THE USE OF SOIL MANAGEMENT GROUPS AND RELATED INFORMATION IN DETERMINING AGRICULTURAL LAND VALUES IN OSCEOLA COUNTY, MICHIGAN

Thesis for the Degree of M. S.

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Stephen G. Shetron

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By

Stephen G. Shetron

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
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ABSTRACT

THE USE OF SOIL MANAGEMENT GROUPS AND RELATED INFORMATION IN DETERMINING AGRICULTURAL LAND VALUES IN OSCEOLA COUNTY MICHIGAN

by Stephen G. Shetron

The valuation of land, in the past, has been primarily by three methods. These are the Income-Capitalization, Market-Comparison and Replacement-Cost approach. These systems appear to be adequate for obtaining approximate indications of land values. Investigation of these methods show that soil capabilities are considered to a lesser degree in the Market-comparison and Replacement-Cost approach than in the Income-Capitalization approach.

This study was conducted to evaluate land based on principles of the above three methods with emphasis on soil through the use of soil management groups. The basic steps used in this study are as follows:

1. Selection of farms and information about them.
2. Collection of soil data.
3. Determining land use.
4. Assigning the various soils to management groups.
5. Measuring the soil and land use areas.
6. Determination of expected net income.
   - A. Estimation of prices recieved for each crop.
   - B. Estimation of yields for each crop per management unit.
   - C. Calculating the gross income per management unit when used for cropland, woodland and pasture.
   - D. Estimating the cost associated with each crop, per management unit.

E. Calculating the net income per management unit when used for cropland, pasture and woodland.

F. Estimation of improvement values.

G. Comparison of expected net income with sale values minus improvement values.

H. Estimating cropland, woodland and permanent pasture values from the above process.

Determined capitalization rates are 22.5% for cropland, 8.9% for pasture and 5.7% for woodland. Investigation of data shows that the capitalization rate for cropland is high due to the lower determined machinery costs from custom rate data than for the actual farming conditions. It is felt that there are two reasons for this. First-- Farm units are too small for the amounts of machinery present. Second-- The Farmer has overstocked as insurance against not being able to obtain desired machinery services. Thus there is inefficient use of machinery.

Results show that the more productive and highly developed land is being under-assessed and under valued. The poorer land in cropland, pasture and woodland is being over-assessed.

It was found that approximately sisty per cent of the farm pperators were working off their farms. The farm has thus become a dual purpose unit; a place to live while earning an income off the farm and also a source of income.

Through the use of soil management units and related soil survey information, it is possible to realistically evaluate cropland, pasture and woodland.

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THE USE OF SOIL MANAGEMENT GROUPS AND RELATED INFORMATION IN DETERMINING AGRICULTURAL LAND VALUES IN OSCEOLA COUNTY, MICHIGAN

Purpose

The purpose of this paper is to demonstrate a method that would be applicable to the valuation of land as an investment whether it be for cropland, forestland, pasture or other agricultural uses. With an understanding of the proposed method, an individual would be able to determine the relative worth of land as an investment.

The method used was similar to the ones previously used in Arenac and Eaton Counties, Michigan. Its validity, adaptation and utility are tested here in the dairy, potatoes and truck type of farming areas in Michigan.

Land appraisal begins with an understanding of value and different kinds of value. A dictionary (27) definition of value is, "The quality or fact of being excellent, useful, or desirable; worth in a thing," or "The estimate which an individual places upon some of his possessions as compared with others." A more liberal definition of value would be the ability to satisfy a need of an individual. We must remember that there are as many kinds of values as there are needs.

An illustration, Barlowe (1), of economic value as applied to land value would be the example of a land owner who buys a parcel of land for four thousand dollars and erects a sixteen thousand dollar house on it. At this point he has invested twenty thousand dollars in his property, a sum which may be considered as an economic value. When the property is appraised for a mortgage loan, it may be appraised at seventeen thousand dollars. A tax assessor may assess it for property-taxation purposes at twelve thousand dollars. Upon a decision to sell his property, a real estate broker might list it at twenty-one thousand dollars. However, before selling the owner discovers that the property is needed for a public project and its condemnation appraisal value is twenty-four thousand dollars. This paragraph is an illustration of the difference among different kinds of economic value.

Concepts of Land Value

Gaddis (6) states that the value of property may be expressed as its worth in terms of money to the individual. This may be affected by terms and conditions of the sale and what the buyer is willing to pay under the existing conditions.

As cited by Black, et al (2), land value may have a three fold concept. First a market value, this is based on experience and actual transactions. This can be refined by collecting data on selling prices and on the major facts about a considerable number of comparable farm sales in an area within the last few years. Their data reflected the differences in yields, types of roads, land tillage and distance from towns. Secondly, value may be an assessed value, which is determined as an estimate of property value for taxation. This is usually lower than the market value. It will probably remain stable from year to year according to the persons assessing the properties. Thirdly, a loan value, which is considered as a normal value based on average production and normal prices of farm products. Loan values are partially determined by regular income from year to year based on income and operating statements prepared by the farm operator.

Another concept of value may be the value of land to the owner. This is determined by its ability to perform particular services for the owner, either as a source of financial income, or as security and as a home. Smith (23)

states that value in this sense could differ from sale price, if the price is more of a statement of sacrifice involved in the sale of property. Smith continues by saying that "value is often confused with price." Many people say a farm is worth a certain amount of money or it has been sold for some sum of money. So in discussing the value of a farm, they are discussing what is generally known as the price set on the farm.

McMicheal (10) contends that it is possible to have a normal agricultural value associated with the land. This is based on the amount a typical purchaser would, under usual conditions, be willing to pay and be justified in paying for the property for customary agricultural purposes, with expectation of receiving normal net earnings from the farm. This is based on the agricultural assets only.

There is a relationship that exists between "value" and "price". Price is an indicator of value to the individual, while "value" by itself is an estimate of what property might be worth, on the average, to a large number of individuals.

Principles of Appraisal

According to Davis (3), appraisal procedure logically divides itself into an inventory of resources and the conversion of these factors into dollar values. Estimates are determined by physical productivity of the farm, its location and its use as a home.

Wagner (26) expresses the appraisal of farm land as the estimation of worth which is determined in part by the production of the farm. The land is the chief unit of production. Inquiry into those factors that constitute and affect value is an important segment of land appraisal.

Land value, in appraisal procedures, may be and usually is determined by one of three methods. The first of these is Income Capitalization. This is the concept that the present value of property should always equal the present worth of all its future incomes. Evaluation should equal the sum of its future flow of income rents discounted back to the present. Mathematically expressed $V = A/R$, when V is the property value which is equal to A, the estimated average annual net return and R, the rate of interest used in the capitalization process. The advantage of this method is that it places emphasis of the future income producing capacities of individual properties. A disadvantage is the difficulty of setting of a proper rate at which to capitalize net income. One has to avoid making a very conservative estimate of net income on poor land and then capitalizing at a high rate.

The second method is the Market Comparison approach. This is determined by the conditions and prices associated with the sales of similar and comparable properties and the price which the property will bring in the current market. This method provides a definite bridge between the theoretical Income Capitalization approach of economic value and the actual exchange values of the market. A disadvantage is often the lack of current market data.

A third approach is the Replacement or Reproduction Cost approach. This is the assumption that properties should be worth their present replacement cost or the cost of providing an acceptable substitute less an allowance for depreciation and obsolescence that has occured. This method has the advantage of easy application and a tendency to treat all properties on a comparable basis. This method does not take into consideration the earning capacity of land except as it is reflected in its replacement cost.

These three methods of land valuation are used in the American Rural Appraisal System. (10, 1)

When determining value it is important to keep various principles in mind. Smith (23) lists these principles as: (1) The highest and best use; that is, the use which will preserve the land and bring to the operator the largest net return over a long period of time. Highest and best use varies with time, economic and technological changes and while it represents a top value in a particular time

for a particular use this perfect market condition is never attained in practice. (2) Increasing and decreasing returns; that is, the response of land to continuing increased utilization. (3) Balance and proportionality; such as rotation of crops and the efficiency of labor and equipment. When these are out of proportion to each other, then conditions are not conducive to highest and best use. (4) Conformity; agreement with other members of society of which the operator is a part, i.e., a dairy farmer in a cash grain district would be an unconformity. (5) Substitution; replacement of one unit for another in case one unit should fail. This represents the upper limit of valuation. (6) The Law of Contribution; additional values due to the erection of additional features on the land, i.e., buildings, fences, electricity and telephone. (7) Competition; concept of supply and demand. (8) Agents of production; these would be labor, coordination or management, capital and natural resources. All of these eight principles are to be kept in mind when using any of the three methods of appraisal.

In the appraisal of land, various factors are encountered. The productivity of the soil is a function of soil management and soil differences, buildings which may add to the income of the family, (or contribute directly to farm family income), and location or distances to markets, towns, schools, etc. In Nebraska (18) it was found that through the lack of recognition of these factors owners of low

value land carried a proportionally heavier burden of taxes than the owner of higher valued, more productive land.

Another factor that should be considered is the type and use of crop rotations or crop sequences. This is an aid in determining the value of specific soil types which will give an indication of worth of soil and thus affect the appraisal of the farming unit. Crop sequence is used to connotate the different patterns of crops which reflect three situations, (1) No crop interaction; (2) Negative crop interaction; (3) Positive crop interaction.

In theory no crop interaction would exist when no crop in the sequence had an affect on any other crop and the soil fertility is in a stable condition. Negative crop interaction is when some crops are detrimental to others in the rotation and basically affect soil fertility. Positive crop interaction can be considered as the beneficial effects some crops have on others in the rotation. Each one of these basic relationships may affect net income.

Henry (7) states two relationships. The first of these refers to factors no farmer can control. These would be soils and location. Soils are the very foundation of the farm and cannot be changed or altered except through the use of fertilizers and other amendments. Soil types clearly place the farm in its perspective high, medium or low bracket. Location refers to the subsequent mass development such as the construction of rail-roads and highways which may enhance location and market value. Location is

important for it is tied in closely with adaptibility. A farm may have value for other than agricultural purposes such as sub-division and other urban uses.

The second relationship of Henry are the factors that the farmer can control. These would be adaption of the farm and size of the unit. The adaption of the farm would embrace a knowledge of soil types, landscapes and workability of soil. Every community has its "Happy Enterprise". This would be an individual who pursues his immediate interest rather than what should be practiced in the management of the soil and thus depreciates the value of the land. Thus the adoption of enterprise to the area is the most difficult factor confronting the appraiser and buyer.

An exception to adoption is specialization such as a livestock feeder or turkeys, which may achieve considerable success even with the poorer soils. This is more the reflection of the individual's ability rather than the soil. This tends to over value some of the poorer soils.

The second factor of farmer control is size of the unit. The operating unit must be large enough to efficiently utilize the land, maintain efficient control of labor and still be within the management ability and capacity of the operator.

Techniques of Land Valuation in Other States

One of the first attempts at developing a system to evaluate land in the Central United States was based on kinds of soil by Kellogg and Ableiter (9). The objective was to group soils into "Natural Land Types" which may be defined as land having particular combinations of physical features - principally climate, soil, topography and stoniness which define its natural productivity for plants.

The laws of California (24) require all lands, if similar in quality and quantity to be valued at the same rate for tax purposes whether cropped or not. In order to accomplish this they have turned to the rating of soil by the Storie Index Method. This method strives to evaluate soil for general agricultural purposes, regardless of location within the state. This rating is based on characteristics and condition of the soils, such as profile development, drainage, alkalinity, erosion and fertility.

From the study conducted by Scholtes and Riecken (22) in Taylor County, Iowa, it was found through the use of soil survey information that many tracts had already been equitably assessed by the county assessor. Some plus and minus valuation of tracts resulted from the application of survey information. This was thought to give a more equitable valuation of these tracts.

Workers in Nebraska (18) used a method based on soil survey information and building values. Economic ratings of soils were prepared for cropland, pasture and rangeland.

Building evaluation was according to a rating system that considers condition, adequacy and location. These values were converted into net incomes and then into land values.

In Central Illinois (17) (25) efforts have been made to determine the productivity of the soils. This was accomplished with soil survey information and production records of farms in Central Illinois. These two were correlated and differences were determined. From the knowledge of the foregoing material, technicians in Central Illinois were able to find the influence of soil types on farming, relative long range earnings and capacity of farms and extent to which earnings on various soil types are influenced by soil management. With these data the relative value of the soils, and thus the farm units, were determined.

In Michigan land value studies (4) (20) (21) a method was used based on expected net income. Soil management groups and related information on their use and productivity in addition to production costs and prices of products, were used to calculate the expected net incomes. These were then compared with sale prices of land to determine dollar values of the land. Priest (20) found that calculated land values compare favorably with those assigned by tax commission appraisers and farmers, but that the total appraised farm values were about 24% higher than the actual sale values. Schairer (21) found that in comparing calculated and sale values, dairy farms are commonly over

valued compared to cash crop farms. Even though dairy farms are worth more because of the costs of buildings required, according to replacement values, buyers do not recognize or are not willing to pay the premium for such property. Results of these studies also show that farms selling for high prices are commonly assessed at a lower proportion of their sale value than those selling at lower prices.

The technique being used in Montana for tax assessment (14) (16), in the reclassification of rural lands, is a method using information from technicians, crop data, services of agricultural agencies and information from farmers. Productivity of the soils is rated according to yields of crops rown and the number of animal units produced as a measure of grazing on pastureland. This provides a relative basis for the assigning of dollar values for tax assessments. This system is not used unless county commissioners find too many inequalities resulting from existing methods of appraisal and tax assessments.

Perry (19) in a recent article cites the Soil Survey Report as a new and useful tool for many diversified interests. These would range from studies on land utilization and planning, industrial and urban development, engineering, woodland development and land appraisal. An example was cited from Polk County, Iowa where 2,569 protests were registered after reassessment in 1949. Of these, 60% were farmers. In 1954 a soil survey was completed at the

request of the county. The information was translated into earning power through a system of crop suitability ratings. Only one farmer protested after use of this revised base in 1954. Soil surveys are an aid when appraising land for it does not penalize the efficient farmer since ratings are based on the production expected from average or normal management and not on how well the farm looks.

Procedure

The procedure used here is similar to the ones used in Eaton County (20) and Arenac County (4). The basic steps in this procedure are as follows:

1. Selection of area for study.
2. Selection of farms and collection of data.
3. Assigning the various soils to soil management groups.
4. Measurement of soil groups by land use.
5. Determination of net income:
   - A. Estimation of yields per management group for each crop.
   - B. Estimating prices received for each crop.
   - C. Estimating proportions of crops grown on each management group.
   - D. Estimating the gross income from each crop and cropland per management group.
   - E. Estimating the cost associated with each crop and cropland per management group.
   - F. Estimating the net income from each crop, cropland, pasture and woodland.
6. Estimating values of standing timber and improvement values.
7. Comparison of expected net income with sale values minus values of improvement and standing timber.
8. Estimating land values from the above process.

Description Of Area For Study

The area under consideration was Osceola County, Michigan. Osceola County is located in the northwest central part of Michigan, figure (1). The types of farming have been described as dairying, hay and truck crops (8). Census data show that during the last twenty years the acreages of potatoes has dropped seventy to eighty percent. Truck crops, at present, seem to play only a minor role on cropland. Minor acreages of potatoes, field beans and cucumbers exist on farms where conditions are favorable. Most of the cropland acreages are used for feed crops of hay, pasture, corn and oats. Wheat is grown as the major cash grain crop.

The growing season ranges from 110 to 130 days on the upland soils. Depressional areas may have temperatures near freezing during the growing season. This tends to limit the use of these areas mainly to hay and pasture with some small grain.

The reasons for the selection of Osceola County were the availability of a recent detailed soil survey, the amount of available data on land use; the need for information on farm appraisal in this particular area of Michigan and the personal experiences of the author.

Figure 1 Map of Michigan Showing the Location of Osceola County.

Selection of Farm Properties and Collection of Data

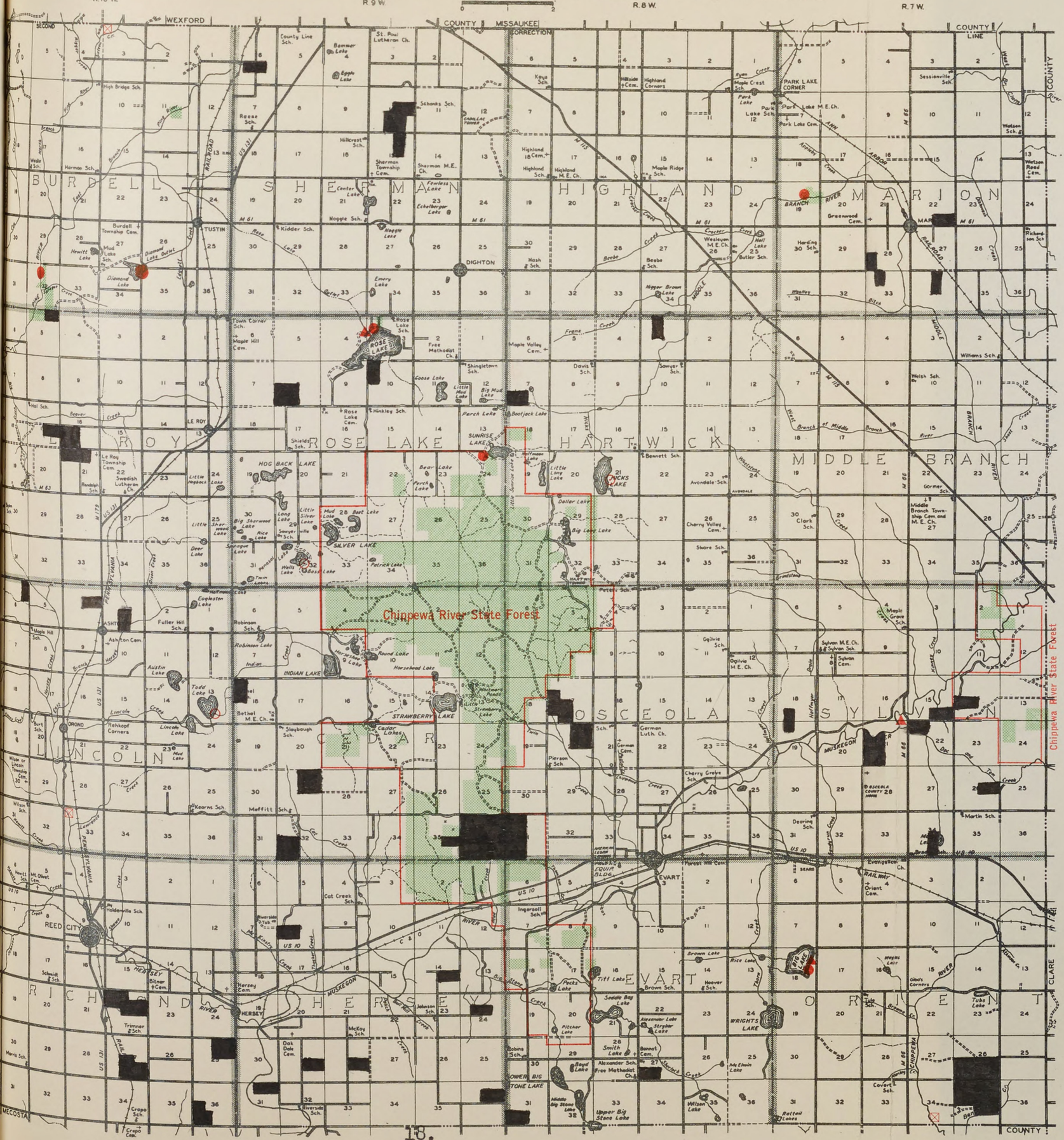
The first step was to collect information on the farms over eighty acres in size, sold between 1952 and 1958 from the Register of Deeds in Reed City, Michigan. This consisted of tabulating the liber, page, transfer date, names of the grantor and grantee, and legal description of the farm units location. Also tabulated was the amount of the revenue stamps and the estimated market price. (55 cents in revenue stamps are required per $500 of sale price for each property). Tax and assessment information for each property was obtained from the Office of the County Treasurer, Court House, Reed City, Michigan.

Tracts of land eighty acres in size or larger were used to insure adequate coverage of the soil management groups and to avoid part time farming. Those areas that were felt to have been transferred for purposes other than agriculture were also eliminated from this study.

Each deed was checked for any restrictions and considerations that would add or subtract from the value of the unit. As a check against the location in the deeds, each sample unit was located on the county plat book. This was to avoid any errors during future investigation of the units. Their distribution is shown in figure (2).

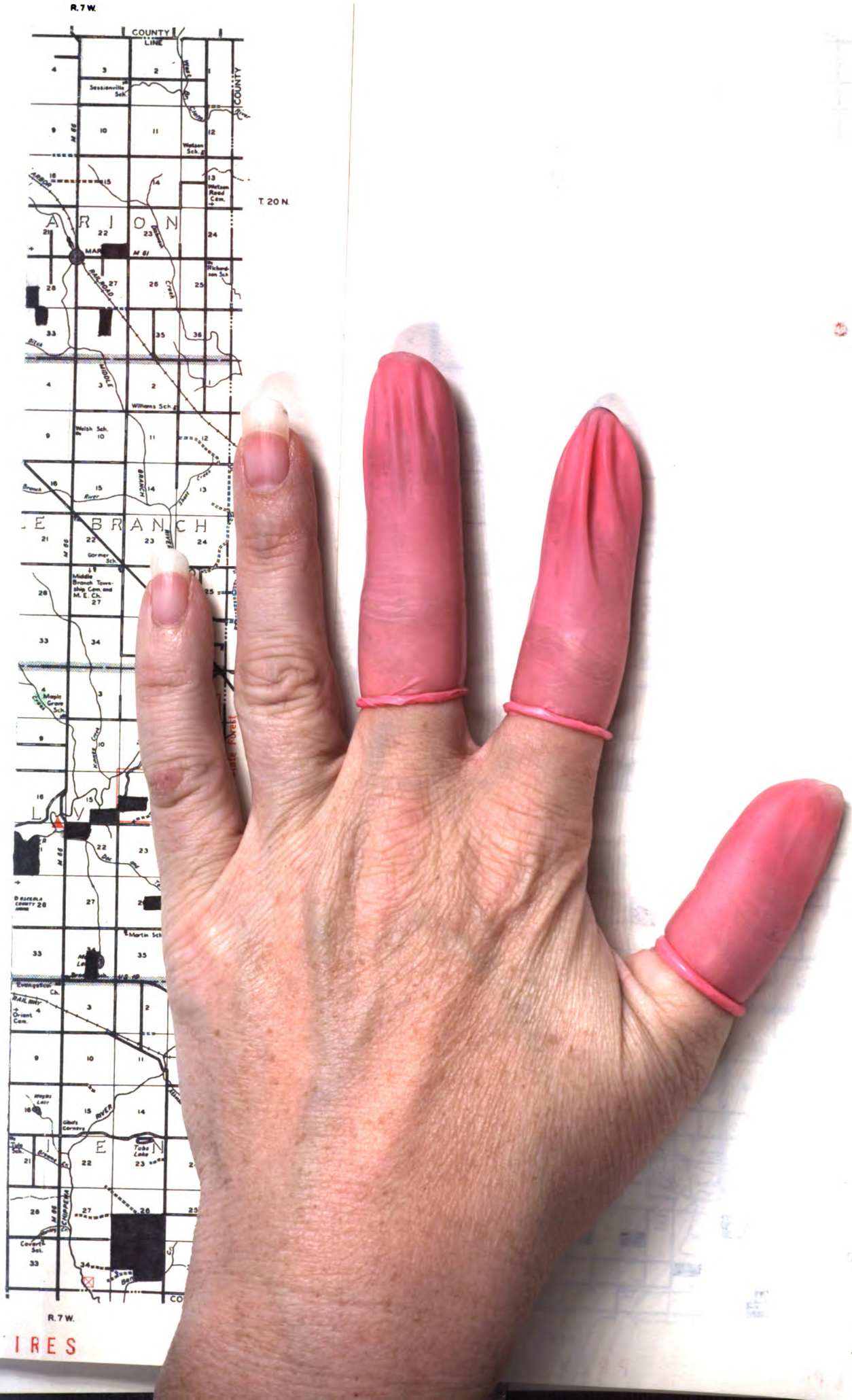
After the farms were definitely located and the boundaries fixed, it was necessary to picture what lay within the boundaries. Items that were included for inventory were soils, land use, homesteads, drainage patterns, rivers, streams, gravel pits, roads and railroads.

Figure 2 Map of Osceola County Showing the Location of Sample Units.



HELP PREVENT FOREST FIRES

OSCEOLA


R. 7 W.
COUNTY LINE
T. 20 N.
R. 7 W.

Soil Management Groups

Soil management groups are interpretative soil groupings based on similar soil properties to a depth of three to five and one-half feet. These management groups can be further subdivided into units on the basis of slope, degree of erosion and stoniness. The management groupings are useful for fertilizer and lime recommendations when used in conjunction with tests of the plow layer and for the design of management practice recommendations when used in conjunction with information on slope, degree of erosion and stoniness.

The numbers used in this system indicate the relative coarseness and fineness of the primary materials from which the soils were formed: 0 is for the finest clays and 5 for the coarse textured sands. Associated with these numbers is a small letter indicating the natural drainage under which the soil has developed; a--for well drained, b--for imperfectly drained, c--for poorly drained soils. Thus, the management roup description for a well drained, sand soil would be 5a.

When one soil is formed from one kind of material over another, a fraction is used. The number in the numerator stands for the texture of the upper material to a depth of 18-42 or 42-66 inches. The denominator refers to the material in the lower story. For example 3/2 a is for well drained, sandy loams 18-42 inches thick over loams to silty clay loams.

On the basis of these principles it is possible to designate the groups of soils with similar characteristics so as to show the relationships among them. The following table shows the relationship of the soils in Osceola County to these management groups. (5)

Soil Series Name	Soil Type Number & Surface Texture	Soil Management Group
Alcona	325 S.L.	3a
Allendale	758 L.S. 760 S.L.	4/1b
Au Gres	740 S. 741 L.S.	5b
Bentley	262 L.S.	4a
Blue Lake	223 L.S.	4a
Bohemian	272 L.F.S. 424 Si.L.	2a
Breckenridge	826 S.L.	3/2c
Brevort	847 L.S.	4/2c
Brimley	636 L.F.S.	3b
Bruce	895 L.F.S.	3c
Butternut	897 Loam	2c
Carbondale	020 Muck or peat	Mc
Coral	664 F.S.L.	3b
Dighton	486 S.L.	2a
Emmet	310 S.L.	3a
Ensley	859 Loam	3c
Epoufette	822 S.L.	4c
Gladwin	696 S.L.	4b
Graycalm	116 Sand	5.0a
Grayling	118 Sand	5.7a
Greenwood	030 Peat	Mc-a
Houghton	030 Muck	Mc
Ingalls	770 L.S.	4b
Iosco	709 L.S.	4/2b
Isabella	442 L.S. 443 S.L. 466 Loam	2a
Kalkaska	112 L.S.	5.0a

Kawkawlin	653 L. 652 Si.L.	2b
Kerston	070 Muck or loam	Mc-L
Kinross	840 S.	5c
Linwood	025 Muck or peat	M/3c
Lupton	012 Muck or peat	Mc
Mancelona	259 S. 260 L.S.	4a
Manistee	213 L.S.	4/1a
Markey	013 Muck or peat	M/4c
McBride	465 S.L. 466 L.S.	3a
Melita	214 S. 215 L.S.	5/2a
Menominee	216 S. 217 L.S.	4/2a
Montcalm	236 L.S. 365 S.L.	4a
Nester	480 L. 479 L.S. 482 S.L.	2a
Newaygo	320 S.L. 343 S.L.	3a
Ocqueoc	202 L.S.	4a
Ogemaw	804 S. 805 L.S.	5b-h
Pinconning	851 L.S.	4/1c
Richter	670 S.L.	3b
Ronald	836 L.	3c
Roscommon	833 S. 834 L.S.	5c
Rousseau	270 F.S. 271 L.F.S.	4a
Rubicon	120 S.	5.3a
Saugatuck	830 S. 832 L.S.	5b-h
Sigma	702 S.L.	4b
Sims	903 F.S.L. 904 Si.L. 907 L. 906 S.L.	2c
Tawas	060 Muck or peat	M/4c
Tonkey	8151 S.L. 8152 L.S.	3c

Twining	642 L. 649 L.S.	2b
Ubly	335 S.L.	3/2a
Wallace	105 S.	5a-h

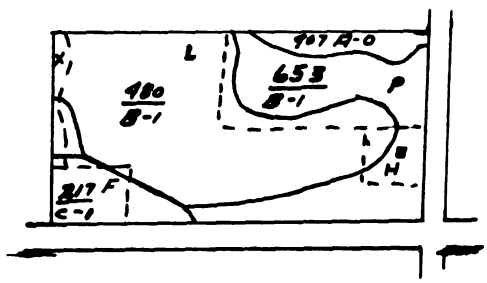
Measurements of the Sample Units.

The distribution of the soils and land use were shown on aerial photos. Through the use of a transparent overlay, information concerning the farms was traced and analyzed as shown in figure 3. A sample of the sheet used in summarizing the acreage by soil groups and land use is shown as form 1 in Appendix B.

The planimeter, a dot counter and a small plastic grid (8" to a mile) were used for the measurement of land use, soil mapping units, size of homesteads, lakes and roads. All of the methods proved to be sufficiently accurate, but the last was more efficient, due to the small areas which were encountered.

Figure 3. Illustration of the Method Used in Determining The Amount of Soil Mapping Units In Acres.

Sample Unit Outline



Location	T 20 N R 7 W Sec. 22 S.½, S.E.¼
Size of Unit	80 Acres
Scale	4 Inches/Mile
Mapping Unit Boundary	
Land Use Boundary	

Soil Mapping Unit	Soil Management Group	Land Use L	P	F	X	H
480/B-1	2a	40	3	1	1	1
653/B-1	2b	13	10			2
907/A-0	2c		3			
217/C-1	4/2a	2		4		
	Total Acres	55	16	5	1	3 = 80 Ac.

Determining Net Income for Cropland

For the determination of expected net income, it is necessary to estimate the expected yields and prices for the crops. From the product of these, the expected costs of production are then deducted to give the expected net income. The procedure is as follows:

A). From the Michigan Agricultural Statistics for 1949 to 1958, Types of Farming in Michigan (8) and data from the National Plant Food Institute (13) yields for each management unit were estimated, these were recorded in table 1. Discussion with the county agent and personal observations substantiated these relative values.

B). In calculating the prices the farmers received, average yearly prices were used. The source of this information was the Michigan Agricultural Statistics for 1952 to 1959. The prices used are recorded in table 2. Seed costs were obtained from the Michigan Farm Bureau and the Okemos Elevator. These are recorded in table 3.

C). Initial data on land use by management groups was obtained from the Osceola County Inventory of Soil and Water Conservation Needs. This information showed each management unit and acres of land use as cropland, pasture, forest or idle land as shown in table 4. The determination of percentages of each crop grown on the cropland in each management group, was estimated by the following procedure. From the data of the Michigan Agricultural Statistics for Osceola County, 1950-1959, charts 4-8 were constructed to give an estimate of total acreage. (Continued on Page 37)

Table 1. Estimated Per Acre Yield of Principal Crops Grown on Each Soil Management Group

Soil Group & Slope	Corn bu. per acre.	Oats bu. per acre	Wheat bu. per acre	Alfalfa Hay-T. per acre	All Hay T. per acre	Pasture Rotation Tons per acre	Perm Pasture cow days
2a-A-B	47	40	30	2.3	1.3	1.2	90
2a-C-D	30	33	21	1.7			
2b	50	40	32	2.5	1.3	1.25	90
2c	52	43	35	2.5	1.4	1.3	90
3/2-3a A-B	37	30	23	1.9	1.1	1.0	75
3/2-3a C-D	30	27	18	1.6			
3c-3/2b	41	40	25	2.4	1.2	1.2	85
3c-3/2c	43	40	25	2.4	1.2	1.2	90
4/2a	30	27	17	1.7	1.0	.9	72
4/2c	37	35	21	2.1	1.1	1.0	65
4a-A-B	35	25	21	1.5	1.0	.8	60
4a-C-D	20	21	17	1.4			
4b-(4b-L)	37	27	23	1.7	1.0	.9	65
4c-(4c-L)	40	30	25	1.8	1.1	.9	70
5/2a	20	21	13	1.2	1.0	.7	55
5.0a-5.3a A-B	15	17	11	.9	.8	.5	30
5.0a-5.3a C-D	10	15	10	.9			
5b	18	20	12	1.0	1.0	.7	35
5c	22	22	13	1.2	1.0	.7	55

Table 2. Price of Products Used in Computing Net Income

Corn	$	1.29 per bushel
Oats	$	.70 per bushel
Wheat	$	1.68 per bushel
Alfalfa (Baled)	$	22.53 per ton
All Hay (Baled)	$	19.90 per ton
Pasture (Permanent)	$	.088 per cow day

Table 3. Estimated Costs of Seeds for Major Crops Used in Computing Production Costs

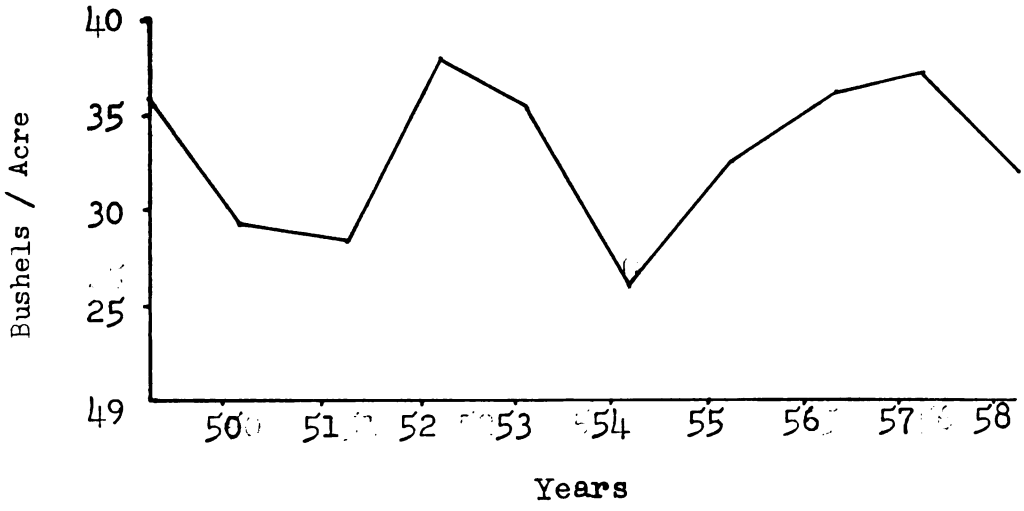
Crop	Cost per bushel	Seeding rate per acre	Certified seed costs per acre	Non-Certified seed costs per acre
Corn	$12.40 (Mich.)	Field 10#/ac.	$ 2.00	$ 1.60
	$12.90 (Pioneer)	Silage 15#/ac.	$ 3.15	$ 2.65
Winter Wheat	$ 3.25	1½-2 bu./ac.	$ 4.50-6.00	$ 3.60-4.80
Oats	$ 1.80	2 bu./ac.	$ 2.70	$ 2.16
Alfalfa	$28.00 (Ranger)	6-10#/ac.	$ 2.76-4.00	$ 2.30-3.80
	$25.80 (Grimm)	6-10#/ac.	$ 2.94-4.90	$ 2.40-4.00
	$36.40 (Vernal)	6-10#/ac.	$ 3.60-6.00	$ 3.00-5.00
Clover	$24.00 (June-Pennscott)	6-10#/ac.	$ 2.46-4.10	*
	$29.00 (Pennscott)	6-10#/ac.	$ 3.48-5.80	*
	$17.00 (June & Sweet Mixture)	10-12#/ac.		$ 2.80-3.36
	$15.00 (Sweet)	12-15#/ac.		$ 2.68-3.60

*Costs, unless shown, for non-certified seed are approximately 20% less than certified seed.

Table 4. Estimation of Land Use in Conservation Needs Survey for Each Soil Management Group

Management Group	Cropland	Permanent Pasture	Idle	Woodland
2a	60.25%	15%	8.25%	16.5%
2b	44.2	35	3.8	17.0
2c	39.6	18	7.9	34.5
3a-3/2a	42.1	21	12.3	24.6
3b-3/2b	56.9	8	10.0	25.1
3c-3/2c	44.0	7	9.0	40.0
4/2a	19.6	20	7.4	53.0
4/2b 4/2c	9.0	58	4.7	29.3
4a	32.3	23	17.1	27.6
4b-(4b-1)	60.2	15	20.0	4.8
4c-(4c-1)	42.1	23	15.9	19.0
5/2a	3.3	20	21.5	55.2
5.0a-5.3a	12.5	11	35.5	41.0
5b	55.5	3	12.0	29.5
5c	49.3	2	8.7	40.0

Figure 4. Trend in Yields, Acreages and Prices of Corn in Osceola County from 1949 to 1958.



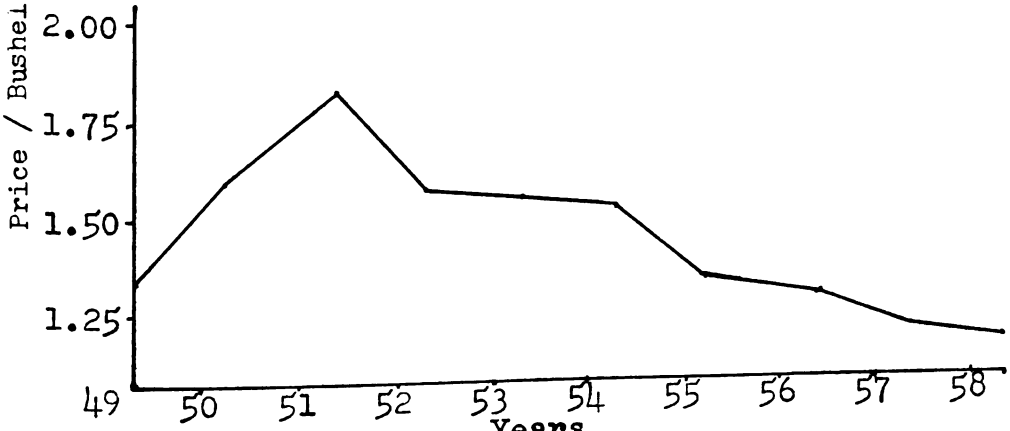


Figure 5. Trend in Acreage, Yields and Prices of Oats in Osceola County from 1949 to 1958.

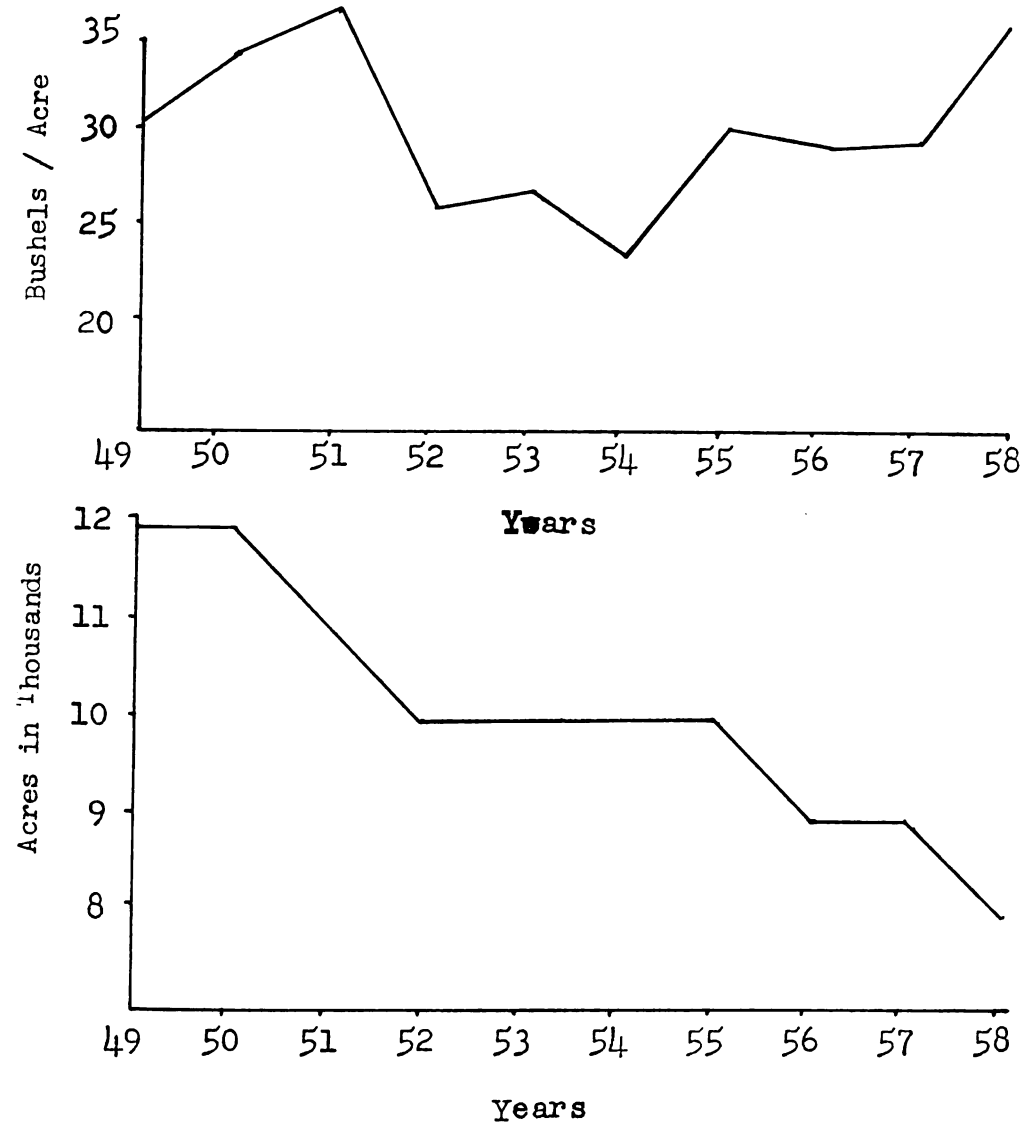


Figure 6. Trends in Yields, Acreages and Prices for Wheat in Osceola County from 1949 to 1958.

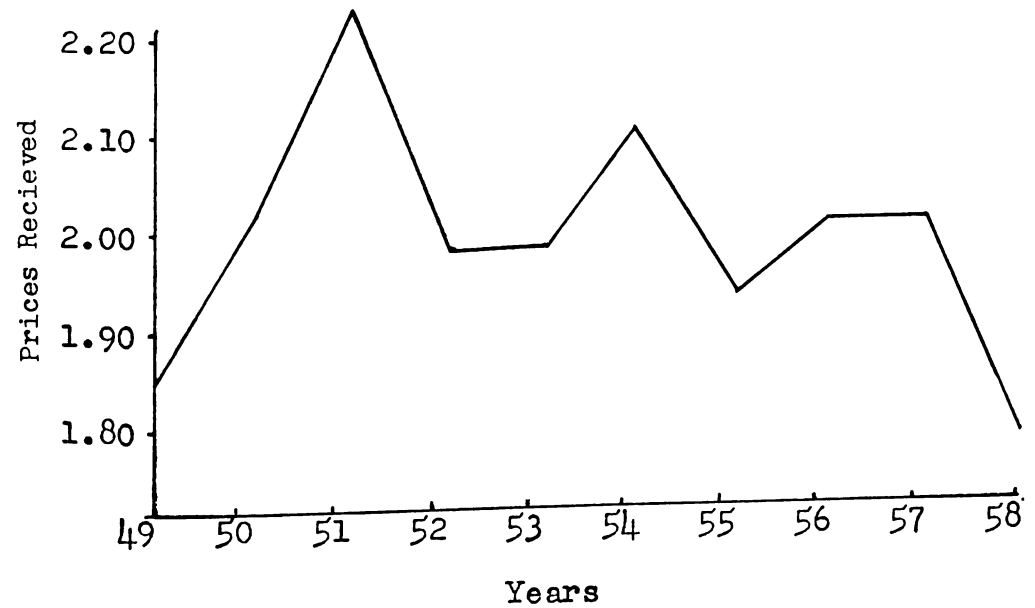


Figure 7. Trends in Yields, Acreages and Prices for Hay in Osceola County from 1949 to 1958.

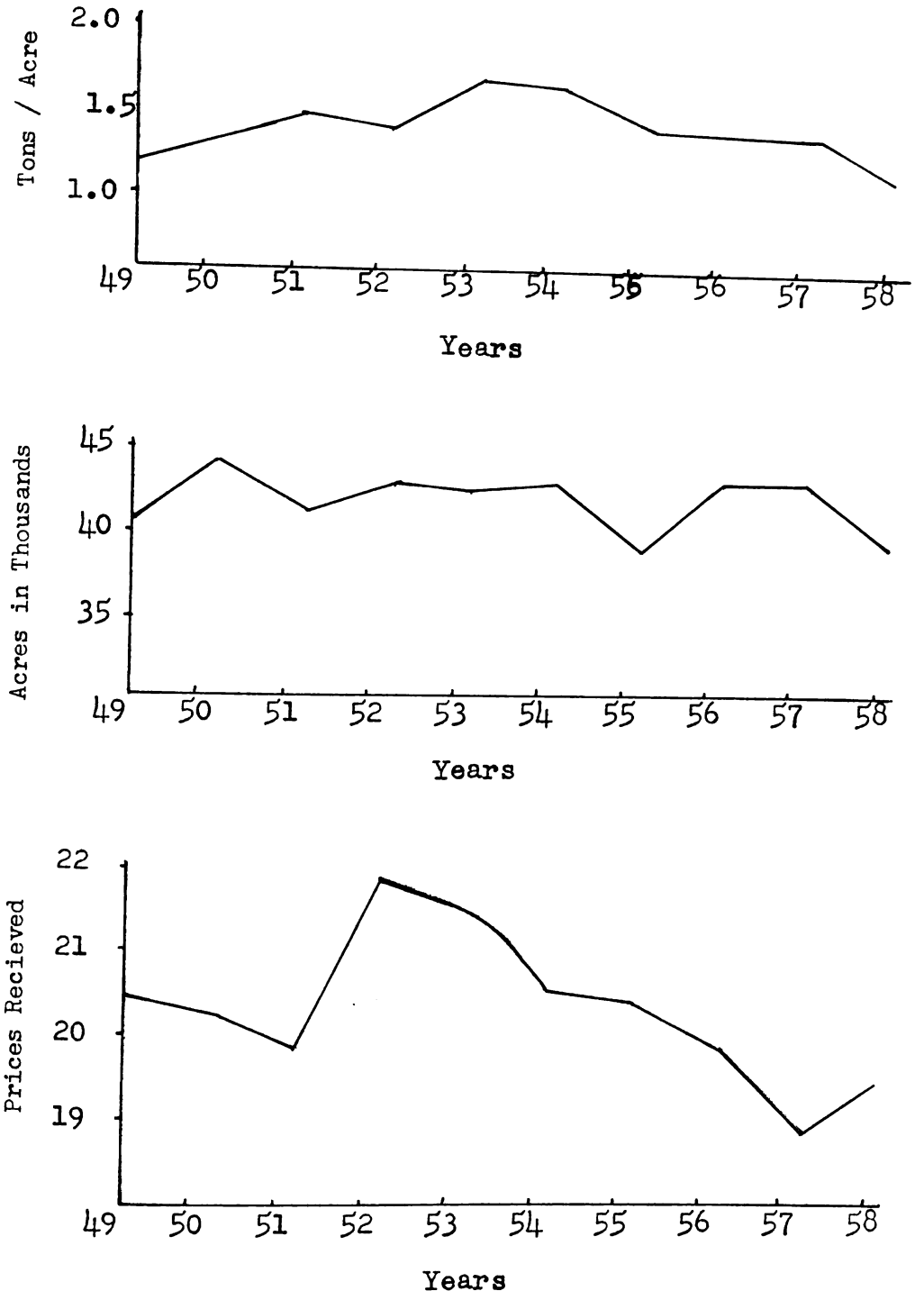


Figure 8. Trend in Number of Cattle and Calves, Cows Milked Two Times a Day, Price of Milk per cwt., Price of Butterfat per Pound from 1949 to 1958.

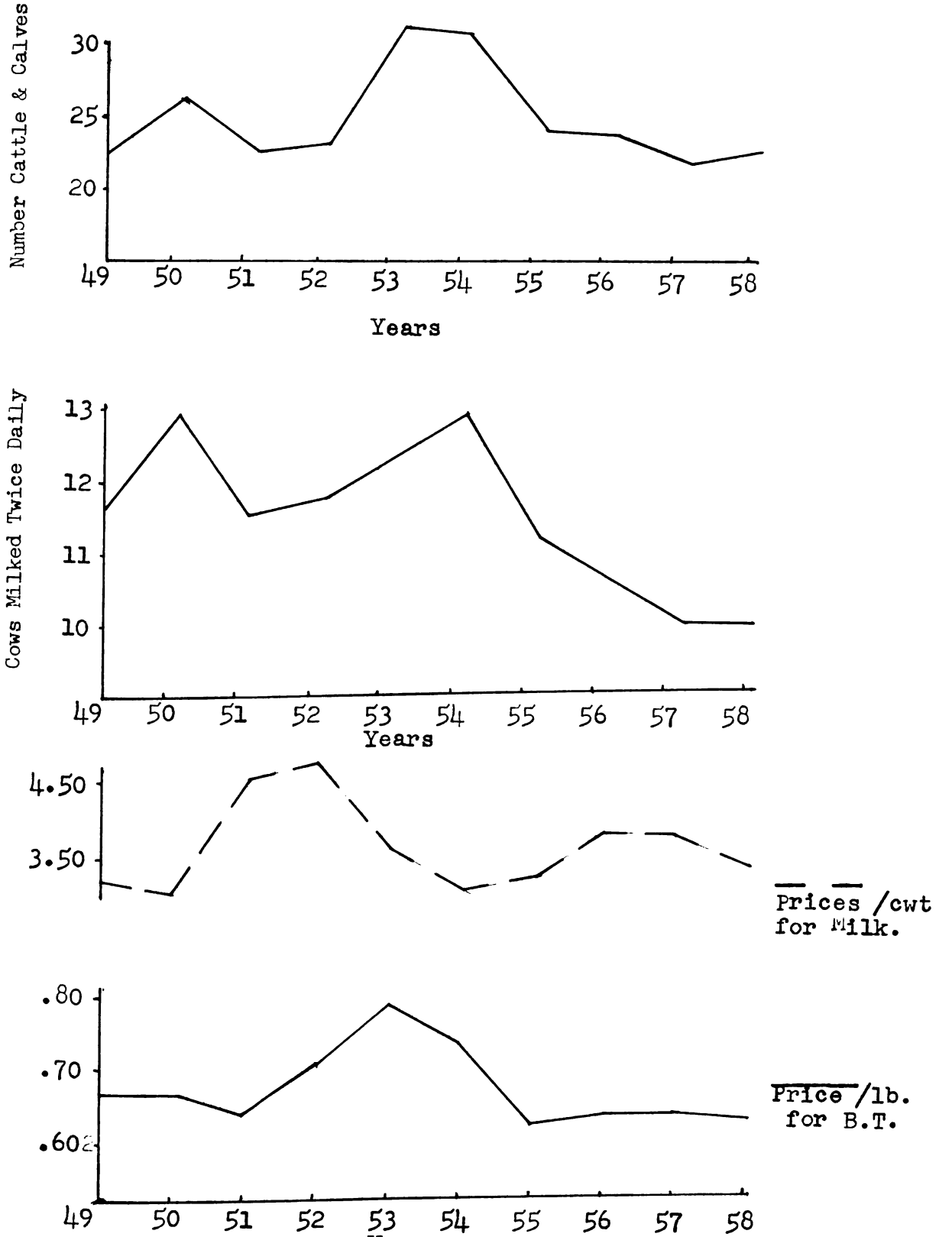


Table 5. Estimated Proportion of Cropland Used for Different Crops on Each Soil Management Group in Osceola County.

Soil Group	Corn	Oats	Wheat	Alfalfa	Other Hay	Rotation Pasture
2a	10%	12%	5%	36%	7%	30%
2b	12	12	8	25	10	33
2c	12	15	8	10	15	37
3a-3/2a	12	12	7	37	8	24
3b-3/2b	10	10	10	30	15	25
3c-3/2c (3c-L)	12	12	5	15	20	26
4/2a	10	10	4	30	20	26
4/2b-4/1b	10	10	10	25	20	20
4/2c						
4a	12	12	5	30	20	21
4b-(4b-L)	10	15	5	25	20	25
4c-(4c-L)	15	20	5	15	15	30
5/2a	5	5	5	25	25	35
5.0a-5.3a	5	5	3	30	20	37
5.0b	10	10	5	15	25	35
5.0c	10	10	5	10	30	35

Table 6. Estimated Acreages of Crops Grown in Osceola County Based on Acreages of Soil Management Groups, Tables 4 and 5, and 1954 U.S. Census Data and the Average of Michigan Agricultural Statistics for the years 1949 to 1953

Soil Management Group	Corn	Oats	Wheat	Alfalfa	Other Hay	All Hay	Rotation Pasture
2a	3,131	3,740	1,552	11,200	2,190	13,390	9,392
2b	405	405	246	844	338	1,182	1,114
2c	159	200	104	132	20	152	489
3a-3/2a	1,200	1,200	697	3,550	743	4,293	2,395
3b-3/2b	40	40	40	120	60	180	100
3c-3/2c (3c-L)	15	15	6	20	26	46	34
4/2a	259	259	100	865	517	1,382	649
4/2b-4/1b	73	73	73	184	145	329	147
4/2c							
4a	3,005	3,005	1,260	8,376	5,037	13,413	5,289
4b-(4b-L)	78	118	39	180	154	334	180
4c-(4c-L)	118	156	39	180	154	334	100
5/2a	4	4	4	25	25	50	35
5.0a-5.3a	500	520	300	2,556	1,683	4,239	3,114
5.0b	53	53	26	70	144	214	110
5.0c	53	54	27	53	179	232	525
Total	9,093	9,842	4,515	28,355	11,415	39,770	23,673
Av. Mich. Ag. Stat. 1949-1958	9,776	10,000	4,490			41,600	
U.S. Census Date 1954	7,837	9,505	3,700	26,600	11,900	38,500	33,581

trends of different crops, total hay and cropland in the county. The average figures from Michigan Agricultural Statistics for 1949 to 1958, were used for the total hay acreages and proportions of other crops of the total cropland area in the county. A summary of the data shows that 86,000 acres of total cropland exists in Osceola County according to the Conservation Needs data. Michigan Agricultural Statistics show an estimated 62,900 acres in corn, oats, wheat and hay. The difference, 23,000 acres, was assumed as the amount, in acres, of rotation pasture. This was found to be a valid assumption upon investigation of reporting methods in Conservation Needs. Idle cropland was not considered as part of the cropland estimate. Of the major crops grown, corn occupies 11%, oats 11%, wheat 5%, all hay 46%, (of which 70% is alfalfa and 30% is grasses) and rotation pasture occupied 27%.

On the basis of the above sources of information and the estimated proportion of the various crops grown on the various soil groups in Arenac County (4), a cropland use table for Osceola County was constructed as shown in table 5.

These estimates were checked by multiplying management group acreages in Osceola County from the recent soil survey of the county by the proportions of these soil groups used for cropland, table 4, and these by the estimated proportions of the cropland in each crop, table 5. It was then possible to compare these estimated acreages of the various crops with the census data on crops grown in the county as shown in table 6.

Table 7. Estimated Gross Annual Income Per Acre From Cropland in Osceola County by Soil Management Groups and Crops.

Soil Groups	Corn	Oats	Wheat	Alfalfa	All Hay	Rotation Pasture	Total
2a	$6.10	$3.36	$2.53	$18.65	$1.81	$8.10	$42.55
2b	7.74	3.36	4.30	14.08	2.58	9.29	41.35
2c	7.86	4.51	4.70	5.85	4.17	10.83	37.92
3a-3/2a	5.71	3.36	2.72	15.83	1.75	5.40	34.77
3b-3/2b	5.28	2.80	4.20	16.22	3.58	6.75	38.83
3c-3/2c	6.65	3.36	2.10	8.11	4.77	7.02	32.01
4/2a	3.87	1.89	1.20	11.49	3.88	5.27	27.60
4/2b	4.38	2.31	3.36	15.18	3.98	4.32	33.53
4/2c							
4a	5.41	2.10	1.78	10.13	3.98	3.78	26.08
4b-(4b-L)	4.76	2.26	1.93	9.57	4.38	5.06	28.96
4c-(4c-L)	7.72	4.20	2.11	6.08	3.28	6.08	29.47
5/2a	1.29	.73	1.09	6.75	4.97	5.51	20.34
5.0a-5.3a	.96	.59	.92	6.08	3.98	4.16	16.69
5b	2.32	.70	2.16	3.37	5.47	5.51	19.53
5c	2.84	.75	2.18	2.70	6.54	5.55	20.56

Table 8. Estimated Average Cost of Production for the Cultivated Crops Grown in Osceola County.

	Corn	Oats	Wheat
Labor, machinery, plowing, disking, dragging, planting and cultivation.	$12.25	$ 7.98	$ 9.55
Harvesting-loading hauling and storage.	$ 5.50	$ 5.75	$ 5.75
Fertilizer and seed costs.	$ 9.91	$10.10	$13.12
10% risk and management charge.	$ 2.76	$ 2.38	$ 2.84
	$30.42	$26.11	$31.26

Table 9. Estimated Average Cost of Production for Hay and Pasture in Osceola County.

	Alfalfa	Other Hay	Rotation Pasture	Permanent Pasture	
Yield	2, 3 T/A	1.3 T/A	2/3 of hay and alfalfa	90 days	
Labor, machinery, plowing, fitting and planting.			$ 1.00	$ 1.50	
Harvesting, mowing, raking, baling and storing.	$ 8.25	$ 6.50			
Fertilizer and seed costs and bulk spreading.	$10.98	$ 9.68	$23.50	$ 1.50	
Risks and management	$ 1.92	$ 1.61	$ 2.40	$ .30	
			$26.90	$ 3.30	
Costs per acre or cow day.	$21.15	$17.79	$ 3.86	$ .036	per cow day

Table 10. Estimated Annual Costs Per Acre of Cropland in Osceola County by Soil Management Groups.

Soil Group	Corn	Oats	Wheat	Alfalfa Hay	All Hay	Rotation Pasture	Total
2a	$3.04	$3.13	$1.58	$7.76	$1.25	$1.16	$17.92
2b	3.94	3.13	2.61	5.39	1.77	1.27	18.11
2c	3.65	3.92	2.61	2.11	2.69	1.43	16.41
3a-3/2a	3.94	3.13	2.19	7.90	1.43	.93	19.52
3b-3/2b	3.04	2.60	3.12	6.45	2.68	.96	18.85
3c-3/2c	3.94	3.13	1.58	3.21	3.58	.99	16.43
4/2a	3.04	2.60	1.43	6.45	3.58	.99	18.09
4/2b	3.04	2.60	1.43	6.45	3.58	.78	17.88
4/2c							
4a	3.94	3.13	1.58	6.45	3.58	.31	19.49
4b-4b-L	3.04	3.92	1.58	5.39	3.58	.96	18.47
4c-4c-L	4.56	5.22	1.58	3.21	2.68	1.16	18.41
5/2a	1.52	1.31	1.58	5.39	4.49	1.37	15.66
5.0a	1.52	1.31	.96	6.45	3.58	1.43	15.22
5.3a							
5b	3.04	2.60	1.58	3.21	4.49	1.37	16.29
5c	3.04	2.60	1.58	2.11	5.36	1.37	16.06

Table 11. Estimated Annual Net Income Per Acre of Cropland in Osceola County by Soil Management Groups.

Management Unit	Cropland	Permanent Pasture	Woodland
2a	$22.63	$4.68	$ .36
2b	23.24	4.68	.36
2c	21.51	4.68	.33
3a-3/2a	15.25	3.89	.33
3b-3/2b	18.46	4.44	.33
3c-3/2c	14.89	4.68	.27
4/2a	8.59	3.75	.27
4/2b-(4b-L)	14.73	3.75	.33
4/2c-(4c-L)	10.00	3.37	.22
4a	6.57	3.12	.27
4b	9.49	3.37	.33
4c	11.06	3.68	.22
5/2a	4.07	2.86	.22
5.0a-5.3a	.61	1.56	.22
5b	2.70	1.80	.33
5c	3.76	2.86	.33

D). For the estimation of gross annual income from cropland in each management group the following procedure was used. The yields per acre of each crop on each group were multiplied by the price per bushel. Through the use or percentage of proportion of the crops on each management group, the gross returns from each crop and the total were determined and recorded in table 7.

E). Estimated costs per acre per year for each crop and cropland on each management group was determined. The common practices in Osceola County in crop proudction are assumed to be similar to those reported in Michigan Experimental Station Bulletin 472. Costs of these operations were based on Extension Folder F-161, Rates for Custom Work in Michigan. These were determined on an acre rate with an average level of management. This was calculated by multiplying costs associated with each crop, table 8 and 9, in each group by the percentage of that crop on each management group, table 5.

Harvesting costs were assumed to vary with yields, Costs of hauling and storage of the crops and costs of these operations were from the custom rate schedule cited above.

Fertilizer use data were taken from the 1954 Census of Agriculture data and the Michigan Agricultural Statistics. Average amounts applied were for corn, 209 pounds per acre; wheat, 251 pounds per acre; oats, 227 pounds per acre; hay and rotation pasture, 191 pounds per acre, costs per pound based on a 5-10-5 analysis at $70.00 per ton.

The estimated net income per acre for the cropland by

soil management groups is then the difference between the estimated total gross income in table 7 and the estimated total cost for the cropland per management group in table 10. These differences in totals are recorded in table 11 and similar expected net incomes from each crop on each soil management unit is also listed in table 12.

F). For permanent pasture, the number of cow days per acre on each soil management group in table 1 was multiplied by eight cents and the costs of producing the pasture in table 9 were deducted, the net income from pasture is shown in table 11.

Table 12. Estimated Net Income Per Acre of Crops by Soil Management Units in Osceola County.

Management Unit & Slope	Corn	Oats	Wheat	Alfalfa Hay	All Hay	Rotation Pasture
2a-A-B	$30.20	$ 1.89	$ 19.28	$30.67	$ 8.08	$23.18
2a-C-D	8.28	-3.01	4.02	17.15		
2b	34.08	1.89	22.50	35.18	8.08	24.30
2c	36.66	3.99	27.54	37.43	8.08	25.43
3a-3/2a A-B	17.31	-5.11	7.38	21.66	4.10	18.67
3a-3/2a C-D	7.95	-7.21	-1.02	14.90		
3b	22.47	1.89	10.74	32.92	10.19	23.18
3c	25.05	1.89	10.74	32.92	10.19	23.18
4/2a	8.28	-7.21	-2.70	17.15	2.11	16.42
4/2b, 4/1b	13.44	-3.01	2.34	19.40	4.10	17.77
4/2c	17.43	-1.61	4.02	26.16	4.10	18.67
4a-A-B	14.73	-8.61	4.02	12.64	2.11	14.18
4a-C-D	-4.62	-11.41	-2.70	10.39		
4b, 4b-L	17.43	-7.21	7.38	17.15	2.11	16.42
4c, 4c-L	21.18	-5.11	10.74	19.40	4.10	16.42
5/2a-A-B	-4.62	-11.41	-9.42	5.89	2.11	11.91
5.0a, 5.3a A-B	-11.07	-14.21	12.78	-.87	-1.87	7.41
5.0a, 5.3a C-D	-17.52	-15.61	-14.46	-.87		
5b	-7.20	-12.11	-11.10	1.38	2.11	11.91
5c	-2.04	-10.71	-9.42	5.89	2.11	11.91

Woodland Evaluation

To determine the expected net income for woodland the expected net returns used in the study conducted by Heneberry et al (4) were used. Preliminary results gave indications that another method of capitalizing the expected net income was needed. Table 11 gives a summary of the expected net incomes from cropland, permanent pasture and woodland on the soil management groups in Osceola County.

Standing Timber Values

In order to obtain an accurate value for wood products on the land it was necessary to design a data and check sheet. This check sheet was a combination of methods used by the Michigan State Tax Commission and the Michigan Department of Conservation Land Examination Sheet. The data sheet places emphasis on species and stand density which is converted to thousands of board feet. This is then multiplied by the corresponding values in table 13a. Each sample unit that contained wooded areas was visited in order to obtain accurate information and data.

Table 14. Estimated Stumpage Values Used For Standing Timber Values.

Saw Timber:

Maple	$25-30 per Thousand Board Feet
Oak	$20-30 " " " "
Beech	$40-up " " " "
Mixed Maple, Beech and Oak,	$18-25 per Thousand Board Feet
Swamp Elm, Ash, Soft Maple	$10-20 " " " "

Pulp:

Aspen, $2.00-3.50 per 4'x4'x100' cord.

White Birch, Oak and Hard Maple, $3.00-500 per 4'x4'x100'

These values are from the Michigan State Tax Commission Manual for 1955.

Table 15. Mean Stumpage Values Used in Estimating Net Income of Woodland in Osceola County.

Saw Timber		Pulp	
Specie	Value	Specie	Value
Maple	$27.50/m bd. ft.	Aspen	$2.75/cord
Oak	$25.00/m " "	White birch	
Beech	$40.00/m " "	Oak & Hard Maple	$4.00/cord
Mixed Maple Beech & Oak	$21.50/m " "		
Swamp Elm & Ash, Swamp Maple	$15.00/m " "		

These values are mean values from table 14.

Improvement Values

Improvements, as used in this study, refer to the homestead unit. This would consist of a house and out buildings. Out buildings usually consist of a barn, silo and in some instances a corn crib, garage and tool shed. The values of the homesteads were studies on 50 farms.

The method of obtaining information on these units was by the use of check sheets patterned after that proposed by Schairer (21) and data in the Michigan State Tax Commission Manual. Photographs were taken to show examples of the homesteads and these are shown in the Appendix A. The purpose of the check sheets was to systematically collect enough field data on the buildings to determine any affects they might have on the sale price of each farm. As with Arenac and Eaton Counties the observable features of the houses and out buildings were assigned a number according to their relative importance. Adaptability was an added feature for out buildings which was not used in the Arenac and Eaton County studies. Examples of these check sheets for the house and out buildings are shown as forms 2 and 3 in Appendix B.

The upper parts of the check sheets are designed to rate the buildings according to the type and quality of construction, material and use. Adjustment for depreciation, location and personal convenience are held as separate items.

Statistical Analysis

From the data compiled on actual sale prices and estimated land values, a correlation coefficient (r) was determined. The square of the correlation coefficient was also calculated and is termed the coefficient of determination (r^2). A test for significance was carried out at the .01 percent level.

A linear equation, $Y_c = a + bx$, was also worked out; Y_c is the computed sale price; a , the point of origin of the line represented by the equation; b, the change in estimated land value associated with a given change in the sale price x, in thousands of dollars.

The statistical analysis carried out for the correlation coefficient, coefficient of determination and linear equation was done by the statistical pool of the Department of Agricultural Economics, and William H. Heneberry, at Michigan State University.

Results of this calculation are shown in Figure 11 which shows the "Relation of Estimated Land Values to Sale Price" less building and timber values. The equation reads: $Y = \$207.50 + 1.058x$; $r = .894$

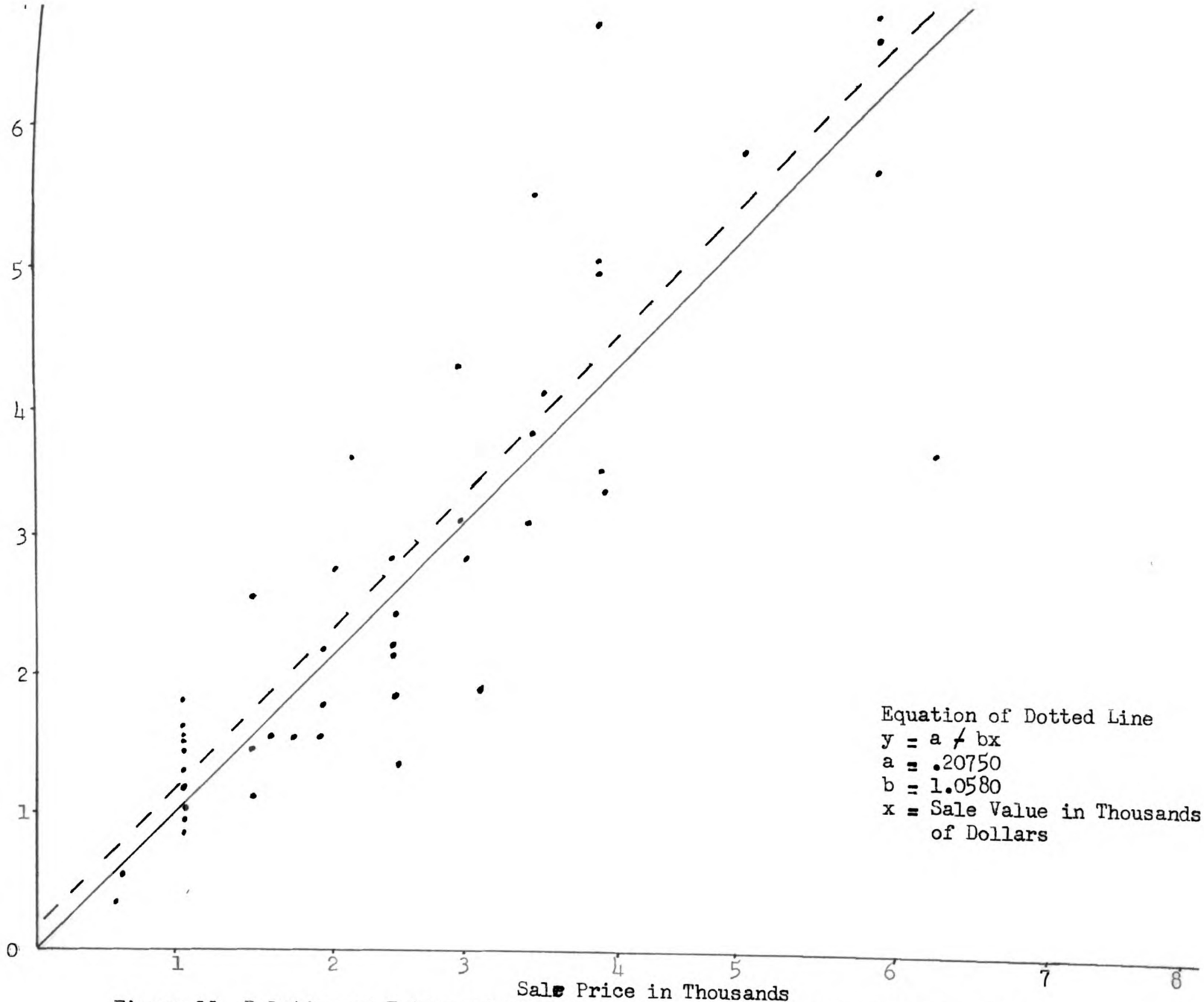


Figure 11 Relation of Estimated Land Values to Sale Price Less Building Values.

Discussion

Trends in the agriculture of Osceola County can be partially understood by consideration of the charts on the major crops and the data on cattle and calves, cows milking two times a day, price of milk and butterfat per hundred-weight in figures 4 through 8.

As the number of cattle increased or decreased, so have the corn acreages. We can assume from this comparison that the corn acreages have fluctuated to meet the demands of cattle or vice versa, the cattle have been increased to use the increased corn supply.

Oats data indicate a steady decline in acreage. There appears to be no relationship to cows, cattle, milk price or other crops grown. The use of an average acreage of oats over the decade from 1949 to 1958 may have over emphasized the present importance of oats on Osceola County. This would tend to lower land values for most of the soils in oats, as indicated in table 12, which show a negative net income per acre.

Wheat shows no clear relationship to other crops grown but the increase since 1955 may indicate it is replacing oats in part. No effect on depressing acreages but may have influenced increased acreages as more farmers turn to wheat for a cash crop. Allotments seem to have no effect on the acreages. Acreage of wheat decreased from 1949 to 1955 even though wheat allotments were in effect. No correlation appears to exist between the wheat data and that on cows,

cattle and milk prices.

The data for hay correlates with the increase in cows, cattle, milking and price data. This increase is felt to meet the demand of more hay required by the cattle.

We can assume, in Osceola County, that oats and wheat play a minor role in the dairy enterprise since there appears to be no effect on them by the other crops grown. Corn and hay acreage trends seem to fluctuate with the amounts of cattle raised, or vice versa. The amounts of cows milked twice daily fluctuate with the prices received, or vice versa, as indicated in figure 8.

It must also be taken into consideration that the numbers of farmers in the county has also decreased. This will tend to depress some of the acreages of the crops grown. Increases in yields are consistent only with wheat. Other crops may be affected more by weather. It can therefore be assumed that the more inefficient farmers are getting out of the farming business.

Upon comparing the data synthesized from custom rates for expenses, with farm account records, it was found that the synthesized costs on a per acre basis were less than those reported in the farm account records. For example it was found that the synthesized machinery expense was half of the farm account figure, and other per acre expenses were similar. It can therefore be assumed that the farmers in Osceola County have over-stocked themselves on machinery as an insurance against not being able to obtain the necessary machines when desired, as might be the case when depending

on custom work. It can also be assumed that they do not have large enough farms for efficient operation. It may be that the farmers themselves do not realize how much their own labor is worth. Thus, the total net income is, under existing conditions, lower than it might be with more efficient operation.

When the data are adjusted to take into account these existing conditions, the capitalization rate is lowered from 22.5% for cropland to approximately 14%. This 14% corresponds to similar results found in Eaton and Arenac Counties. Discussion with some of the land owners and town's people revealed that a 10 to 12% capitalization rate was considered to be average for cropland. In this study the costs based on custom work rates and the 22.5% rate was used for estimating the land values from the expected net incomes for cropland. The 22.5% capitalization rate was determined by a process of comparison which is a percentage relationship that exists between the annual net returns and going market values of comparable properties. The capitalization rate in this study is an average figure of the estimated net income divided by the sale price in figure 9. Figure 10 shows the sample units after capitalization of data in figure 9.

In the plot of values of sale price in thousands per farm sampled as opposed to assessed value in thousands per farm, figure 12, several relationships are apparent. The higher the sale in thousands of dollars, the less in proportion is the assessed value. Or conversely, the lower the sale value of a property the higher the percentage that the

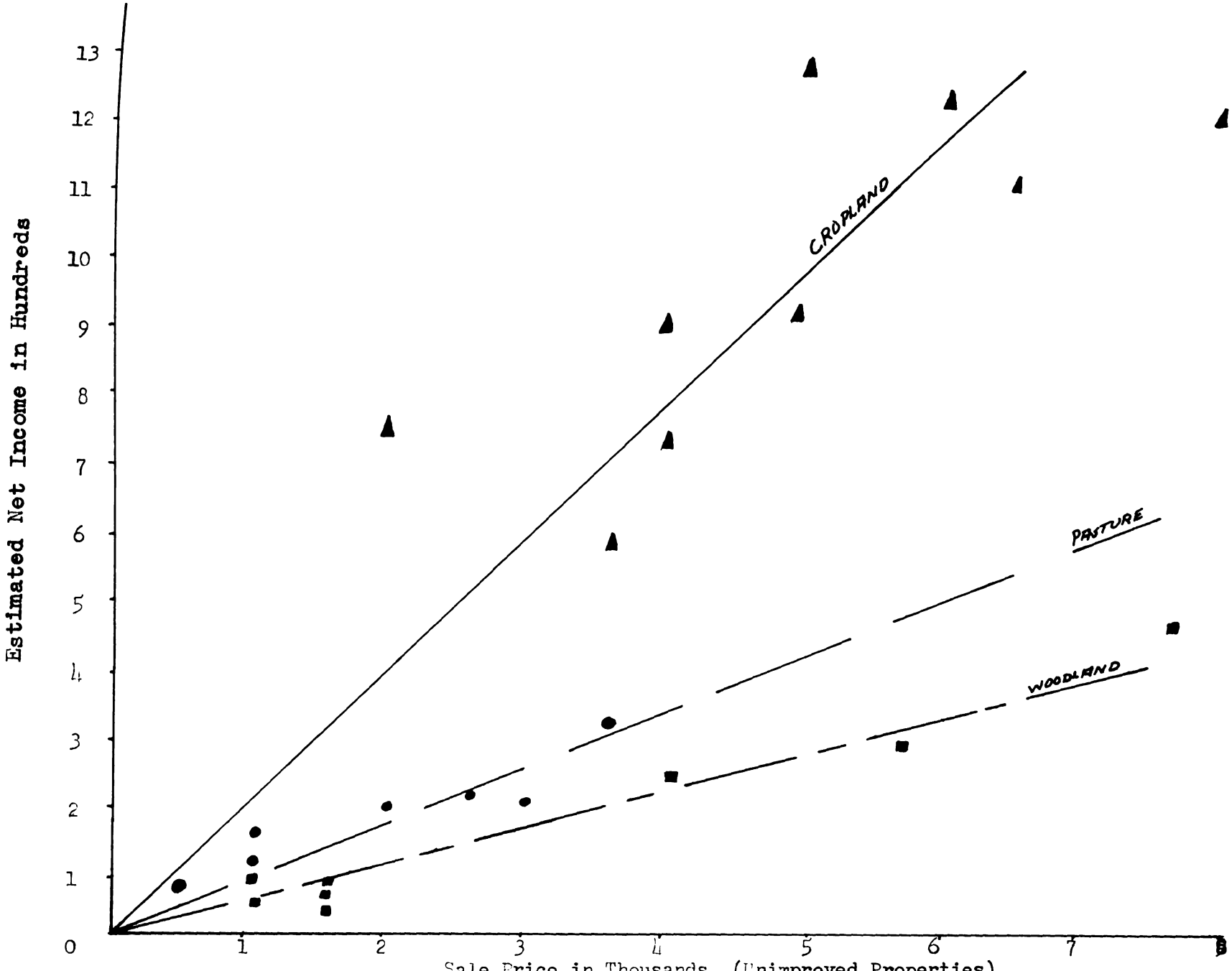


Figure 9 Relation of Computed Net Income to Sale Price.

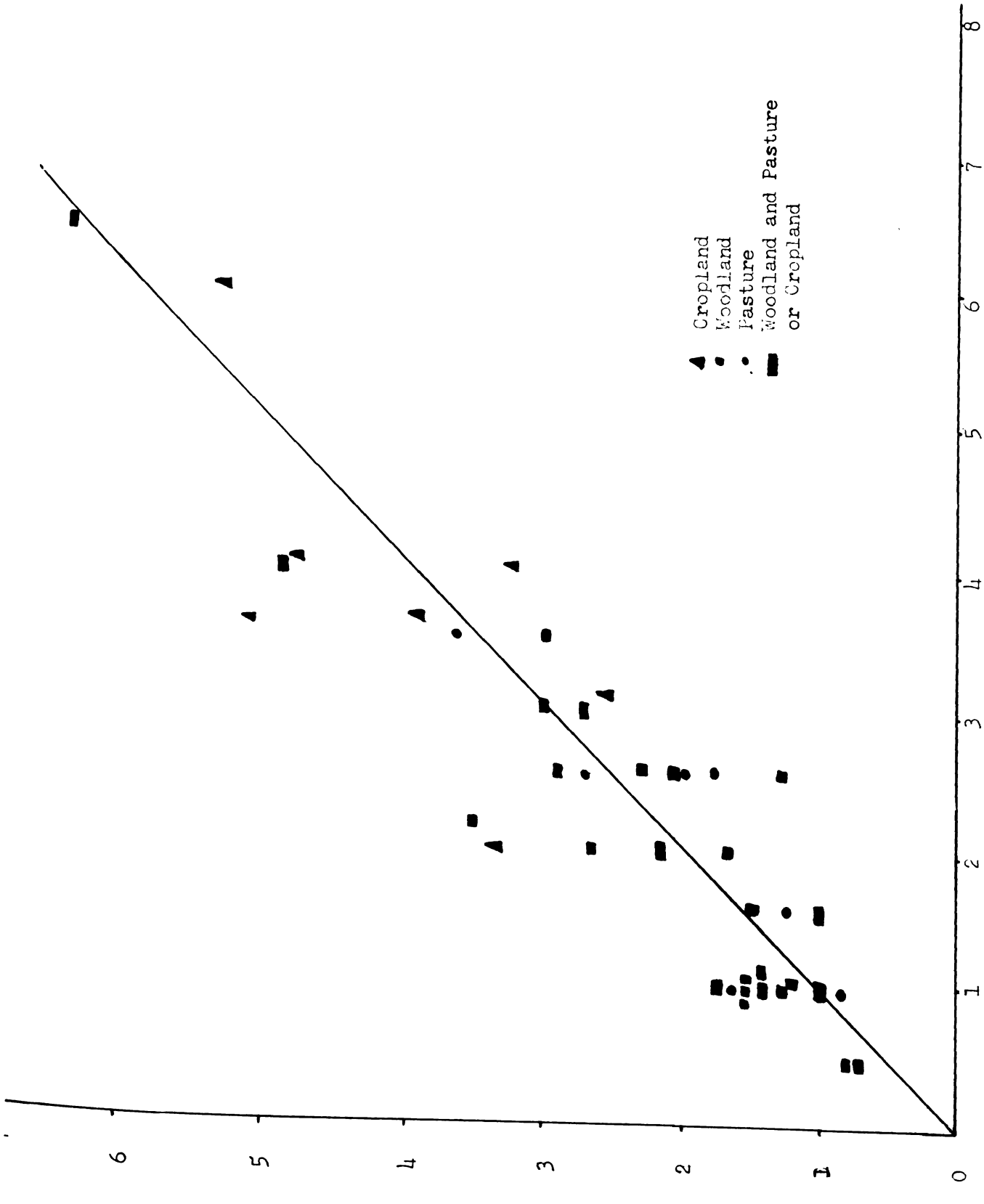


Figure 10 Relation of Computed Land Values of Unimproved Properties after Capitalization of Net Incomes.

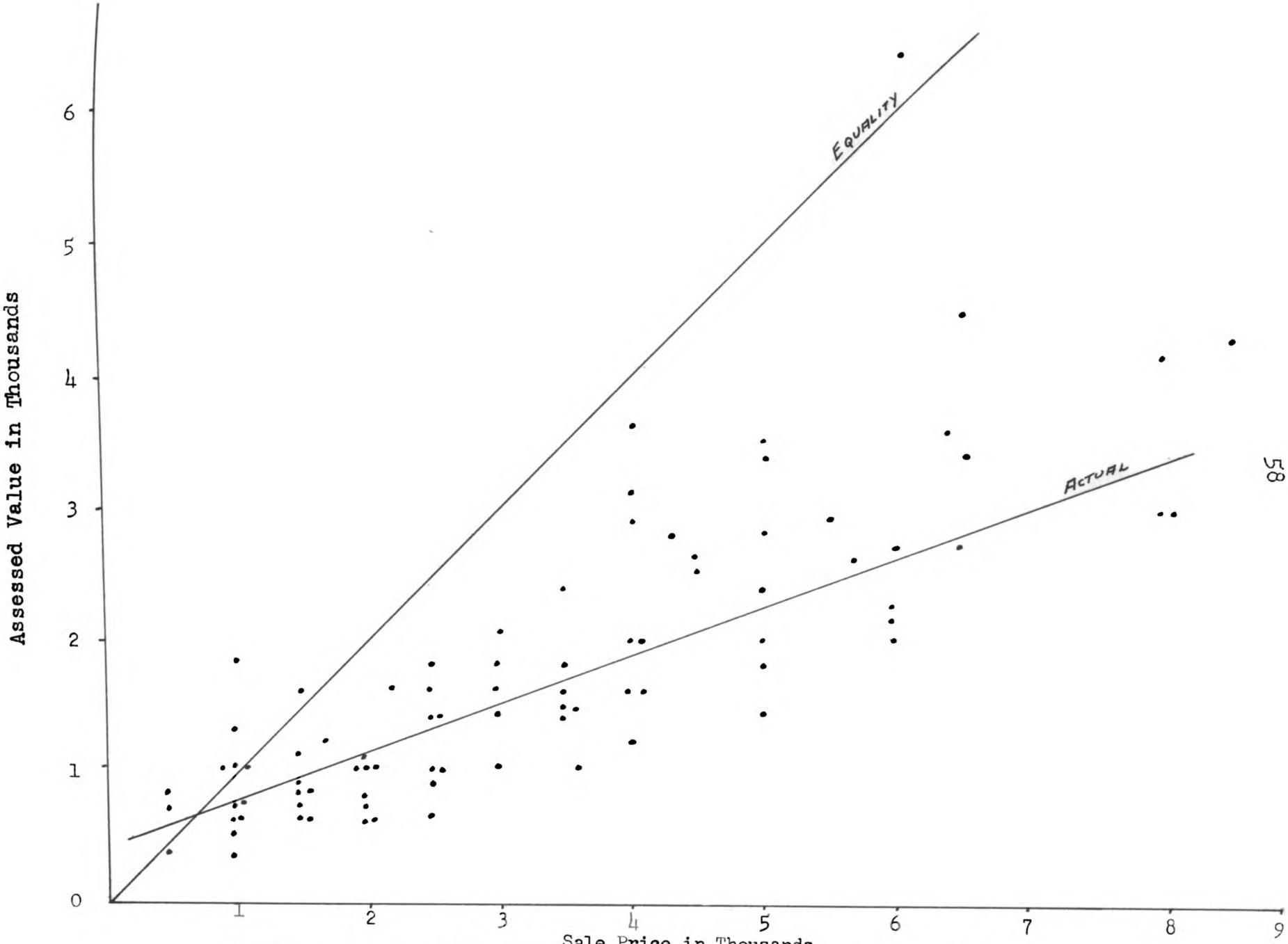


Figure 12 Relation of Sale Price to Assessed Value in Osceola County

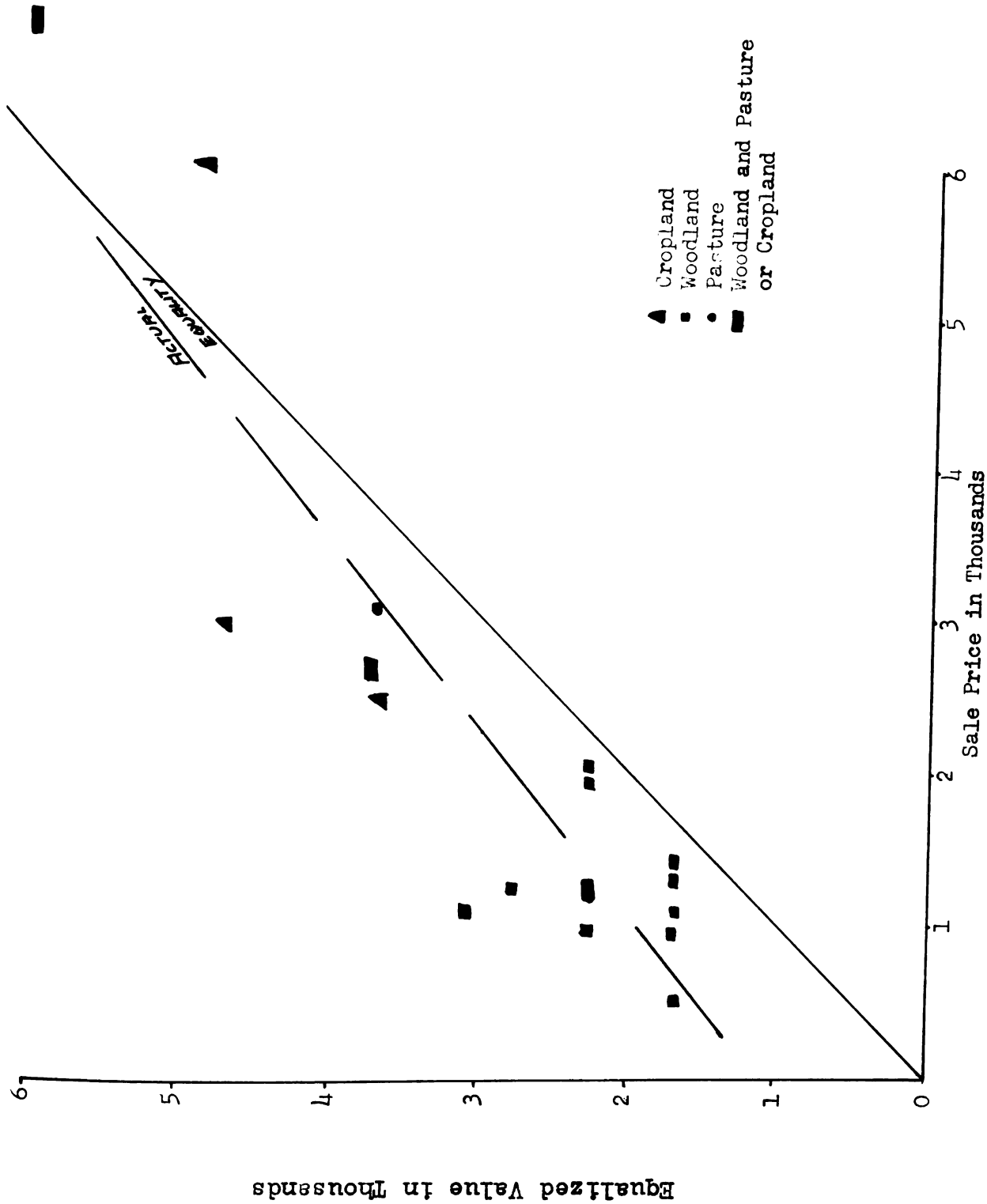


Figure 13 Relation of Equalized Value to Sale Price

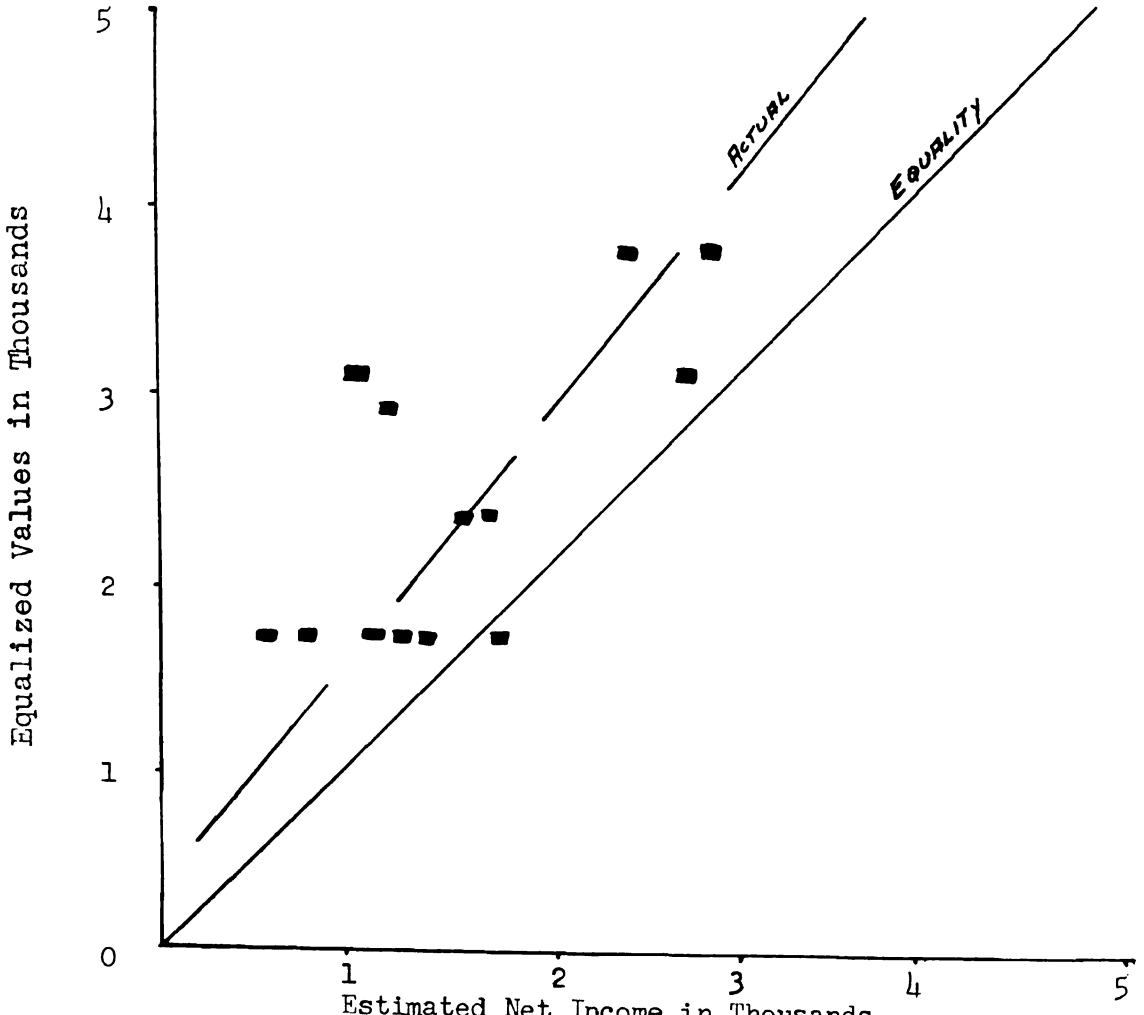


Figure 14 Relation of Land Values Estimated From Net Incomes to Equalized Values.

assessed value is of the sale price. From other data in other states and counties in Michigan, this appears to be a common situation.

When considering this relation of sale price to assessed value, it is obvious that the more productive and highly developed land or larger farms are being under assessed and that the poorer or smaller farms are being relatively over assessed. This relationship to amounts of improvements on the land is borne out by the fact that the dots at the higher end of the curve are more commonly farming units with improvements and sold as such. Most of the dots at the lower end of the curve are units of idle and forested lands, without improvements.

The assessor in this situation has apparently also tended to undervalue the more intensively cultivated or more productive land and over valued the less productive idle and forested land. The same situation holds true for each of the individual townships. This also held true for the Eaton and Arenac County appraisal studies and in other states such as Nebraska and Iowa. Use of the method tried in this study would avoid the bias and result in more equitable land evaluation.

When comparing the relation of estimated sale price in thousands to equalized values on sixteen sample units, figure 13, the following relationships seem to exist. Regardless of land use the improved farms are valued by equalization 15% higher than the sale price. Adjustments made during the course of study are as follows. All of the

equalized values used multiplied by 2.8 from the Michigan State Tax Commission, in order to bring the values from 1958 to 1959 dollar values. This was done to bring into line the equalized values of each sample unit for comparison with sale values based on 1959 data. The sale prices were also adjusted for the time of sale to a 1959 base. Inaccuracies in these adjustment factors may tend to show over equalization of sample units when compared to sale prices or values based on estimated net income, figure 14. It must be remembered too that the estimated net income is an average figure from 1952 to 1959 or centering around 1954-55. On these farms too it appears that they have been over valued even when comparing equalized values to estimated values based on net income or sale prices. Relating the equalized assessed values to value based on the expected net income from the soil management groups and the sale price of properties currently being sold would decrease this over valuation bias.

During the evaluation of the improvements of the sample units, it was found by the check sheets that the house and out buildings values fell into ½d and D classes by the Michigan State Tax Commission Manual. This was also found by Schairier in Arenac County. Personal contact with the local people in Osceola County found a general opinion that the improvements acccunted on the average for approximately half the value of the sale price, while land was felt to consist of the other half of the sale price. This corresponds to the

data in Current Developments in the Farm Real Estate Market, for Michigan, 43 to 45% of the value is for improvements. This helps to explain the over valuation in equalization for many improvements were rated in a class higher than was done in this study. On the other hand it was also found that many of the buildings were improved since the initial sale and time of valuation. This proved to distort the data for it was almost impossible to put an original value on the buildings at the time of the sale. This distortion would tend to over value the less productive land by giving an impression of a highly productive unit.

Another point of interest was that a high proportion of farm operators are working off the farm in small local industries. This was also found by the Soil Conservation Service in a survey of their cooperators in Osceola County Soil Conservation District. Three out of five were not farming full time. There appears to be a correlation of size of farming unit to farmers working off the farm. The smaller the unit the more likely the farmer to be working in industry. This is also noticeable in the analysis of major crops grown, acreages of each and the numbers of cattle or calves and cows milked two times a day. From 1949 to 1953 there seemed to be a general increase in all of the above due possibly to the Korean conflict and from 1953 to the present, there has been a general decrease in the above. It is believed that the latter is due to the general trend of farm personel to seek added income by working in the small industries.

From table 12 several important relationships are to be observed. Management Units 4a, 5a, 5b and 5c show a trend of higher estimated land value and thus a higher net income for forestry and pasture than cropland land use. Management units 2a, 2b, 3a and 4a show a higher estimated land value when used for cropland and pasture than for forestry and pasture combinations. It can therefore be assumed that the most intensive and economical land use for units 5a, 5b and 5c is forestry and pasture combinations. For management units 2a, 2b, 3a and 4a the most economical and intensive land use is cropland and pasture. When the reverse of these land uses occurs, the trend is for lower estimated net income and lower land values.

Results of the statistical analysis conducted by the statistical pool of the Agricultural Economics Department at Michigan State University, found a correlation coefficient of .944 between estimated land value and sale price. By squaring this number, the coefficient of determination is found. In this case it is .891. This can be interpreted as the percent, 89%, of the sale price of land and estimated land values that can be attributed to the parameters used in the method of estimating the land values.

As indicated by the linear equation $y = .2075 + 1.058x$, figure 11, where the point of origin of the line represented by the equation is 207.50 dollars. The amount of change in estimated land value associated with a change in the sale price of $100.00 is $105.80.

Results of the statistical analysis are similar to the

results found by Tom Priest in a similar study in Eaton County, Michigan.

Conclusion

This study is based on the use of soil management groups and related information for evaluation of farmland. This system has the advantage of eliminating bias on the part of the assessors. It takes into consideration the differences in soils, land use and incomes that can be derived from the land.

Any individual who uses this system should realize that adjustments and checks are necessary. As changes occur in land use and with advancement in technology adjustments will need to be made in land values. Adjustments are also necessary for current local variations in productivity such as yields lost through drought, floods and poor soil conditions. This can be accomplished by adjusting the net incomes by soil groups and then an adjusted capitalized value can be determined.

Soil management groups can be used for purposes other than land evaluation. They can be used as a basis for buying and selling land. Banks and other lending institutions can use these soil management groups to determine the feasibility of lending money. Finally soil management groups can be used for improvements in farm management by adjusting land use or farm sizes to the soil present to get the most net income consistent with a permanent agriculture for a farmer, or farm manager as indicated in tables 11 and 12.

Additional Research Needs

During the course of this study, it became apparent that more research is needed. In the field of soils and crops, more accurate data are needed with respect to types of crops grown on different soils in the various counties. Yields of the crops grown on different soils with given management are also needed. Other items that seem to be lacking are the knowledge of crop sequences, machinery and practices used, including erosion control measures, and amounts of fertilizer being applied. This information is not generally available or specific for any certain soil and types of farming areas.

In the field of economics, the determination of costs of each operation, on other than account farms, for the typical farm operator is lacking. It would also be desirable to have studies conducted on the effect that industry has on land values and on the general farm situation in the various farming areas of Michigan. As stated in the discussion, 3/5 of the farm population in Osceola County have part time work away from the farm. Thus the farm has arrived at a dual purpose. The farm has remained a place to live and other industries have become a place of employment.

Relative price data on farms in relation to location, types of roads, modern conveniences, school debts and taxes are lacking but are necessary for a more complete picture of land values. These may also influence the type of farm operation.

In the field of Agricultural Engineering there is limited information on the effect of the soil properties and soil management on the cost of using machinery. There are indications that soil texture and drainage have an effect on the power requirements of machinery. This will directly affect the costs of using the machines in dollars and cents. It is known that clayey soils and sod crops will increase the expenses through increased power necessary to pull when compared to sandy soils and cultivated crops. The amount of influence on expenses by soil management groups cannot be evaluated at this date.

Additional research is needed on more realistic capitalization rates. This appears to vary from area to area.

There is also a need of information on woodland values. This is with respect to species, stand densities and costs of operation for pulp, maple syrup and other forest products. More information is needed on costs of the harvesting and transportation and prices received for wood products.

It has been found during the course of this study, that in almost every phase adequate information is lacking for adequate evaluation of lands for agricultural purposes. It is therefore felt that additional work is needed on land evaluation for agricultural purposes throughout Michigan. The method tried here seems to be very satisfactory in the types of farming areas where it has been tried.

Bibliography

1. Barlowe, Raleigh. Land Resource Economics Prentice Hall Inc., Englewood Cliffs, N.J. 1953

2. Black, Clawson, Sayre and Wilcox, 1947. Farm Management MacMillin Co., New York, N.Y.

3. Davis, W. D., 1946. Rural Appraisal Procedures, The Appraisal Journal, Vol. XIV pg. 348-360.

4. Heneberry, Wm., Schrirer, O., & Whiteside, E. P., 1956 Uses of Soil Maps for Improving Tax Assessments Procedure for Farm Property in Arenac County, Michigan. Unpublished Manuscript, Michigan State University.

5. Fertilizer Recommendations for Michigan Crops, Extension Bulletin 159 (revised), 1957. Cooperative Extension Service, Michigan State University.

6. Gaddis, P. L., 1946. Some Fundementals of Farm Appraisal The Appraisal Journal, Vol. XIV, pg. 136-143.

7. Henry, E. G., 1946. Appraising Farm Lands. The Appraisal Journal, Vol. XIV, pg. 33-37.

8. Hill, Elton B. & Mawby, Russel G., 1954. Types of Farming in Michigan. Michigan Agricultural Experiment Station Special Bulletin 206.

9. Kellogg, Charles E. & Ableiter, Kenneth J., 1935. A Method of Rural Land Classification, U. S. Dept. of Ag. Tech. Bulletin No. 469.

10. McMicheal, Stanley, 1951. McMicheals Appraising Manual Prentice Hall Inc., Englewood Cliffs, New Jersey

11. Michigan Agricultural Statistics, Michigan Dept. of Agriculture, Michigan Crop Reporting Service, Cooperating with the U.S.D.A., 1949 to 1958.

12. Michigan State Tax Commission Assessors Manual, 1958. Published and distributed by Authority of Act 215, P. A. 1954, Second Printing.

13. Michigan Checklist for Areas 3 and 4, 1959. National Plant Food Institute, Midwest Regional Office, Chicago, Ill.

14. Murray, William G., 1958. Appraisal of Farm Real Estate U. S. Dept. of Agr. Yearbook of Agr. 1958, pg. 190-197.

15. Nielson, James & Bittner, R. F., 1958. Farm Practice Adoption, Michigan Agr. Exp. Station, Tech. Bulletin 263.

16. Nunns, Frederick K., 1958. The Classification of Rural Lands, U. S. Dept. of Agr. Yearbook 1958, pg. 362-370.

17. Odell, R. T., How Productive Are the Soils of Central Illinois. Illinois Agricultural Experimental Station. Bulletin 522.

18. Ottoson, Howard, Aandahl, Andrew & Kristjanson, L. Burbank, 1954. Valuation of Farm Land for Tax Assessment. Nebraska Agricultural Experiment Station Bulletin 427.

19. Perry, Robert D., 1960. New Tool Proves Useful. The Appraisal Journal, Vol. XXVIII, pg. 465-468.

20. Priest, T. W., 1960, Use of Soil Management Groups and Related Information in Evaluation of Farmlands. Thesis for the Degree of M.S., Soil Science Dept. Michigan State University.

21. Schairer, Dale H., 1959. Rating and Valuing Building on Their Physical Characteristics, Thesis for the Degree of M.S., Ag. Eng. Dept., Michigan State University.

22. Scholtes, W. H. & Riecken, F. F. Use of Soil Survey Information for Tax Assessments in Taylor County, Iowa.

23. Smith, Glenn C., 1950. Appraisal of Farms, The Appraisal Journal Vol. XVII, pg. 503-511.

24. Storie, E. & Weir, Walter W. The Use of Soil Maps For Assessment Purposes, Soil Science Society of America, Vol. 7, pg. 416-418.

25. Thompson, W. N. & Johnston, P. E., 1954. How Valuable are The Soils of Central Illinois. Illinois Ag. Exp. Station Bulletin 550.

26. Wagner, John J., 1947. Valuation of Farm Lands, The Appraisal Journal, Vol. XV, pg. 545-557.

27. Websters New Collegiate Dictionary, 1949, G. & C. Merriam Co., Publishers, Springfield, Mass., pg. 1209.

Appendix A

Picture Supplement

The following three pages contain photographs of various scenes of farm buildings, and associations of soils and land use with the typical vegetation present. A narrative follows describing the photographs:

Scenes A & B: A homestead, house and out buildings, located on Nester and Isabella soils. The topography is from moderate to steeply sloping with general agriculture as the main land use. This unit typifies the average level of management. It has modern facilities and is worth approximately $4,500-5,000. This would be a class D home by the standards of the Michigan State Tax Commission.

Scenes C & D: A homestead on Isabella soils with moderate to steep slopes. This unit would be considered above average. The main enterprise here is general farming and dairy, with a value of approximately $8,000-8,900 for the buildings.

Scenes E & F: This represents one homestead with house and barn and the associated fields. These are level to gently sloping sandy soils. Unit would be considered average for the county. If the owner were to depend on the land for an income this unit would not appear as it does. The

owner in this case works at a factory ten miles away. Resources from two incomes have been placed back into the homestead for improvement; the i come from the land and from the factory.

A

B

• APR 61

C

• APR 61

D

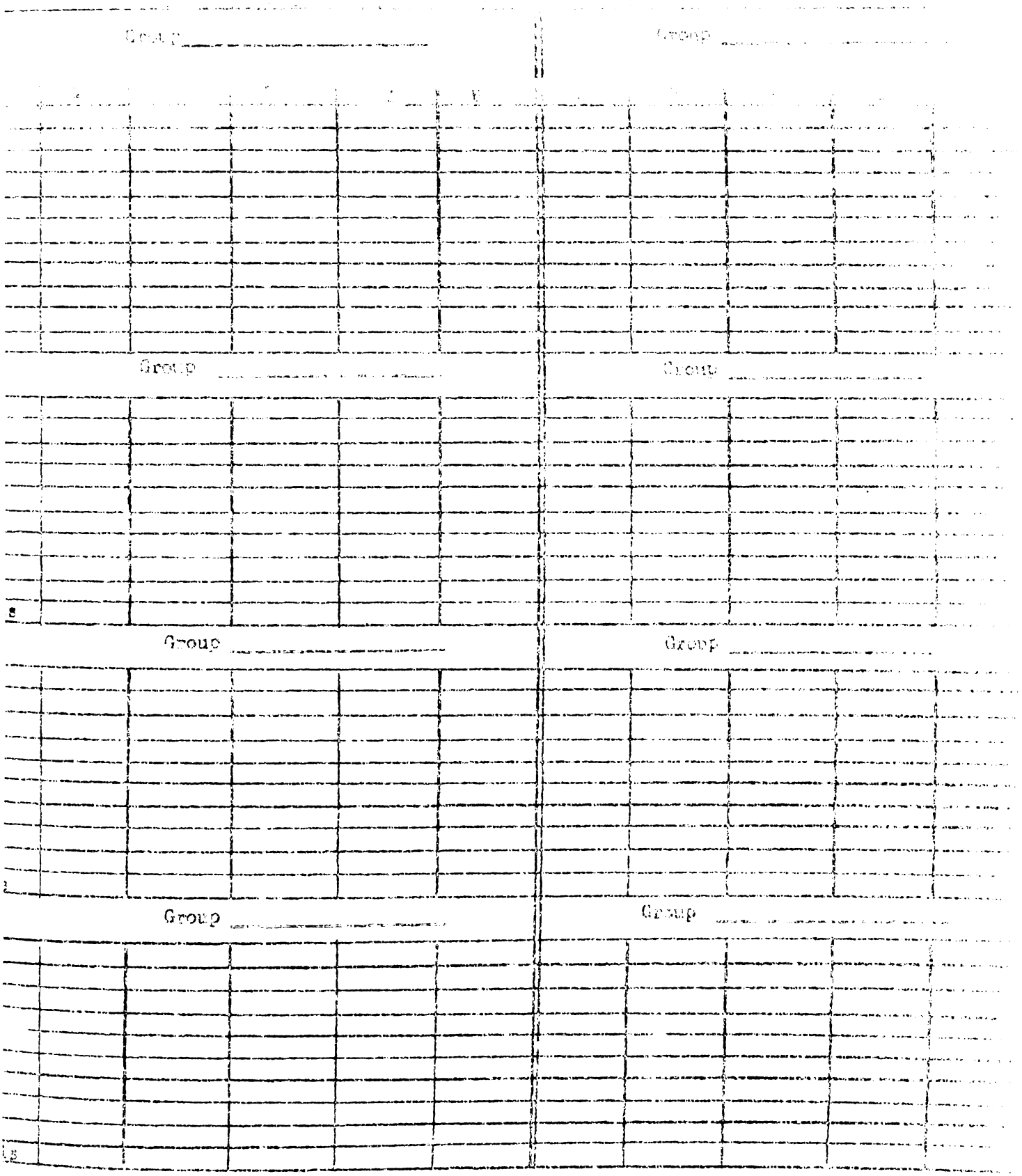
APR 61

E

APR 61

F

Appendix B
Examples of Tabulation Forms Used in This Study
Form 1



S.G.S. 10/59

Form 2

DRIVE LOC. FROM: _____

CODE NUM: _____

COMMENTS ON APPEARANCE: _____

DIAGRAM OF UNIT, TOP OR SIDE OR BOTH: NUM OF STORIES _____

FOUNDATION	BLOCK POURED (30)	BLOCK POURED (40)	STONE (30)	POOR PICK LIMEWALL (0)	CONDITION
FRAME	WOOD (15)	BLOCK (10)	WOOD FAILED (50)	BLOCK FAILED (0)	
SIDING	STONE BRICK (30) WOOD	STONE AS. BRICK WOOD (20)	INSULBRICK (10)	TAR PAPER (0)	
ROOFING	INTERLOCK (30)	3 IN 1 (20)	SHEET METAL (10)	WOOD SINGLE ROLE ASPHALT (0)	

ADAPTABILITY + OTHER FEATURES THAT AFFECT DESIRABILITY INCLUDING OBSOLESCENCE + CONFORMITY WITH COMMUNITY STANDARDS.

SUM OF CHECKED ITEMS: _____ PLUS ADJUSTMENT -- ADAPTABILITY: _____

TOTAL: _____ AGE: _____ BASE VALUE: _____

CONVENIENCES:

___ R.F.D. ___ SCHOOL BUS

___ MILK RTE. ___ POWER LINE

___ TELEPHONE

ADJUSTMENTS: (COMPARISON TO OTHER UNITS)

LOCATION: _____ ROADS: _____ TOPOGRAPHY: _____

APPEARANCE: _____

ADJUSTED BASE VALUE: _____ D.V.: _____

Form 3

[illegible]

Name & location: ____________

____

____

Chief Use: ____________

Comments on Appearance:

____

____

____

Present use	Built for (40)	Not built for (30)	Not used (0)	CONDITION or % Good
Foundation	Block (40) Poured Treated Post	Block some Poured Failure Stone (20)	UNTREATED POST Piers lime wall (0)	
Construction	Stud Block Pole Steel Timber (40)	Stud Pole Timber Block Steel some Failure (20)	OTHER (0)	
Siding	Wood Metal (20)	Wood metal Asbestos rusted, loose or rotted ([illegible])	Asphalt Roofing etc (0)	
Roofing	Interlock Asphalt metal (20)	Asphalt metal tin ([illegible])	Wood (0)	
Ground Floor	Concrete (20)	Gravel Combination wood (10)	Dirt (0)	

Adaptability & other Features that affect Desirability of units

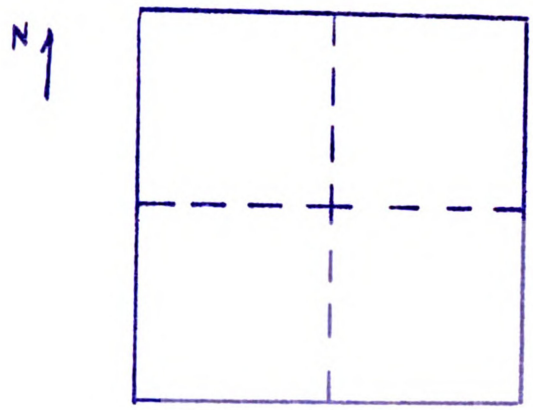
Sum of Checked items: ____________ Adjustment for Adaptability: ____________

total: ________ Age: ____________ Base Value: ____________

Adjusted Base Value: ____________ Depreciated value: ____________

WOODLAND EVALUATION SHEET

Form 4



SCALE: _____

NAME & LOCATION OF UNIT:

CODE NUMBER:

COVER TYPE LEGEND:

SPECIES:

M - NORTHERN HARDWOOD
Mh - HEMLOCK SUB
E - BOTTOM HARDWOOD
Er - RED MAPLE SUB.
Ea - ASH SUB TYPE
O - OAK
Ox - SCRUB OAK
A - ASPEN
T - TAMARACK
F - BALSAM FIR
Gr - UP. GRASS
G.S - LOW GRASS
UB - UPLAND BRUSH
Ab - P. BIRCH SUB.
Ax - SCRUB ASPEN
W - WHITE PINE
R - RED PINE
J - JACK PINE
C - CEDAR
Sb - BLACK SPRUCE
Sw - WHITE SPRUCE
Bk - BRACKEN FERN
LB - LOW BRUSH
LI - LEATHER L. BOG
C - CROPLAND C.O.W.H
P - PASTURE:
P_1 - NATIVE GRASS
P_2 - SEEDED MIX
P_3 - ROTATION
P_4 - PERMANT
P_5 - PASTURED WOOD

STAND DENSITY: SCATTERED - SCAT, POOR - ', MEDIUM - ", GOOD ".

SITE CLASS	DIA	VOL. RANGE	GOOD Bd ft	GOOD cd	MED Bd ft	MED cd	POOR Bd ft	POOR cd
SAPLING	1-5"	LOW	0					
		AV.	0	2.5		2.2		1.5
		HIGH	0	2.9		2.8		2.0
POLE TIMBER	5-9"	LOW	700	13	500	7	200	3
		AV.	1400	20	1000	12	1000	5
		HIGH	1500	24	1500	13	1200	7
SAW TIMBER	9-15"	LOW	6,000	18	3,000	13	1500	5
		AV.	7,000	23	5,000	17	2800	10
		HIGH	10,000	26	6,000	20	3000	13
LARGE SAW T	15"+	LOW	12,000	24	5,000	17	1500	6
		AV.	14,000	34	8,000	21	4000	12
		HIGH	18,000	40	14,000	26	5000	16

SITE 1 (GOOD) 2 logs HARDwood 3½ CONIFERS (16' logs)
" 2 (POOR) LESS THAN SITE ONE.

SPECIES	SITE CLASS	DIA	S.Q	VOL. RANGE	STOCKING Bd.ft	STOCKING cd	CROPLAND	PASTURE	AC. M. G.

GAME & GAME COVER:

USE OF UNIT: (SUGAR BUSH):

COMMENTS OR PERTINENT DATA - SPECIAL VALUE:

SOURCES: MICH. TAX MANUEL - FORESTRY SECTION
MICH. DEPT. CONS. - LAND EXAMINATION REPORT.

S.G.S. 5/60