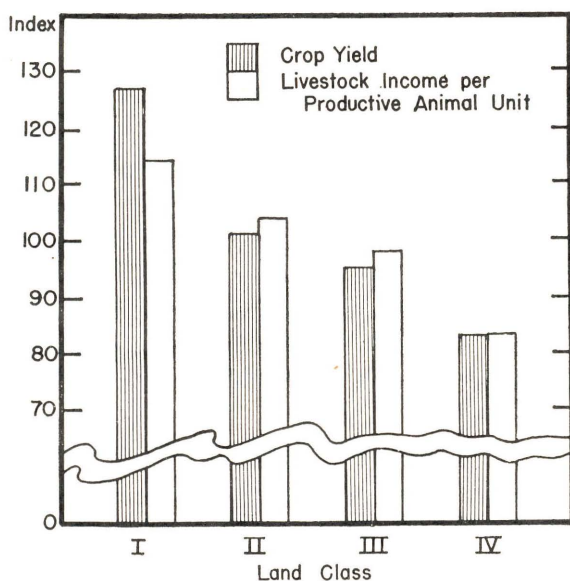


Fig. 5. Comparison of crop yield indexes with livestock income per productive animal unit, by land class in the four-township area, Barry County, 1946.

Efficiency in the use of labor is important since the labor charge was the largest single item of expense of operating the farms in this study. Productive man work units per farm is a measure of size if the farm business since the total for a farm depends upon the kind and amount of crops and livestock produced.

Labor efficiency in this study was measured by the productive man work units per man—the productive work accomplished by each man in a year. The man work units accomplished per man ranged from 90 to 512 on different individual farms and averaged 244 for the 65 farms in the study. The comparable figure for the farms in the different land classes ranged from 329 on Class I land to 158 on Class IV land. This indicates that labor efficiency or accomplishment was twice as high on the good land as on the poor land. It should be realized in this regard that much of this relationship between work accomplished per man and the class of land is due to the size of the farm business.

Total labor charge per tillable acre averaged \$15.58 for the group of farms but was about \$4 an acre more on the two poorer land classes than on the better ones. This is really more of an indication of intensity of operation than it is of efficiency. It merely indicates that each man operated more acres of tillable land on the better land classes. Furthermore this does not take into consideration the fact that the yields were higher on the better land classes so that actual production per man was even greater. The labor charge for each productive man work unit indicates what it costs to get one unit of productive work done. In other words, the lower the charge the more efficient was the labor—at least the labor accomplished more in a given amount of time.

It takes about as much machinery to till an acre of poor land as to till an acre of good land.

Gross income per man averaged \$3,245 and ranged from an average of \$5,784 on Class I land to \$1,748 on Class IV land. Much of this was undoubtedly due to the difference in the size of the farm businesses, but many of the most efficient operators were farming land in the two best land classes.

FINANCIAL SUMMARY

How did incomes vary between the different land classes? Although the operators of the farms on Class I land had smaller farms, they had an average of \$20,503 invested in their business. This was about 55 percent more than was invested by the operators of the farms on Class IV land (Table 8). The average gross income was \$6,537 per

farm on the best land, which was more than two and one-half times that on the farms on Class IV land. The expenses, however, were about \$2,200 on the farms on the three best classes of land, with a \$600 or 27-percent reduction on the Class IV land, as one might expect in light of the low average gross income.

TABLE 8—*Farm financial summary by land classes in the four-township area, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
Acres per farm.....	162	126	177	164	158
Capital investment per farm.....	\$17,371	\$20,503	\$19,589	\$16,793	\$13,192
Gross income from—					
Dairy products.....	\$2,047	\$2,886	\$2,104	\$2,086	\$1,244
Cattle.....	707	1,052	750	712	378
Hogs.....	416	855	252	453	256
Sheep and wool.....	133	130	141	146	90
Poultry and eggs.....	279	284	261	301	247
Crops.....	514	1,085	1,044	233	23
Labor off farm.....	131	241	204	93	37
Other.....	57	4	38	63	103
Total.....	\$4,284	\$6,537	\$4,794	\$4,087	\$2,378
Total expenses*.....	\$2,141	\$2,210	\$2,175	\$2,275	\$1,687
Net farm income.....	\$2,143	\$4,327	\$2,619	\$1,812	\$691
Interest on investment at 5%.....	\$866	\$1,025	\$971	\$839	\$660
Labor income.....	\$1,277	\$3,302	\$1,648	\$973	\$31
Percent of farms with labor income above \$1200..	42%	62%	35%	52%	9%

*This differs from the figures in Table 6 as this includes the charge for family labor but neither the charge for the operator's labor nor the interest on the investment.

Net farm income is what remains after all operating expenses have been paid and allowance has been made for a charge for family labor and for the board for hired labor. The net farm income varied from an average of \$4,327 on the farms on the Class I land to only \$691 on the farms on Class IV land.

The 65 farms returned an average labor income (net farm income less a 5-percent interest charge on the investment) of \$1,277, and ranged from an average of \$3,302 on the Class I land to \$31 on the Class IV land (Fig. 6). The range in labor incomes within the soil class groups indicates that the returns from some of the farms on the better land classes were lower than the returns from some of the farms on the poorer land classes. The range also was much greater within the better land classes than within the poorer ones—there was more difference between the incomes of the high-profit operator and the low-profit operator on Class I or II land than between the high and low on Class III or IV land.

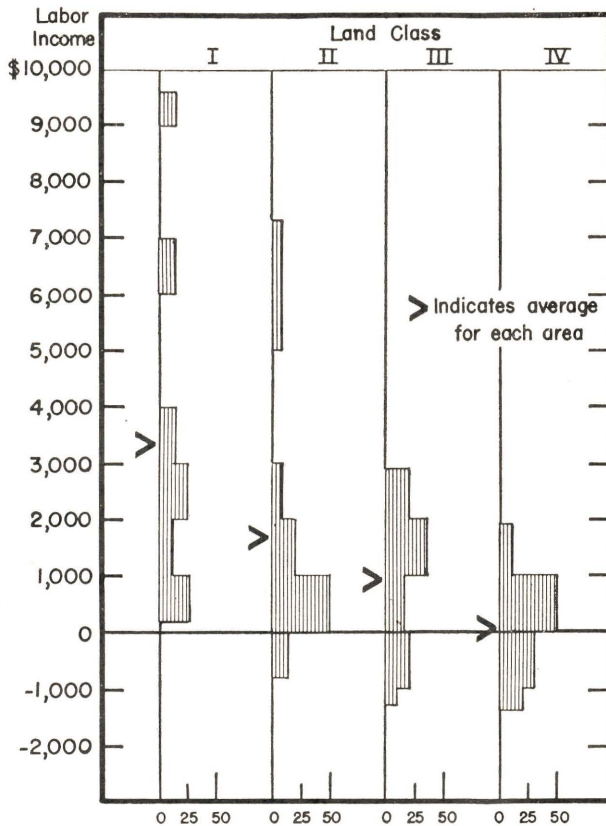


Fig. 6. Labor income—range, average and distribution by \$1,000 groups, by land classes, Barry County, 1946.

Labor income is the term used to indicate the farmer's financial return for his labor and his management (Fig. 7). Forty-two percent of the farms in the study showed a labor income above \$1,200 (annual charge for operator's labor), with 62 percent of the farms on Class I land above that figure and only 9 percent of the farms on Class IV land returning more than \$1,200. See Table 8 for labor returns.

SUCCESS ON DIFFERENT LAND CLASSES

Success on the farms located on the different classes of land is dependent upon many factors. These include type of soil, topography, level of productivity, present and past management practices, and the amount of energy and money that have been spent on soil mainte-

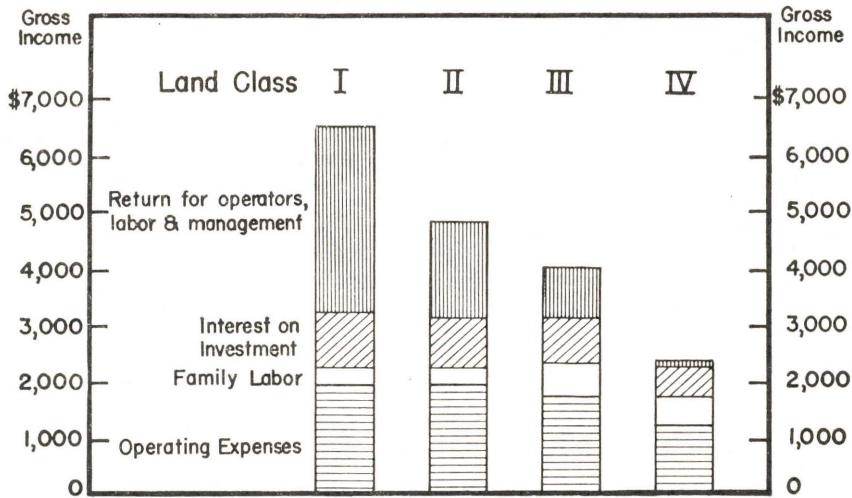


Fig. 7. Average gross income and its disposition by land classes in the four-township area, Barry County, 1946.

nance. Farms located within each of the different land class areas would ordinarily be expected to have about the same topography and soil types, but there were of course some variations between farms. Certain farms were less fertile or were rougher than others. The effect these factors had upon the success on the different land classes will be discussed.

CLASS I LAND

Gross income was high on the more successful farms. Expenses varied little in comparison with gross incomes, making the net farm incomes range from \$700 to just over \$12,000 per farm. There must be a great deal of business transacted if there is to be a high net income.

The productivity on the Class I land varied considerably, as indicated by the crop yield index, which was discussed in the previous section of this report. The indexes on the two or three highest income farms on Class I land were considerably higher than they were on the lower income farms. There was much more livestock kept on the high income farms than there was on the low-income farms; the farms were larger, there was more productive man work accomplished and labor efficiency was high.

Conservation practices on Class I land varied considerably between farms. There was more commercial fertilizer and lime used on the more successful farms than on the less successful ones. There was also

a little more money spent for seed and fertilizer on the more successful farms—where, undoubtedly, it was available to be spent.

Efficiency showed up to advantage on the more successful farms. This was brought out by the following facts:

1) The number of productive man work units per man ranged from 512 on one of the more successful farms down to less than 200 on one of the less successful ones.

2) The expenses for each \$100 of income were, as would be expected, much less on the more successful farms. This ranged from a low of \$34 on an efficiently operated farm to a high of \$110 on an inefficiently operated farm. The average for the eight farms was \$49.

3) Livestock income from each unit of productive livestock ranged from \$104 on the less efficient farms to \$406 on the more efficient farms. These three efficiency factors indicate the wide variation in the efficiency of operation between farms located on the same class of land.

The more successful farmers on the Class I land were, on the average, a little younger, were operating larger farms, carrying on more farm business, keeping their expenses relatively low and accomplishing a great deal more productive work per man than were the less successful farmers. Most of the variation in these items was due to the type and quality of the management carried on by the individual farm operators. This was particularly evident when we remember that these wide variations occurred on land that was practically the same in productive ability.

CLASS II LAND

On Class II land, as on Class I, the more successful farms were again those that had high gross incomes. There was considerable variation between farms in this particular factor. Expenses per farm did not vary much. The variations were in the amount of the gross income per farm. Thus, the net farm incomes ranged from about \$130 to slightly over \$9,000 per farm on the same land class. We must repeat, there must be a great deal of business transacted if there is to be a high net income.

The productivity of the farms on Class II land varied considerably as indicated by the following factors. The average crop yield index on the four highest-income farms on Class II land was 105 as compared with a crop yield index of only 92 on the four low-income farms. There was nearly twice as much livestock kept on the four high-income farms as there was on the four low-income farms. The farms were larger.

There was nearly twice as much productive man work accomplished and labor efficiency was high on the high-income farms. There was an average of 32 percent of the tillable land in hay and pasture on the four high-income farms, while the comparable figure for the four low-income farms was 47 percent. The latter came about because one operator was in the process of changing the major portion of his farm over to a forage type of operation. Even with this high percentage of land in hay and pasture, these four operators still maintained only half as much livestock as the high income farmers.

Conservation practices on Class II land varied considerably between farms, much the same as they did on the Class I land. More commercial fertilizer and lime were used on the more successful farms. Also, more money was spent for seed and fertilizer on the more successful farms.

Efficiency was in evidence on the more successful farms. The number of productive man work units per man on the four most successful farms averaged nearly 40 percent more than on the four least successful. The expenses for each \$100 of gross income were much less on the four most successful farms, averaging \$50, while the comparable figure for the four least successful was \$130. The average for the 17 farms on Class II land was about \$68 of expenses for each \$100 gross income. The amount of income from each unit of productive livestock for the high-income farms was \$266, while it was \$144 for the four low-income farms.

The four high-income farmers on this land class were on the average 5 years younger than the four least successful. The more successful ones were operating larger farms, carrying on more farm business, and were keeping their expenses relatively low. There was more productive work on the farm and they were accomplishing more per man than were the less successful farmers. It seems, as on the Class I land, that the variation in these items was largely due to the type and quality of the management carried on by the individual farm operators. The productivity of the soil was evidently an important factor, but there were certainly many others that helped make for success on any of the land classes.

CLASS III LAND

High gross incomes for the most part also went hand in hand with high net incomes on the farms on Class III land. There were, however, two or three particular cases where the gross income was especially

high but the expenses were also very high, making these farms fall in a lower net income class. After all, it is the difference between the gross income and the total expense that a farmer has available to spend for his family living. A few farms on this land class did not return sufficient gross income to pay interest and operating expenses and thus the operator received no financial returns for his labor or for the labor of members of his family.

The crop yield index for the 29 farms in this land class was 95. The average crop yield index for the five high-income farms was 108, compared with 94 for the five low-income farms. The range was from a low of 68 to a high of 149.

There was more livestock kept on the high-income farms than on the low-income farms, but there was not as great a range in this particular item as on either land Class I or II. The low-income farms were larger than the high-income farms by 16 acres, but the high-income farms had 14 acres more tillable land than did the low-income ones. In other words, a larger proportion of the high-income farms was in cultivation. There was more productive man work accomplished and labor efficiency was higher on the high income farms.

Conservation practices on Class III land varied considerably between farms as they did on the other land classes. There was more commercial fertilizer and lime used on the more successful farms than on the less successful. There was also more money spent for seed and fertilizer on the more successful farms.

Efficiency showed up to even more advantage on the more successful farms on Class III land than on the other land classes. This was brought out by the fact that the number of productive man work units per man ranged from an average of 291 on the five high-income farms to 191 on the five low-income farms. The expenses for each \$100 of gross income were twice as high on the low-income farms than on the high-income farms, or \$110 and \$56 respectively. The average for the 29 farms was \$79. The five more efficiently operated farms showed a return from each productive animal unit of \$222, while the five less efficiently operated farms returned only \$158 for each unit. These efficiency factors indicate the wide variation in the efficiency of operations among farms located on Class III land. It should be noted, however, that the variation within this land class was not so great as it was among farms on either Class I or Class II land.

The more successful farmers on Class III land were considerably younger than the less successful. The farmers on the five high-income

farms averaged only 43 years of age, while the five low-income farmers averaged 62. The five high-income farmers carried on more business on farms made up of more tillable acres; they kept their expenses relatively low and accomplished more productive work per man than did the less successful farmers. Certainly the soil made considerable difference, but one must not overlook the management factor among farms located on the same land class.

CLASS IV LAND

Class IV land was not significantly different from the other land classes from the viewpoint of variation in gross incomes. There was a spread of over \$3,100 between the high-gross-income farms and the low ones on this particular land class. Expenses varied little; in fact, the expenses for the three high-income farms were almost identical to the expenses for the three low-income farms. The net incomes, however, were a different story. The average of the three high-income farms showed \$1,894 net farm income, compared with a negative \$389 for the three low-income farms. In other words, these farms with the low net farm incomes did not return enough money to pay for the family labor and the operating expenses. In fact, one of the low-income farms lacked \$280 of paying the operating expenses; the family labor and the operator got nothing for their work. In other words, the cash expenses exceeded the cash income by \$280.

The productivity on the farms on Class IV land varied considerably as indicated by the following factors. The crop yield indexes on the three high-income farms averaged 106, compared with only 71 on the three low-income farms. There was more than twice as much livestock kept on the high-income farms as on the low-income farms with an average of only 11 productive animal units on the three low-income farms.

One of the differences on this particular land class was the fact that the farms were larger in total acreage and larger in tillable acreage on the three low-income farms than on the high-income farms. The latter averaged 97 tillable acres and the low income farms averaged 124. There were, however, 322 productive man work units of work accomplished on the high-income farms, compared with 223 on the low-income farms. Labor efficiency was also high on the higher income farms. The proportion of tillable land in hay and pasture on the high- and low-income farms averaged 70 percent and 40 percent, respec-

tively. It might be well to note that there was considerable idle tillable land on the three low-income farms on this land class.

Conservation practices on Class IV land varied much the same as they did on the other land classes. More commercial fertilizer and lime were used on the more successful farms. Also, a little more money was spent for seed and fertilizer on the more successful farms, but the difference was not so outstanding as it was on the other land classes. The average crop expense per year for the three high-income farms on this land class was only \$149, compared with \$136 for the three low-income farms. This is not high in either case, but the major portion of this expense was for seed, with second place going to combining.

The difference in efficiency was quite noticeable between these two groups of farms. The productive man work units per man on the three most successful farms averaged 269, compared with 152 on the three low-income farms, or about 77 percent higher on the high-income farms. The expenses for each \$100 of gross income on the three high-income farms amounted to only \$82, but the comparable figure for the three low-income farms was \$211, or more than 150 percent greater on the low-income farms. The average for the 11 farms on Class IV land was \$108 of expense for each \$100 of income. This includes a charge for the work of both the operator and his family. The amount of income from each unit of productive livestock for the three high-income farms was \$148, while it was only \$87 for the three low-income farms.

The three most successful farmers on this land class averaged 20 years younger than the three least successful ones. The least successful farmers had the larger farms in this particular case, but they did not do the volume of business that the higher income farmers did nor were they as efficient in the use of their labor.

It seems here, as on the other land classes, that the variation within the different items is considerable, even within the same class. There is also a great deal of difference, as shown, between the management on the different land classes. In other words, land quality and managerial ability are both important in the maintenance of a high level of income.

SUMMARY REGARDING SUCCESS ON DIFFERENT LAND CLASSES

To close this discussion about success on various land classes, it seems advisable to indicate some of the ideas of some of the older, more successful farmers interviewed in the course of this study. These

men lived in the four-township area and had been watching the management practices of their neighbors for many years.

One of these men thought that one of the biggest things contributing to the success of some farmers over others was getting the work done on time. For example, he thought some farmers were habitually about one operation behind schedule. They might be hauling manure just about the time they should be fitting their land for oats or corn. He also said that some farmers did not manage their work right; some did not use good fertilizer practices; others thought that they could take two or three tons of alfalfa off the land year after year and not put anything back; and some thought that the land should produce like it did when their grandfathers were there. He thought the latter was impossible unless the soil fertility was maintained, such as growing legumes and applying fertilizers.

Another one of the older farmers of the community made the following remarks when questioned by the enumerator: "Young man, it isn't the farms or the land that's to blame for our farming conditions, it's the farmers. They don't farm right. They think they must cultivate all of this land just because they have tractors. You can't farm that way. The land has to be in grass once in awhile. It has to rest."

Another operator made the following comparison between two different farms with which he was familiar, both of which were about the same size and were located on the same land class. He said that one particular farm was in very good shape when the man bought it about 1941. He did not have any family. He farmed the farm for 5 years. It "went down hill" fast. Now the farm is almost worthless. There is a federal loan on it which is about to be foreclosed. On the other farm, however, the farm supported both the operator and his son's family, and there was quite a little money left over. The same elderly man said that success on farms on this rough land, just as it was on other types of land, was a combination of hard work, good management and frugality. He said that these three factors usually applied to both the farmer and his wife.

One farmer volunteered the information that many farmers work hard but don't manage properly. He said that both hard work and management were required for success in farming. Some men, he said, wouldn't make a living on the best soil possible. He also thought that pasture and hay land needed improving. He thought that putting marl on pasture made a big difference. He said that the pasture grasses came up sooner in the spring and were a darker green.

It is quite evident that the quality of the land had a definite effect on the success of the farm operators. It is also quite evident that the management of the various farms located on each of the land classes varied considerably and may have influenced the success of the operator more than the quality of the soil.

FORAGE MANAGEMENT

Hay and pasture management on the rough morainic soils of southern Michigan is a serious problem to most farmers in that area. Their native pastures dry out during the summer. Many of them get their cows "through" July and August, when June grass is short, by pasturing hay land after the first cutting, and occasionally supplementing with some green corn, perhaps a little hay or grain and "exercise pasture." Other farmers provide some kind of rotation pasture, such as alfalfa-brome, sweet clover or sudan grass—something that provides an abundance of succulence while their permanent pastures suffer from the heat and sun of mid-summer.

TABLE 9—*Relation of certain management factors to forage utilization by land classes, Barry County, 1946*

Item	Area average	Land class			
		I	II	III	IV
Number of farms.....	65	8	17	29	11
Acres per farm, total.....	162	126	177	164	158
Percent of farm tillable.....	64	83	65	60	60
Real estate value per acre.....	\$71	\$93	\$78	\$67	\$56
Percent of tillable land in:					
Hay.....	25	17	25	26	27
Pasture.....	24	21	18	27	31
Row crops.....	18	20	19	19	12
Small grains.....	23	35	28	19	15
Percent of total pasture that is tillable.....	43	79	41	40	48
Forage crop acreages per roughage consuming animal unit:					
Hay.....	1.9	1.3	2.1	1.8	2.5
Pasture: Tillable.....	1.8	1.4	1.5	1.9	2.8
Non-tillable.....	2.3	.4	2.2	2.8	3.1
Total.....	6.0	3.1	5.8	6.5	8.4
Roughage-consuming animal units per farm:					
Cattle.....	12.7	14.4	13.1	13.2	9.8
Sheep.....	1.0	1.1	0.8	1.3	0.5
Total.....	13.7	15.5	13.9	14.5	10.3
Average number of cows.....	9.6	9.6	10.0	9.8	7.8
Feed purchased: Per farm.....	\$420	\$282	\$372	\$536	\$290
Per tillable acre.....	\$4.08	\$2.69	\$3.21	\$5.44	\$3.08
Dairy product sales per cow.....	\$213	\$272	\$211	\$213	\$159
Productive man work units per farm.....	323	372	341	329	215
Gross income per farm.....	\$4,284	\$6,537	\$4,794	\$4,087	\$2,378

The acreage of forage crops, including hay and both tillable and non-tillable pasture for each roughage consuming unit of productive livestock varied from 3.1 acres on Class I land to 8.4 acres on Class IV land (Table 9). Farms on Class IV land had nearly three times as much forage acreage per head of livestock as did farms on Class I land. Another way to say the same thing is that from the forage viewpoint, farms on Class I land had nearly three times the livestock carrying capacity of farms on Class IV land.

Two farms were selected from each of the four land classes, in order to describe and compare forage crop programs on individual farms in this region. An effort was made to select two farms in each land class that were operated in quite a similar manner except for the forage management program, particularly that of pasture. Several factors will be discussed, dealing with each of these farms in order to present the differences in forage management that may occur within the same land class.

CLASS I LAND

Forage crop acreage for each roughage consuming animal unit (cattle and sheep) on Farm A amounted to 3.1 acres (Table 10). The

TABLE 10—*Relation of certain management factors to forage utilization on individual farms, Barry County, 1946*

Items	Land class							
	I		II		III		IV	
	A	B	C	D	E	F	G	H
Farm designation.....	110	160	257	287	180	280	130	136
Acres per farm.....	79	86	81	58	89	31	73	70
Percent of farm tillable.....	\$100	\$75	\$97	\$100	\$78	\$64	\$62	\$44
Real estate value per acre.....								
Percent tillable land in:								
Hay.....	17	7	27	32	36	34	25	65
Pasture.....	13	20	10	4	47	—	52	5
Row crops.....	18	27	23	18	13	35	6	13
Small grains.....	52	29	40	46	4	23	17	17
Percent of total pasture that is tillable.....	65	100	71	6	91	—	100	31
Roughage consuming animal units:								
Cattle.....	10.5	12.2	32.1	28.4	20.1	26.2	8.1	7.9
Sheep.....	0	1.7	0	0	0	0	2.5	0
Horses.....	0	3.0	0	3.0	2.0	2.0	2.0	2.0
Total.....	10.5	16.9	32.1	31.4	22.1	28.2	12.6	9.9
Average number of cows.....	9	7	24	22	15	18	7	6
Feed purchased, total.....	\$373	\$406	\$341	\$1112	\$1206	\$3234	\$261	\$139
Forage crop acreages per roughage-consuming animal unit:								
Hay.....	1.4	0.6	1.7	1.7	2.6	1.0	1.9	6.2
Pasture: Tillable.....	1.0	1.6	0.7	0.2	3.4	—	3.9	0.5
Non-tillable.....	0.6	—	0.3	2.9	0.3	5.2	—	1.1
Total.....	3.0	2.2	2.7	4.8	6.3	6.2	5.8	7.8

hay on this farm was red clover with a yield of 1.5 tons per acre in 1946. The tillable pasture was June grass. The six acres of non-tillable pasture were wet and swampy. The operator had done nothing to improve his permanent pasture. He did use considerable amounts of commercial fertilizer on his crops but none on his tillable June grass pasture. The operator of Farm A purchased about \$373 worth of feed during the year, which amounted to over \$4 for each tillable acre on his farm. His sale of dairy products per cow amounted to \$170, indicating a low-income dairy herd.

Farm B had 10 acres of alfalfa-brome hay which yielded 2.5 tons per acre. The pasture was all tillable and was made up of 17 acres of alfalfa-brome and 10 acres of June clover. The cows on this farm, however, were pastured not only on the tillable pasture but on the aftermath of both wheat and hay fields. The cows were frequently changed from field to field, in the belief that the pasture would have a chance to revive after each short period of use. The cows received grain during the entire season. This farmer had used considerable fertilizer on his rotated crops which meant some fertilizer on his tillable pasture fields during each rotation. He spent about \$400 for feed (\$3 for each tillable acre) on his farm. The dairy product sales per cow amounted to \$188, or only \$18 more than that received by the operator of Farm A, neither of which are outstanding figures. These two farms, as well as others on Class I land, were grain and livestock farms rather than outstanding dairy farms.

CLASS II LAND

Farm C had 22 acres of alfalfa, 22 acres of alfalfa-brome and 11 acres of clover and timothy, each with a yield of 1.5 tons per acre. The 24 dairy cows were pastured on 15 acres of brome-clover pasture until about the first of August (Table 10). After that they were alternated among 7 acres of sudan, 12 acres of second-cutting alfalfa, 10 acres of second-cutting alfalfa-brome and back to the 15 acres of brome-clover pasture. These cows were also fed grain and hay throughout the pasture season.

Farm D had 27 acres of alfalfa-brome hay yielding 1.5 tons per acre, 21 acres of clover hay yielding 1 ton per acre and 5 acres of timothy, also with a 1 ton yield. The 22 cows and 3 horses on Farm D were pastured on 60 acres of permanent low-land pasture until about August 1, at which time they were turned into about 27 acres of alfalfa from which the first cutting of hay had been removed. The cows on

this farm received grain during the pasture season and started to get hay about the first of October. About 11 head of young stock were turned into another poorly drained permanent pasture about the middle of April and were left there without any supplemental feed until about the first of December. There were 2.7 acres of forage for each roughage-consuming animal unit on Farm C, as compared with 4.8 acres for each such unit on Farm D.

The operators of these two farms used both lime and commercial fertilizer to a considerable extent and were both following what are ordinarily considered good rotations on their tillable land. They had, however, done nothing to improve their permanent pastures. The operator of Farm C, of course, had little non-tillable pasture, while the operator of Farm D had a large acreage of poorly drained pasture, difficult to rehabilitate in any way except by an expensive tiling project.

The dairy products sales per cow on these two farms were approximately the same, just under \$270. The operator of Farm D, however, spent nearly four times as much for feed as did the operator of Farm C, or \$6.62 for each tillable acre in his farm. It is significant that the operator of Farm D who had the large acreage of non-tillable pasture also had to purchase the largest amount of feed. This fact, together with the fact that the two herds of cows provided practically the same amount of dairy sales per cow, is of interest.

CLASS III LAND

The operators of these farms were considered by their neighbors to be two of the outstanding dairymen in Barry County. Their farms were located on Class III land and were selected for a comparison in this study because of the different types of pasture provided for their dairy herds. There was 6.3 acres of forage crops for each roughage-consuming animal unit on Farm E, as compared with 6.2 acres on Farm F.

The operator of Farm E had 28 acres of alfalfa-brome hay, yielding 2 tons an acre and 30 acres of clover and timothy hay yielding 1 ton an acre. About 15 cows and some young stock were pastured during the day on 40 acres of mixed legume pasture from the latter part of May to the first of October. Another 18 acres were used for night pasture and some odd areas for calf pastures. After the hay was removed those fields were pastured for a few days at a time on different occasions. Grain was fed to the cows throughout the year. About

\$1,200 was spent for commercially purchased feeds or about \$7.50 per tillable acre in the farm. Some marl had been used on the tillable pastures on Farm E within the past two years and manure was spread on the pastures once in two years. This operator made a practice of reseeded his tillable mixed legume pastures every seven years although these pastures were not in the major crop rotation for the farm. Commercial fertilizer had not been used. Dairy cattle were the major type of livestock kept on Farm E, and the dairy product sales for the 15 cows averaged \$295 per cow.

The operator of Farm F had 25 acres of alfalfa-brome hay, yielding 1.5 tons per acre and 4 acres of clover yielding 1.5 tons per acre. The 18 cows on this farm were pastured on about 74 acres of non-tillable pasture consisting of woods and swamp from the first of May to the middle of November. The young stock were pastured on another wet, swampy, non-tillable pasture of about the same size for about the same period of time. This adds up to 6.2 acres of forage for each roughage-consuming unit of livestock. The cows were fed grain throughout the year, but the calves were not. The cows were also fed hay after the first of October. About \$3,200 was spent for commercial feed on Farm F, or nearly \$38 for each tillable acre on the farm. There had been nothing done to improve the permanent pastures on Farm F. Many acres were wet and swampy and would be expensive to drain. Dairy product sales averaged a gross of \$318 per cow in the herd, which was \$23 more than the sales per cow on Farm E. Perhaps the difference was in the amount of feed purchased. It surely was not in the quality of pasture available.

CLASS IV LAND

The pasture and hay programs on these farms were quite different. There were 5.8 acres of hay and pasture on Farm G and 7.8 acres on Farm H for each roughage-consuming animal unit (Table 10). This was the reason why these two farms were selected for comparison.

The operator of Farm G had 8 acres of alfalfa and 16 acres of clover and timothy. He pastured 7 cows, some young stock, about 40 head of sheep and 2 horses on 49 acres of permanent June grass and timothy pasture from May 10 to November 1. The operator referred to the pasture as permanent but tillable—it had been tilled. He utilized his hay fields as pasture after the first cutting of hay was removed. Grain was fed to the cows during all the year. This farmer spent \$261 for feed; only \$205 of that was for dairy cattle and half of the \$205 was for hay.

This amounted to a total feed bill of \$2.75 per tillable acre but about \$29 for dairy feed for each cow. The sale of dairy products amounted to \$229 for each of the seven cows. Some marl but no commercial fertilizer had been used on this farm. Some manure had been spread on the permanent tillable pastures, but nothing else had been done to improve them. There were no plans to plow them up again in the foreseeable future.

The operator of Farm H had 5 acres of alfalfa-brome hay yielding 1 ton per acre and 57 acres of clover yielding 0.9 ton per acre. He had only 11 acres of non-tillable pasture and 5 acres of tillable pasture on which he pastured his 6 cows and young stock from May 15 to November 1. The non-tillable acreage was used for less than a month after May 15. He did, of course, utilize the 62 acres of hay land for pasture after removing the first cutting of hay. The cows were fed grain and some hay throughout the year and, in addition, were fed green corn starting about August 15. Hay was used to advantage, for commercially purchased dairy feed was held to a minimum of only \$34 for the entire herd and ensilage was not available. The 6 cows on this farm produced sufficient dairy products to make average sales amount to \$300 per cow. This was done with relatively little concentrate and a great deal of forage. Marl was used on tillable pasture when corn was to follow in the rotation. This operator reseeded his permanent pastures where possible about every 10 years by seeding to wheat and a legume. He hoped in the future to reseed his pastures more often than every 10 years.

CONCLUSIONS REGARDING PASTURE MANAGEMENT

Different farmers handle their hay and pastures in many different ways. Some have permanent non-tillable pastures on rough, relatively low-valued land while others have permanent pastures on relatively level, high-valued land. Some operators use tillable pasture exclusively—pasture that fits into the major crop rotation on the farm. These usually consist of a legume and grass combination such as alfalfa-brome or timothy and clover. The permanent pastures of this area consist of June grass, timothy and other perennial grasses. In some cases as much as 10 acres of this kind of pasture was needed to pasture a cow for a year.

Although a relatively small proportion of their land was in cultivation, the farms on the poorer land classes had a larger percentage of their tillable land in hay and pasture and more pasture for each unit

of livestock than did farms on the better lands. This was needed to provide the necessary forage with the idea that concentrates could be more readily purchased. There were no other significant relationships between hay and pasture management and quality of the land. The differences seem to be among individual farmers, the quality of their livestock and their individual management methods.

The records in this study indicate that rarely does a farmer carry on an improvement program for permanent pastures in an effort to obtain more pasture days of high quality forage. Some farmers manage their pastures carefully in order to get the most and best feed from them while others merely turn their stock into an area and hope that there is sufficient forage to sustain them. True, many permanent pastures are wet and would necessarily be expensive to drain, while others are so rough as to make reseeding virtually impossible. Perhaps new methods of improving these pastures will come out of current experimental work on this crop.

There are many non-tillable pastures that are of little value either as pasture or for other purposes due to their degree of roughness, soil type, location or moisture holding ability. Certainly some of these lands could be used in some more effective manner. Better utilization and improvement of permanent pastures have been and continue to be among the major problems facing farmers operating the rougher lands of southern Michigan.

DIFFERENCES IN FARM TENURE BY LAND CLASSES

Baltimore Township was selected for this part of the study as being quite representative of the four-township area both from the viewpoint of tenure and land class. All four of the land classes were represented and in nearly the same proportion as they were in the entire four-township area (Table 1).

LAND AREA IN DIFFERENT TENURE CATEGORIES

The 1945 U. S. Census of Agriculture indicated that about 22 percent of the land in farms in Barry County was operated by someone who rented it from the owner. The information obtained from the township committeemen in Baltimore Township indicated that in 1946 about 29 percent of the land in that township was operated by someone who did not own it. About 60 percent of the farm land in the township was operated by the owner and 11 percent was idle in 1946. Only

entire farms in this particular section of this study were considered, not fields on individual farms.

Table 11 indicates that the owner-operators were operating a little more of the better classes of land than were the tenants. It also indicates that the major proportion of the idle farms were on Class III and IV land, with 56 percent of them on Class IV land.

TABLE 11—*Relation of land class to land tenure in Baltimore Township, Barry County, 1946*

Item	Town- ship totals	Land class			
		I	II	III	IV
Land operated by owners, acres.	13,461	1,052	4,831	5,250	2,328
Land operated by tenants, acres.	6,594	610	2,006	2,497	1,481
Land idle in 1946, acres.	2,528	—	112	990	1,426
Owner operated, percent.	100	8	36	39	17
Tenant operated, percent.	100	9	30	38	23
Idle, percent.	100	—	5	39	56

RELATIONSHIP OF TENANTS TO LANDLORDS

About 70 percent of the land operated by tenants in Baltimore Township was operated by tenants who were unrelated to their landlord. The other 30 percent of the land was operated by tenants who were in some way related to their landlord.

Table 12 indicates that more of the better classes of land—that is, Classes I and II—were operated by tenants who were unrelated to their landlords than was the case where the tenant was related to the landlord. In fact, 70 percent of the land farmed by tenants who were related to their landlords was on Class III and IV land. This indicates that when a tenant rented a farm from someone other than his relatives that he looked for and secured a farm on the better classes of land.

TABLE 12—*Relation of land class to kinship of tenant and landlord, Baltimore Township, Barry County, 1946*

Item	Town- ship totals	Land class			
		I	II	III	IV
Tenant-operated land, total acres.	6,594	610	2,006	2,497	1,481
Tenant related to landlord.	1,976	247	346	957	426
Tenant unrelated to landlord.	4,618	363	1,660	1,540	1,055
Percent tenant-operated land.	100	9	30	38	23
Percent tenant related.	100	12	18	48	22
Percent tenant unrelated.	100	8	36	33	23

DEGREE OF OPERATION OF FARMS BY TENURE GROUPS

A rather indefinite classification of farm operation was instituted at this point in the study. The township committeemen were asked which farms were fully operated and which were only partially operated; that is, which farms were fully operated in a commercial manner with the idea of getting a living from them; which ones were farmed as sidelines, or as part-time farms, or operated by an old couple primarily as a place to live with little commercial product going to market.

Table 13 indicates both the acreages and percentage distribution of this operation classification according to the tenure of the operator. About 73 percent of the owner-operated land was fully operated. About 92 percent of the Class I land was fully operated in the owner-operated group while only 29 percent of the Class IV land was fully operated.

Only 66 percent of the tenant operated land was fully operated with the better classes of land being more fully operated and ranging down to only 51 percent of the Class IV land being fully operated. This is at least an indication that the more intensive operations were on the better lands.

TABLE 13—*Relation of land class to the degree of operation of owner-operated and tenant-operated land in Baltimore Township, Barry County, 1946*

Item	Township totals		Land class							
			I		II		III		IV	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Owner-operated land.....	13,461	100	1,052	100	4,831	100	5,250	100	2,328	100
Fully operated.....	9,789	73	969	92	4,139	86	4,001	76	680	29
Partially operated.....	3,672	27	83	8	692	14	1,249	24	1,648	71
Tenant-operated land.....	6,594	100	610	100	2,006	100	2,497	100	1,481	100
Fully operated.....	4,334	66	433	71	1,479	74	1,670	67	752	51
Partially operated.....	2,260	34	177	29	527	26	827	33	729	49

OPERATION OF MULTIPLE TRACTS ACCORDING TO TENURE GROUPS

The 1945 U. S. Census of Agriculture indicated that there were about 190 farms in Baltimore Township. This is also the approximate number of farmers in the township. It does not, however, indicate the number of tracts of land operated by farmers.

The following information, however, on a tract basis, was obtained.

1. Twenty-eight farmers rented thirty-nine tracts of land outside their own farms.

2. Nine farmers owned and operated twelve tracts of land outside their home farms.
3. Five farmers rented land and owned land outside their home farms.
4. Nine farmers rented nine tracts of land outside Baltimore Township.
5. Seven tracts of land were operated in Baltimore Township by farmers living outside of the township.

There is, of course, some duplication in the items given above, but it indicates that approximately one-fourth of the farmers operated other tracts of land in addition to the one on which they lived.

There was not a great deal of relationship between the amount of multiple operatorship and the class of land. Class I and II land probably had the greatest proportion of the multiple operators, with Class IV land having the fewest. Most of this type of farming operation is an effort to increase the size and volume of business on a particular farm. In this way more land is obtained on which to raise crops for sale or feed. The advent of modern, rubber-tired machinery has done much to expand this multiple operation of farms because machinery may be moved more readily from one place to another.

SUGGESTIONS AND RECOMMENDATIONS

Some soils and some farms in the rougher land areas of southern Michigan are highly productive, readily cultivated and financially profitable to their operators. Other lands are extremely rough, difficult to work, produce little and provide their operators with meager returns. Some of the poorer lands are idle or farmed very little, owing perhaps to the availability of jobs with good wages in the surrounding towns. These farms may again be operated when other work is less plentiful.

GENERAL SUGGESTIONS

This study indicates that the fertility and the topography of the land have much to do with the success attained by the farmer who operates it. On the other hand, good and proper management are probably even more important than the land class.

It seems that there is a basis for the following general suggestions in this study. They apply to the farms in the four-township area which

in turn, is quite representative of the larger rough and morainic area of southern Michigan.

1. Farm the best land available.
2. Follow soil conservation practices as may be needed to conserve and improve the productivity of the farm.
3. Increase the acreage of the farm unit if possible.
4. Improve the quality of forage crops.
5. Keep as much livestock as possible in order to increase the size of business.
6. Increase the yields of both crops and livestock to increase the volume of business.
7. Use labor effectively.
8. Keep expenses at a minimum but do not do so at the expense of proper use of commercial fertilizer, lime, good seed, pasture improvement and other items affecting good crop yields.
9. Market products to good advantage.

These suggestions, if followed, will tend to increase the farmer's income and the level of living that he is able to provide for his family.

SPECIFIC RECOMMENDATIONS

Class I Land—There is probably no particular farm which is made up entirely of any one land class. The classification of the land refers more to the general area. For the most part, the farms on Class I land should continue to be farmed much in the manner that they have been farmed in the past excepting of course for some needed changes in management and cropping systems on some farms. It would seem that there should be no drastic changes in the methods of tillage. Conservation practices, however, could be improved. Good farm management practices, will continue to “pay off” on any of the land classes.

Class II Land—The farms located on this land class are for the most part, less fertile and more rolling than those on the Class I land. There are many cases where rough, rolling areas of Class II land should be in pasture instead of row crops as they are being farmed at present. Some of this land is subject to erosion and should undoubtedly be covered with a grass cover crop most of the time, particularly in the winter. Much pasture improvement could be carried out on this land class in order to produce more roughage from the same number of acres. If one really desires to farm in the morainic area of southern Michigan, surely Class I or Class II land provides the “best buy” from the viewpoint of productive ability for the price.

Class III Land—It is recommended that the farms on Class III land should be in hay and pasture to a much greater extent than at present. This might range from 65 to 70 percent of the tillable acreage, as compared with 53 percent on the farms studied in 1946. It is likely that many of the farms on Class III land should be larger in size in order to provide an economically sized unit for profitable farm operation. A farm on which a good forage improvement program had been carried out might logically be at least twice as large as the present average size of farm in this land class. There are also some areas of Class III land, that might be taken completely out of arable agriculture and diverted to some other purpose in conjunction with some of the Class IV land.

Class IV Land—Considerable portions of the Class IV land could well be taken out of a tilled type of agriculture and turned into some other use, such as country estates, recreational areas, Christmas tree production or fur production. Other areas where a large portion of it is in one block could quite readily be used as either game preserves or hunting areas.

It is true that there are individual fields and small areas that could quite logically be in some tilled crop, but their area is so small in comparison with the larger area of extremely rough and unproductive land that it would not be economically sound to farm them. These small areas or fields could be used for managed game cover or for the production of food for game birds and animals.

One of the major difficulties in changing Class IV land to the uses recommended above, is that the land is now relatively high priced for any such use. It certainly is priced out of line with the better agricultural areas. This study indicates that the price of Class IV land particularly is out of line from the viewpoint of comparative production figures, and its long-time agricultural value.