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AN APPRAISAL OF THE USE OF SOIL SURVEY INFORMATION
AS THE BASIS FOR VALUING LAND FOR TAX PURPOSES
IN SPINK COUNTY, SOUTH DAKOTA

BY

DONALD DEAN PATTERSON

A thesis submitted
in partial fulfillment of the requirements for the
degree Master of Science, Department of
Economics, South Dakota State
College of Agriculture
and Mechanic Arts

January, 1964

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This thesis is approved as a creditable, independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Adviser

Head of the Major Department

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DDP

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CHAPTER I

INTRODUCTION

Since about 1900, prominent writers in the field of public finance have found justifiable reason for condemning the general property tax.¹ Many of its deficiencies are inherent in its basic nature while others arise from problems of administration. Yet as a matter of custom and because the property tax is well adapted to local use, there seems little reason to believe that it will be completely replaced by other sources of revenue in the near future. It is even doubtful that land should be deleted from the property tax base because of the windfall gains that would accrue to present landowners. There is, however, strong justification for enacting modifications in the structure of the property tax and seeking means of strengthening its administration.

One's understanding of an established institution is often aided by a knowledge of the conditions under which it originated and of the conceptual changes which accompanied its development. In the case of a tax, fiscal trends and tax-income relationships are also useful from the standpoint of analyzing current problems and in policy formulation.

¹ Harold M. Groves, Financing Government, 5th Ed., Holt, Rinehart and Winston, Inc., New York, N.Y., 1958, pp. 50-62; Jens Peter Jensen, Property Taxation in the United States, University of Chicago Press, Chicago, Ill., 1931, p. 478; J. H. T. McPherson, "The General Property Tax as a Source of State Revenue," State and Local Taxation, The Macmillan Company, New York, N.Y., 1908, p. 475; Edwin R. A. Seligman, Essays in Taxation, 9th Ed., The Macmillan Company, New York, N.Y., 1921, p. 62.

Historical trends are of special interest when studying the property tax because it has survived with few modifications during a period of changing economic conditions. Since its adoption in Colonial times, the nation's economy has passed from the agricultural to the present industrial stage. Many of today's property tax problems are related to these gradual changes in the economy of the country and in the needs of its citizens. These aspects of the property tax are also related to the main topic of this thesis—equity² in the assessment of farm land.

²Equity in taxation implies equal treatment for people in similar circumstances.

CHAPTER II

THE PROBLEM

Historical and Legal Sketch

The tax structure of the American colonies included direct levies on polls, faculties, and property. Additional revenue was raised from excise taxes, duties on commerce, and license fees. The extent of reliance on each of these sources varied by colonies with the property tax of greatest importance in the New England area.³ In some colonies, the property tax was levied on the annual or rental value of land rather than on its capital worth.

Property tax liability originally was not confined to material goods or things apart from the person of the individual. Each taxpayer was expected to contribute according to his "estate or ability" which at that time had much the same meaning. The value of one's "estate or ability" for assessment purposes was based on "a discretionary estimate of the collections and relative wealth" of the individual by local officials.⁴ A voluntary aspect was added to this arbitrary assessment procedure, since no provision was made for the disclosure of property by the owner.

Colonial charters ordinarily contained few directives governing taxation, leaving the development of revenue systems to the

³Harold M. Groves, Financing Government, 5th Ed., Holt, Rinehart and Winston, Inc., New York, N.Y., 1958, p. 617.

⁴Jens Peter Jensen, Property Taxation in the United States, University of Chicago Press, Chicago, Ill., 1931, p. 35.

legislative bodies. Lists of taxable property, including both real and personal items, were eventually developed by the legislatures. Uniform values, subject to frequent change, were specified by the revenue acts for each type of taxable property.⁵

By the time of the Revolutionary War, property had been used in varying degrees as a supplement to the tax base in every colony. Some of the newly organized state governments included provisions for the universal and uniform⁶ taxation of property in their constitutions. Other state constitutions offered no basic revenue laws, leaving the task to the legislatures. The status of the property tax at various times was expressed by the following clauses taken from selected state constitutions:

Maryland (1777) ... but every person in the State ought to contribute his proportion of public taxes, ... according to his actual worth in real or personal property within the State.⁷

Tennessee (1796) All lands liable to taxation ... shall be taxed equal and uniform in such manner that no one hundred acres shall be taxed higher than another except town lots which shall not be taxed higher than 200 acres of land each.⁸

Illinois (1818) The mode of levying a tax shall be by valuation so that every person shall pay a tax in proportion to

⁵Ibid., p. 28.

⁶Universal taxation of property refers to the inclusion of all property except that specifically exempted by statute. The uniformity rule applies to both the rate of taxation and the assessment ratio of taxed property within a given district.

⁷Jensen, op. cit., p. 34.

⁸Ibid., p. 37. This concept of property taxation stressed uniformity according to area rather than value and assumed a homogeneity in tracts of land which seldom exists.

the value of the property he or she has in his or her possession.⁹

The trend toward universal and uniform taxation of property established by the Illinois constitution prevailed until 1873 when Pennsylvania started a reversal by permitting the classification of property. A constitutional provision stated that: "All taxes shall be uniform upon the same class of subjects within the territorial limits of the authority levying the tax."¹⁰ This modification permitted recognition of the income earning power of the various categories of property by allowing the use of different rates and levels of assessment.

The movement for a classified property tax gained momentum after 1900, and most state constitutions now include provisions for some degree of differential taxation. The constitution of South Dakota (1889) carried the uniformity rule, and in 1918 the Pennsylvania classification provision was adopted.¹¹

Property Tax Trends Since 1900

Until the early 1900's, property taxes were the main source of revenue for both state and local governments. The data in Table 1 indicate that the states have largely withdrawn from the property tax field since that time. In terms of percentage, it is also apparent that the property tax is of less fiscal importance now than formerly.

⁹Ibid.

¹⁰Ibid., p. 40.

¹¹Ibid., p. 42.

Table 1. Property Taxes as a Percent of Total State and Local Taxes, United States and South Dakota, Selected Fiscal Years 1902-1960^a

Year	United States ^b			South Dakota		
	State and local	State	Local	State and local	State	Local
1902	82.1	52.6	88.6			
1913	82.8	46.5	91.1			
1922	82.7	36.7	96.9	93.8	80.8	95.8
1932	72.8	17.4	97.3	80.4	45.3	92.6
1942	53.2	6.8	92.4	52.9	1.8	83.3
1953	44.8	3.5	87.0	58.9	.3	97.5
1957	44.6	3.3	86.7	58.2	1.5	92.6
1960	45.4	3.4	87.4	57.1	— ^c	94.0

^aBased on taxes collected rather than levied.

^bData for 1960 includes 50 states.

^cLess than .01 percent.

Source: United States data computed from the following U.S. Bureau of the Census publications: Governmental Finances in 1960; Historical Statistics on State and Local Government Finances 1902-1953; U.S. Census of Governments 1957, Compendium of Government Finances, Vol. III, No. 5.

South Dakota data computed from John E. Thompson and Max Myers, Taxation in South Dakota, Agricultural Economics Pamphlet No. 58, Agricultural Experiment Station, South Dakota State College, Brookings, August 1956; and the following U.S. Bureau of the Census publications: Compendium of State Government Finances in 1953 and 1960; Financial Statistics of State and Local Governments, 1932; Governmental Finances in 1960; Revised Summary of State Government Finances, 1942-1950; U.S. Census of Governments 1957, Compendium of Government Finances, Vol. III, No. 5; Wealth, Debt and Taxes: 1922.

In absolute terms, however, property tax collections have been increasing each year. Property tax collections in South Dakota increased more than 82 percent between 1951 and 1961. The average annual increase during this period was 6.7 percent. In fiscal 1961, property tax collections in South Dakota exceeded sales tax collections

by more than five times.¹² This absolute increase may be largely attributed to the rising costs associated with the level of local government services deemed necessary by our growing population.

The property tax represents a legal claim of government on farm real estate which must be paid as a condition of ownership. It does not fluctuate with output and, in the long run, (except in the case of hobby farms) must be paid out of farm income. Therefore, the relation of taxes to income may be used as a measure of the impact of property taxes on farmers.

Table 2 reflects recent trends in the tax-income ratio for South Dakota and the United States.¹³ Between 1949 and 1960, farm real estate taxes increased steadily in relation to the nation's net farm income. The same was true for South Dakota, but the fluctuation from year to year was much greater. Annual weather fluctuations in South Dakota probably account for the variable income data which in turn is

¹²Computed from South Dakota Citizens Tax Study Committee, Report of South Dakota Citizens Tax Study Committee, December 1959, Table 37, p. 152; and additional data obtained by personal communication with Mr. Bruce D. Gillis, Commissioner of Revenue, State of South Dakota. Sales tax figure obtained from State of South Dakota, Sixth Annual Report of the Department of Revenue, Fiscal Year 1960-1961, p. 18.

¹³The state income figures have been deflated by the index of prices paid by South Dakota farmers based on the 1947-1949 level. The index is a measure of the changes in price of a representative selection of goods and services purchased by South Dakota farmers and includes the main elements of expenditure for farm living, production, and financing. The deflated income figures provide a closer estimate of the farmers' purchasing power relative to that of the base period. A similar index, more applicable to the nation as a whole, was used to adjust the income data for the United States.

responsible for the variations in the tax-income ratio. The national figures constitute an average of all the different type-of-farming areas in the country and reflect price and crop yield fluctuations and variations in local tax policy. This comparison tends to overestimate the burden of real estate taxes on farmers because all farm real estate is not owned by farmers.

Table 2. Taxes Levied on Farm Real Estate, Total Net Farm Income, and Taxes as a Percent of Income, South Dakota and United States, 1949-1960

Year	Taxes levied on farm real estate ^a (millions)		Total net farm income (millions)		Real estate taxes as a percent of income	
	South Dakota	United States	South Dakota ^b	United States ^c	South Dakota	United States
1949	17.3	706.2	155.5	12,926.0	11.1	5.5
1950	18.2	740.6	239.0	13,592.2	7.6	5.4
1951	19.1	772.8	303.9	14,454.9	6.3	5.3
1952	19.6	804.5	172.9	13,336.5	11.3	6.0
1953	20.7	838.9	211.9	11,855.4	9.8	7.1
1954	20.2	869.7	206.4	11,231.0	9.8	7.7
1955	22.0	928.4	125.0	10,506.2	17.6	8.8
1956	25.1	977.3	137.9	10,190.4	18.2	9.6
1957	26.0	1,043.5	247.3	10,333.3	10.5	10.1
1958	25.8	1,103.2	228.1	11,579.5	11.3	9.5
1959	26.8	1,187.5	91.4	9,510.9	29.3	12.5
1960	29.5	1,284.0	235.5	9,965.0	12.5	12.9

^aYear of levy but not necessarily year of payment.

^bDeflated by Parity Index for South Dakota (1947-49 = 100).

^cDeflated by Parity Index for United States (1947-49 = 100).

Source: Tax data—U.S. Department of Agriculture, Agricultural Statistics, 1950-1961. Income data—U.S. Department of Agriculture, Economic Research Service, The Farm Income Situation, July 1961; U.S. Department of Agriculture, Economic Research Service, Farm Income - A Supplement to the Farm Income Situation for July 1961.

Further evidence of the farmers' changing tax status can be shown by comparing the average annual tax levied per acre on farm real estate with the parity ratio.¹⁴ This comparison for South Dakota and the United States is presented in Table 3 and Figure I. These data clearly show a decline in the farmers' ability to pay

Table 3. Average Farm Real Estate Tax Levied Per Acre, Index of Tax Per Acre, South Dakota and United States, and South Dakota Parity Ratio, Selected Years 1936-1960

Year	Tax per acre		Index of tax per acre (1947-49 = 100)		South Dakota parity ratio (1947-49 = 100)
	South Dakota	United States	South Dakota	United States	
1936	.24	.38	55.8	61.6	76.9
1940	.28	.39	65.1	63.2	66.7
1945	.32	.44	74.4	71.3	93.2
1950	.47	.69	109.3	111.9	89.5
1951	.49	.72	114.0	116.8	99.1
1952	.51	.76	118.6	123.2	87.0
1953	.52	.79	120.9	128.1	77.7
1954	.53	.82	123.3	133.0	74.3
1955	.58	.87	134.9	141.1	68.4
1956	.64	.91	148.8	147.6	64.7
1957	.67	.97	155.8	157.3	65.3
1958	.66	1.03	153.5	167.0	69.6
1959	.69	1.11	160.5	180.0	66.7
1960	.76	1.20	176.7	194.6	64.1

Source: U.S. Department of Agriculture, Agricultural Statistics, 1937-1961; South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture 1960, March 1961.

¹⁴The parity ratio is found by dividing the index of prices received by the index of prices paid by farmers for the same period. It is a reflection of the ability of South Dakota farmers to pay the real estate taxes levied on their property.

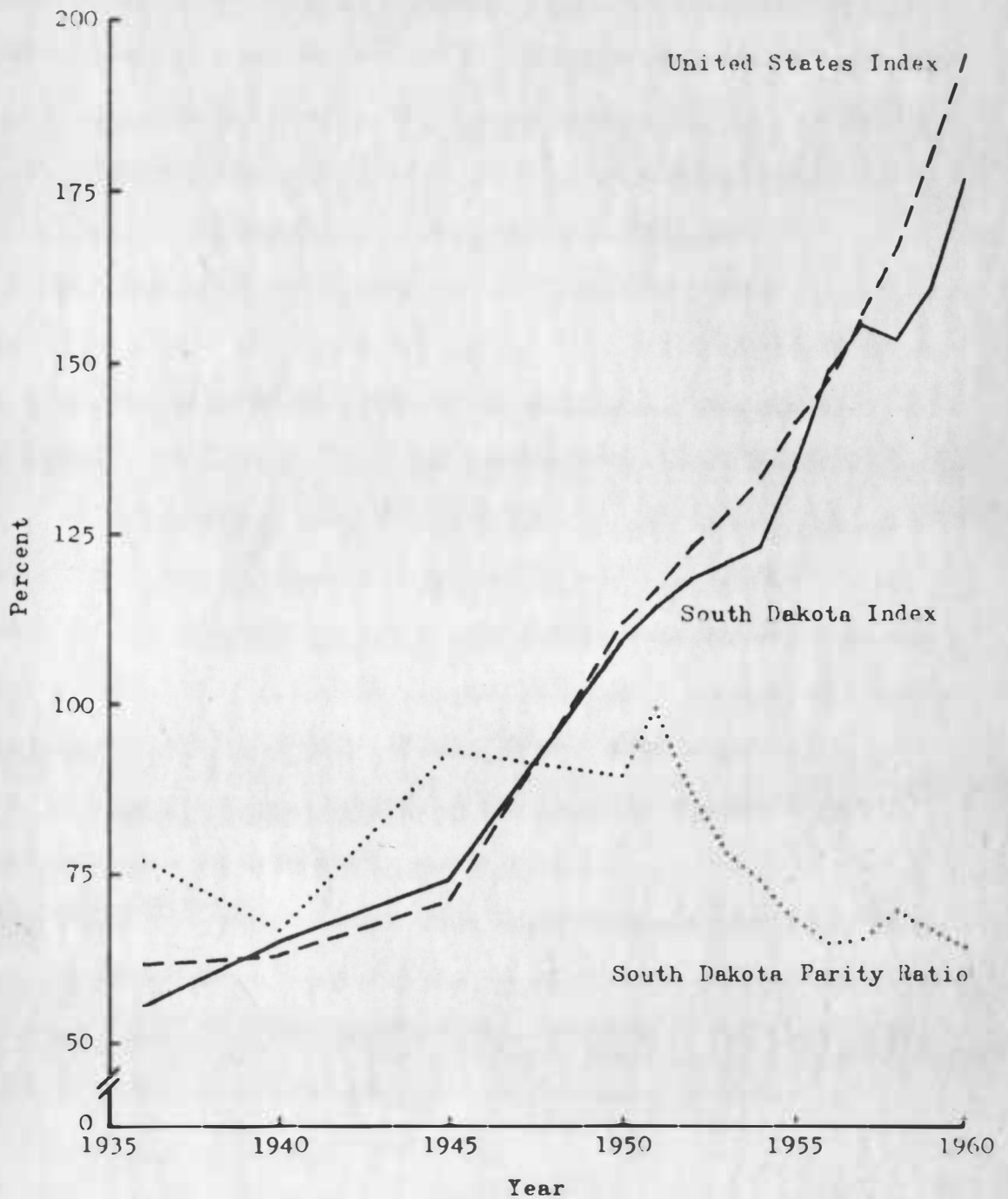


Figure I. Index of real estate tax levied per acre, South Dakota and United States, South Dakota parity ratio, selected years 1936-1960 (1947-49 = 100)

Source: Table 3.

during a period of rising real estate taxes. The index of real estate taxes per acre and the parity ratio are composite figures for farmers as a group. They merely reflect changes in the relationship between property taxes and ability to pay rather than variations in the tax burden of farmers as a group or as individuals.

In studying fiscal trends and tax-income relationships, one must keep in mind that ability to pay was the main criterion of equity at the time the property tax gained wide acceptance. Tax equity is still measured in these terms, but property ownership is no longer as indicative of an individual's wealth or ability to pay taxes. The nation's economy has changed to such a degree that personal income from property is relatively small compared to that derived from services, profits, and intangible sources. Mortgaged property held with small equity also contributes little to the owner's net worth.

The need for less emphasis on the property tax has long been realized, but most states will probably continue to rely on it as a major source of local revenue. This means that the farmer must continue to accept it as a part of his expense. In view of this, it is especially important that consideration be given to any means which promises to distribute the property tax burden more equitably.

Inequitable Assessment of Farm Real Estate and Its Effects

Assessment-sale ratio studies in South Dakota indicate a lack of uniformity¹⁵ in the assessment of farm real estate between counties, and similar inconsistencies exist between townships and individual farms.¹⁶ Inequitable assessment within taxing districts causes a further distortion of the tax load among property owners. A differential in the assessment level of succeeding governmental units creates further inequity when (1) tax levies are imposed by each unit and (2) when state grants-in-aid are allotted on the basis of property valuations. These inequalities may retard the progress of communities seeking public support for schools and other tax supported institutions. Over extended periods, inequity also contributes to changing patterns in land use and tenure.

As long as assessed values and mill rates remain low, inequity in assessment does not pose a serious problem. However, rising costs of local government have necessitated mill levy increases which

¹⁵ Uniformity as used in this sense refers to the relationship between the assessed and market values of land within and between tax units. A uniform condition exists when the ratio between these variables for each parcel of land within the unit approaches a constant. The legal ratio in South Dakota is .60.

¹⁶ The median county ratio for farm real estate in 1960 ranged from 24.9 in Pennington County to 62.2 in Campbell County. The individual ratios for Pennington County covered a range of 65 points while the range for Campbell County was 95. (State of South Dakota, Department of Revenue, Division of Taxation, Third Annual Report, Real Estate Assessment-Sales Ratio Study of the State of South Dakota, for the Calendar Year 1960, Pierre, 1960.)

magnify the existing inequalities. Assuming that the present property tax-farm income trend continues and that the control of property, particularly land, remains essential to an efficient farming enterprise, inequity in assessment will become more critical.

Improving Assessment Procedure

Many people now recognize the need for re-evaluating and improving taxing methods. South Dakota legislators have demonstrated their concern by creating the office of county director of equalization, designed to coordinate and improve assessing procedures. Under this system progress is being made in most counties, but much remains to be accomplished.

In the case of land, inaccurate and arbitrary assessment can be greatly reduced by the use of appraisal techniques which give consideration to the features of the soil. With some additional knowledge of expected crop yields and cost-price relationships, soil features or properties can be interpreted in terms of income earning capacity. The net income producing capacity of the soil can then be used as the basis for determining relative land values for tax purposes. Such a method was used in making the 1960 assessment of farm land in Spink County, South Dakota.

As interest in improving assessing procedure grows locally throughout the state, more people can be expected to inquire about the value of systems used in other areas. Some of them will undoubtedly request the help of college and experiment station personnel in

interpreting and applying similar measures. Therefore, it seems appropriate that an evaluation be made of the effectiveness of the system applied in Spink County.

Objective of the Study

The objective of this study was to evaluate the use of soil survey information as a means of attaining equity in the assessment of farm land in Spink County, South Dakota.

Procedure

Previous to 1955, South Dakota farm land assessments were based on the judgments of part-time assessors whose jurisdictions were limited to townships or similar governmental districts. Since 1955, the county tax program has been administered by an appointed county official, currently the director of equalization. Progress in improving assessment quality¹⁷ was made after 1955, but the assessed values in most townships remained clustered about the average. Individual judgment was still the main factor in determining land values. The use of a soil survey as the basis for the 1960 assessment of farm land in Spink County made it possible to attain a range in the distribution of assessed values consistent with the earning capacity of the soil. If ability to pay is reflected in earning capacity, the 1960

¹⁷In property tax assessment, the terms quality and equity have similar meanings since both relate to fairness. Equal treatment of equals and unequal treatment of unequals ensures a high degree of fairness in assessment. Under present standards, quality is measured in terms of uniformity.

assessment should have contributed a semblance of equity to the distribution of the property tax burden on land.

Market value has long been accepted in South Dakota as the most reliable measure of worth or tax liability available. This concept has been upheld by the courts on numerous occasions. Presumably, the land values derived by any method of assessment would stand a better chance of acceptance if they were closely aligned with market values. For this reason, market value was used as the standard in this analysis.

This study was designed to measure any change in the quality of the assessment resulting from the use of the soil survey as the basis for valuing land. Two sets of assessment-sale ratios based on the 1959 and 1960 assessments were computed for a sample of unimproved tracts which were stratified according to physiographic area and kind of soil. The median and coefficient of dispersion for both sets of ratios were determined for the entire sample and for each of the strata. The coefficient of dispersion was used as a measure of the uniformity attained by the two assessments.

To supplement this analysis, the relationship between economic productivity and actual market value was determined by regression analysis for the tracts in each physiographic area. Also, the distributions of assessed values for 1959 and 1960 were compared for selected townships.

CHAPTER III

METHODS OF VALUING LAND

Kinds of Value

Land is a source of future earnings and other satisfactions, both tangible and intangible, which accrue to the owner. The tangible earnings associated with land ownership are measured by the amount of money income, while the intangible or psychic earnings are measured in terms of satisfaction. At a given time, the value of a property is equal to the discounted expected future net income plus the psychic satisfactions of ownership. The dollar value of this potential income is measured each time the property is sold on the competitive market. The market provides direct, factual evidence of worth and is considered to be one of the objective measures of value. Other kinds of value used in connection with appraisal theory are merely abstractions from market value.¹⁸ Loan and condemnation value, for example, are derivatives of market value selected to fit a particular purpose.

Values derived for tax purposes are also abstractions which need not be related to a specific monetary base in order to ensure equity among owners. In this case, emphasis is placed on the relative value of one property to another rather than on absolute dollar amounts. This comparative feature distinguishes tax appraisals from those made

¹⁸H. Van Vliet, "Value and Valuation Theory in Assessment," The Saskatchewan Rural Land Assessment System, 2nd Ed., by T. H. Freeman, W. E. Thompson, and C. H. Chappell, Published by Authority of Minister of Municipal Affairs, Regina, Saskatchewan, 1950, p. 119.

for other purposes.¹⁹ There is, however, a level of market value which best suits the purpose of taxation. In order to avoid undue criticism, the relationship between these two levels of value should conform roughly to the concept accepted by the public. In most states the ratio between assessed and market value is established by statute at a rather arbitrary level far below unity.

Standards of Value

Most students of land appraisal agree that the productivity of a farm must be appraised prior to its valuation by any method. Differences of opinion exist as to the best method for converting physical production estimates into value. Some prefer to use the actual sale prices of farms judged to be of similar productivity as standards of comparison while others favor the determination of value by the capitalization of estimated net income. These methods of valuation are similar in that both are related to a price level. Land values are determined by farm income and the prices received for farm products. Therefore, any level of land value selected for comparison in the sale value method will be based on a price level. The income approach makes more direct use of a price level, since actual values must be placed on both farm inputs and outputs.

¹⁹William G. Murray, "Principles of Valuation for Tax Purposes," Proceedings Land Valuation Conference, by Committee on Tenure Credit and Land Values, Northern Great Plains Advisory Council, Fort Collins, Colorado, June 17-19, 1952, p. 11.

Many rural appraisers in the United States and Canada rely heavily on net income estimates for valuing land. In Europe more emphasis is placed on the comparative sales approach.²⁰ Government agencies and private appraisal firms in this country often use both methods, one as a check against the other. Both approaches have merit and will be summarized in the discussion which follows.

Valuing Land by Capitalizing Net Income

This method of valuation is based on the fact that the net return to agricultural land is governed by the productivity of the soil.²¹ Within a particular climatic setting, soil productivity is the major factor which limits crop yields and net income. Over a period of years, higher net incomes per acre are realized from the more productive soils. To the extent that soil productivity is an element of value, this differential should be reflected in the appraised values of separate tracts of land.

This approach to value is based on an inventory of soil resources, probable physical production, prices, and costs. Net income may be figured by the rental share or owner-operator methods.

²⁰Van Vliet, op. cit., p. 122.

²¹Soil productivity is the capability of a soil to produce a specified plant or sequence of plants under a defined set of management practices. It is measured in terms of inputs of labor and materials in relation to outputs or yield. A productive soil possesses a balance of chemical, physical, and biological properties favorable for the economic production of the crops adapted to a particular area. (Soil Survey Staff, Soil Survey Manual, U.S. Department of Agriculture Handbook No. 18, August 1951, p. 367.)

Both have advantages and disadvantages in different situations, but with complete information the results should be similar.

Capitalizing the Rental Share

The rental share method, illustrated and discussed in detail by Murray,²² is most useful in a region where tenancy is common. Under this method, the landlord's average annual product, in the form of cash rent or a share of the crop, is converted into value using projected long-term prices. The common expenses of ownership, such as taxes, cost of seed, insurance, and maintenance, are then deducted from this gross income. The resulting figure represents the net return to the landlord for the use of the land.

The assumption made here is that the rate of return to landlords is comparable to the rate of return which farmers as a group receive on their investment.²³ The competitive market in which renters and landlords establish cash rents and rental contracts supposedly ensures this adjustment. Also, it is presumed that the rate of return from farming will determine whether the owner operates the land himself or leases it to a tenant.

Van Vliet expressed the opinion that this assumed degree of adjustment does not actually exist in most localities.²⁴ He

²²William G. Murray, Farm Appraisal and Valuation, 4th Ed., The Iowa State University Press, Ames, Iowa, 1961, pp. 211-237.

²³Van Vliet, op. cit., p. 136.

²⁴Ibid.

mentioned the effect of custom on rental agreements and cited evidence to indicate that a uniform rental share fails to distinguish between soils of different economic productivity. Estimates of landlord income in areas where renting is uncommon are not satisfactory because they bear no relation to fact.

Capitalizing the Net Income Realized by the Owner-Operator

The owner-operator method, outlined by Freeman, Thompson, and Chappell, has been used as the basis for rural land assessment in the Canadian Province of Saskatchewan since 1939.²⁵ Computing net income by this method entails a greater number of estimates since all farm expenses, including an allowance for unpaid family labor and interest on the operator's investment, must be subtracted from gross income. It is readily apparent that more cost-price data must be available for the effective use of this method. Aside from this common criticism, Van Vliet feels that the owner-operator approach is more realistic since it tends to reflect variations in soil, climate, and type of operation.²⁶

Regardless of the method used in estimating net income, the next step is the conversion of net return into value. Net return is

²⁵T. H. Freeman, W. E. Thompson, and C. H. Chappell, The Saskatchewan Rural Land Assessment System, 2nd Ed., Published by Authority of Minister of Municipal Affairs, Regina, Saskatchewan, 1950, pp. 139-265.

²⁶Van Vliet, op. cit., p. 138.

capitalized into an "earnings level of values"²⁷ which represents the current worth of the tangible portion of expected future income. The net money income must be sufficient to sustain the interest on the buyer's investment and thus support the value of the property over a period of years.

Finally, the less tangible elements of value, such as location and physical hazards, which may add to or detract from the income value of the land, must be accounted for. The final figure represents an average or normal value based on anticipated earnings. Over a period of years the market value of the property can be expected to fluctuate above or below the appraised value depending on the optimism of buyers and sellers.

Friedrich Aereboe, a German writer, sharply criticized the income approach on the grounds that it is "impracticable, unscientific and indefensible."²⁸ He emphasized the effect of small crop yield variations on net returns and pointed out the difficulty in selecting an interest rate for use in capitalization. G. C. Haas admitted that "land derives its value solely from its products, and, therefore, its value must be proportional to the value of its product."²⁹ However,

²⁷Ibid., p. 121.

²⁸Friedrich Aereboe, The Value of Landed Property, Based on its Net Revenue, its Purchase Price, and the Credit that it Commands, Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases, International Institute of Agriculture, November 1912, pp. 2344-2345.

²⁹G. C. Haas, Sales Prices as a Basis for Farm Land Appraisal, Minnesota Agricultural Experiment Station Technical Bulletin 9, St. Paul, November 1922, pp. 3-4.

he reasoned that the risk involved in predicting the present worth of future land products and the difficulty of estimating present and future production costs limits the usefulness of any appraisal scheme based on productivity. Karl Brandt also found greater merit in the comparative value method which employs actual sales data.³⁰

Van Vliet expressed the belief that some of the objections to the net income approach cited in the literature may reflect the environment of the writers.³¹ In his opinion, the success of the comparative sales method in many European countries has been enhanced by a more stable land market and a fairly regular turnover of land.

Criticism of the number of cost-price estimates needed for the computation of net income is not as valid as it once was. Farm management research conducted within the last fifteen years has removed some of the arbitrary element from these estimates.

Difficulties are encountered with the net income method when a high proportion of land value is due to the amenities or when a small portion of the income is derived from the soil.³² This is often the case with small acreages or specialized farms located near large cities. Substantial errors may also result in the appraisal of marginal farms. If receipts and expenses are nearly balanced, a slight

³⁰ Karl Brandt, "Land Valuation in Germany," Journal of Farm Economics, Vol. 19, No. 1, February 1937, p. 178.

³¹ Van Vliet, op. cit., p. 122.

³² William G. Murray, Farm Appraisal and Valuation, 4th Ed., The Iowa State University Press, Ames, Iowa, 1961, pp. 340-342.

change in net income will strongly affect the capitalized land value. Finally, the selection of a realistic capitalization rate which approximates that used subjectively by individuals in discounting the value of future income is still a major problem.³³

Valuing Land by Comparison with Actual Sales

This approach requires that a schedule of land values be developed from the actual sales which have occurred in a particular county, physiographic area, or type-of-farming area. Each transaction used as a reference in this schedule must be checked for validity and classified according to soil resources and non-income features. The current value of other land is then determined by comparing it with these established standards of market value.

The use of selected sales as indicators of the market's reaction to different kinds of land is sound in itself. It can be justified on the grounds that sale prices are objectively determined by the forces which govern the free market. They are established by the competitive bargaining of actual buyers and sellers and are supposedly free of all arbitrary judgments. In actual practice, however, the objective quality may be entirely lost in the process of comparing other land with the selected standards.³⁴ Sections of land with similar relief often appear to be of uniform quality, but different

³³Van Vliet, op. cit., p. 125.

³⁴Ibid., p. 123.

soil patterns may contribute to a wide spread in the net returns from the various quarter sections. Some differences in income potential are readily apparent from the qualitative standpoint but are difficult to judge and express quantitatively. Any technique which involves human judgment in comparing one quarter section of land with another is subject to the same error associated with the judgment estimates used when land values are based on income estimates. The range of this error is substantially reduced if the comparisons can be made with the help of a detailed soil map.

Soil productivity differences are commonly cited as the prime reason why farm land prices vary within a particular area. Buyers (particularly investors) and sellers presumably consider the income potentials of the various grades of land in making their decisions. If expected income were the only consideration, sale value would be merely an index of future land income as estimated by buyers and sellers. There is evidence to indicate that, because of special circumstances, individuals sometimes place far more emphasis on other aspects of property, both tangible and intangible.

Binkley,³⁵ in a study of the Spink County land market for the year 1958, found that 44.2 percent of the tracts offered for sale were purchased for farm enlargement. It is conceivable that a farmer in need of additional land to maintain an economic unit might place

³⁵Kenneth J. Binkley, An Analysis of Farm Enlargement by Owner-Operators in Spink County, South Dakota, 1958, Unpublished Master's thesis, South Dakota State College, Brookings, December 1959.

considerable emphasis on location with respect to his present headquarters. Federal farm policies such as acreage allotments and diversions are known to influence land prices. Some individuals express a preference for rolling as opposed to level land, or they may be willing to pay a premium for the privilege of living in a certain community. Any of these factors may strongly affect the selling price of a given property, but they do not appeal equally to all prospective buyers. Each example might represent a valid transaction in which soil quality received secondary consideration.

It is apparent that the successful use of the comparative sales method depends upon the proper interpretation of the sales used as standards of market value. Specific circumstances surround each sale; buyers and sellers bargain with different objectives and levels of knowledge. While it is possible to select standards for defining a bona fide transaction, the analyst often lacks complete knowledge of the conditions under which the sale was made. For this reason, little weight should be placed on any one sale. The safety in the use of sales data as a value indicator lies in the number of observations selected.

Appraised values determined by the capitalization of estimated net income or based on the comparative sales method will be consistently more accurate if based on a detailed soil survey. The use of soil survey information in appraising land for tax purposes will be discussed in the next chapter with particular reference to the application used in Spink County, South Dakota.

CHAPTER IV

THE SOIL SURVEY AS THE BASIS FOR VALUING LAND
FOR TAX ASSESSMENT

Introduction

An equitable distribution of the tax burden among individuals is a prime objective of taxation. In this society, equity in taxation is often thought of as tax payments in accordance with ability to pay. Accurate and systematic assessing procedure facilitates equity in property taxation. Basing assessed land values on the net income producing capacity of the soil helps to achieve equity by placing the owners of land with similar productivity in like circumstances.³⁶

³⁶Since about 1935, various writers have published papers and bulletins outlining methods of using the soil survey in appraising land for tax assessment. Several of these publications are essentially reports on its application and use in different states and type-of-farming areas. (Andrew R. Aandahl, "Using Soil Survey Information in Land Valuation for Tax Assessment," Soil Science Society of America Proceedings, Vol. 17, No. 3, July 1953, pp. 293-294; Andrew R. Aandahl, William G. Murray, and Wayne Scholtes, "Economic Rating of Soils for Tax Assessment," Journal of Farm Economics, Vol. XXXVI, No. 3, August 1954, pp. 483-499; Harold G. Halcrow and H. R. Stucky, Procedure for Land Reclassification in Montana, Montana Agricultural Experiment Station Bulletin 459, Bozeman, February 1949; Charles E. Kellogg and J. Kenneth Ableiter, A Method of Rural Land Classification, U.S.D.A., Technical Bulletin No. 469, February 1935; A. J. Klingelhoets and P. C. Westin, Soil Survey and Land Valuation for Tax Purposes, Agronomy Department, Agricultural Experiment Station, South Dakota State College, Circular 109, Brookings, June 1954; Quentin W. Lindsey, A Procedure for the Equitable Assessment of Nebraska Farm Land, Agricultural Experiment Station, University of Nebraska, Bulletin 400, Lincoln, December 1950; H. H. Lord, S. S. Voelker, and L. F. Giesecker, Standards and Procedure for Classification and Valuation of Land for Assessment Purposes in Montana, Montana Agricultural Experiment Station Bulletin 404,

Each taxable unit of comparable land receives essentially the same basic assessed value.

The 1960 assessed value for each parcel of agricultural land in Spink County was based on estimated net income determined by the owner-operator method. Relative economic ratings, developed from the net income figures, were used to reflect differences between soils and between tracts of land. The economic rating for each tract was

Bozeman, 1942; Howard W. Ottosen, Andrew R. Aandahl, and L. Burbank Kristjanson, Valuation of Farm Land for Tax Assessment, Agricultural Experiment Station, University of Nebraska, Bulletin 427, Lincoln, December 1954; W. H. Scholtes and F. F. Riecken, "Use of Soil Survey Information for Tax Assessment in Taylor County, Iowa," Soil Science Society of America Proceedings, Vol. 16, No. 3, July 1952, pp. 270-273; R. Earl Storie and Walter W. Weir, "The Use of Soil Maps for Assessment Purposes in California," Soil Science Society of America Proceedings, Vol. 7, 1943, pp. 416-418; C. C. Taylor, G. H. Aull, C. E. Woodall, and W. J. Paver, Jr., Suggested Procedures for the Assessment of Farm Real Estate in South Carolina, Clemson Agricultural College, South Carolina Agricultural Experiment Station Bulletin AE 188, Clemson, January 1960.)

The proceedings of conferences on land classification and valuation contain papers and summaries of discussions on the subject. (Committee on Tenure Credit and Land Values, Great Plains Agricultural Council, Proceedings Land Classification Conference, Omaha, Nebraska, April 1-3, 1957; Committee on Tenure Credit and Land Values, Northern Great Plains Agricultural Advisory Council, Proceedings Land Valuation Conference, Fort Collins, Colorado, June 17-19, 1952; The Classification of Land, Proceedings of the First National Conference on Land Classification, Agricultural Experiment Station, University of Missouri, Bulletin 421, Columbia, December 1940.)

Textbooks on farm appraisal include sections on this topic. (William G. Murray, Farm Appraisal and Valuation, 4th Ed., The Iowa State University Press, Ames, 1961, pp. 344-366.)

The authors of a recent tax study in North Dakota recommended the use of soils data as a means of achieving equity in assessments. (William E. Koenker and Glenn W. Fisher, Tax Equity in North Dakota, North Dakota Economic Studies No. 4, Bureau of Business and Economic Research, University of North Dakota, Grand Forks, September 1960, p. 59.)

converted directly into a relative value, and no attempt was made to approximate current market value by capitalizing net income. A summary of the procedure used in developing the economic ratings is contained in the following sections.

Nature of the Soil Map

The soil map provides the physical basis for comparing one piece of land with another. It shows the extent and distribution pattern of the different soils³⁷ or combinations of soils which make up the landscape. Other natural and cultural features such as the drainage pattern, depressions and lakes, buildings, roads, and railroads are also indicated.

Each delineation on the soil map refers to a separate portion of the land surface. It may be relatively homogeneous with respect to the internal and external soil properties and thus contain only one soil type, or it may be a complex of two or more soils with contrasting properties. In either case, the soil units shown are defined so that the map can be interpreted for the maximum number of uses.

By using a uniform system to describe the soil properties which can be recognized in the field, it is possible to classify the soils

³⁷ Soils are defined in terms of observable features such as the color, texture, structure, consistence, thickness, and arrangement of the horizons or layers which compose the soil profile. Differences in soil depth, slope, stoniness, and erosion which are judged to have practical significance in land use are separated as soil phases within a given soil type. From the properties which denote soil types and phases, such things as natural drainage, permeability, organic matter content, tilth, and fertility level may be inferred.

of a county into groups of like individuals with similar management problems and yield potentials. The next step is to determine the capacity of these groups of similar soils to produce crops within a specific agricultural setting. These are important considerations in appraising land for any purpose, since they are related to both present and future productivity.

Estimating Physical Production

The production of an acre of land results from the interaction of climate, soil, and management. The nature and intensity of management varies with land use. Rangeland, for instance, requires less intensive management than do vegetable crops produced under irrigation. Yield estimates are made with specific reference to land use and defined soil management practices. Once the conditions of management have been selected, the average yield for each of the crops commonly grown on each soil can be estimated.

The levels of management used in making estimates of physical production are usually intended to represent (1) the common methods used by the majority of successful farmers in the area, (2) the practices used by the outstanding operators, or (3) the best methods known through state, federal, and private research. In land valuation for tax assessment, the crop yield estimates are based on the first of these alternatives. This allows recognition of the typical or "most likely" management situation for each soil unit and avoids the necessity for establishing conditions of average management which would not apply equally to all soils. Since the estimated crop yields for

a particular soil are those commonly attained by the typical farmer, superior management is not penalized; and assessed values are based on the physical attributes of the land which are not subject to rapid change.

Field estimates are based on farm records, the research of state and federal agencies, and a knowledge of soil properties interpreted through field observations. When production data is limited, as is often the case with the less extensive soils, judgment and the ability to interpret field observations become more important. The accuracy of these estimates has increased along with our knowledge of soil and plant science. They are essential to any method of land valuation based on net income but require additional interpretation in the field of economics.

Economic Ratings

General

In order to compare one piece of land with another, criteria must be developed for rating the soil types involved. Yield of the main crop per acre, feed units per acre, and gross income per acre have all been used for this purpose. These ratings make no allowance for production costs and, therefore, do not indicate the income-earning capacity of the soils. Economic ratings, however, are based on net income and can be calculated for any combination of crops, including pasture and timber. They are developed systematically through a series of estimates based on available knowledge conditioned

by judgment. When computed for different soil types, they provide an economic basis for making comparisons between soils.

In most areas the soils are distributed over the landscape in an intricate pattern such that each section of land contains a combination of soil types. Some soils are suitable for crop production while others are best used for pasture. The soils suited for the production of crops generally produce more net income when used for that purpose. Natural and cultural boundaries, however, often determine the best use for a particular portion of the landscape. Some areas of potentially productive soils, transected by highways, railroads, and streams, are not cultivated because of size or irregular shape. Other small tracts may be associated with areas of nonarable land or isolated by ownership lines. Under these conditions, production costs are high; and more income may be realized from uses other than crop production. Hence, areas of the same kind of soil often require different economic ratings.

Ordinarily, the economic rating assigned to a particular area should be based on the use which promises the highest return rather than on present use. A pasture rating for an area of highly productive soil cannot be justified solely on the basis of current use. In some cases, however, the use of a crop rating which is lower than the pasture rating would be proper. For example, small patches of infertile claypan soils with a low cropland rating often occur in fields of highly productive soils. In this situation, the earning capacity

of the claypan soils might actually be less than areas of the same soil used for permanent pasture.

Economic Ratings for Cropland³⁸

Before the economic ratings for cropland can be computed, the typical rotations, management practices, and yields for each soil must be estimated. Next, the total production of each crop per 100 acres of each soil type is determined and converted into gross income using predicted prices. The expenses of crop production are estimated and subtracted from the gross return to arrive at a net income figure which reflects the earning capacity of the soil.

The relationship between gross income and expenses for cropland is illustrated by Figure II. Gross income from crops is directly related to soil productivity and yields, whereas the costs of production, generally, are not.³⁹ The extra labor needed to handle a larger volume of grain or hay and the additional storage facilities required account for the increasing expenses indicated in Figure II.

³⁸Howard W. Ottoson, Andrew E. Aandahl, and L. Burbank Kristjanson, Valuation of Farm Land for Tax Assessment, Agricultural Experiment Station, University of Nebraska, Bulletin 427, Lincoln, December 1954, pp. 19-22.

³⁹The exception to this occurs with some of the less productive soils. It may actually cost more to perform the tillage operations on hilly, stony, or claypan soils.

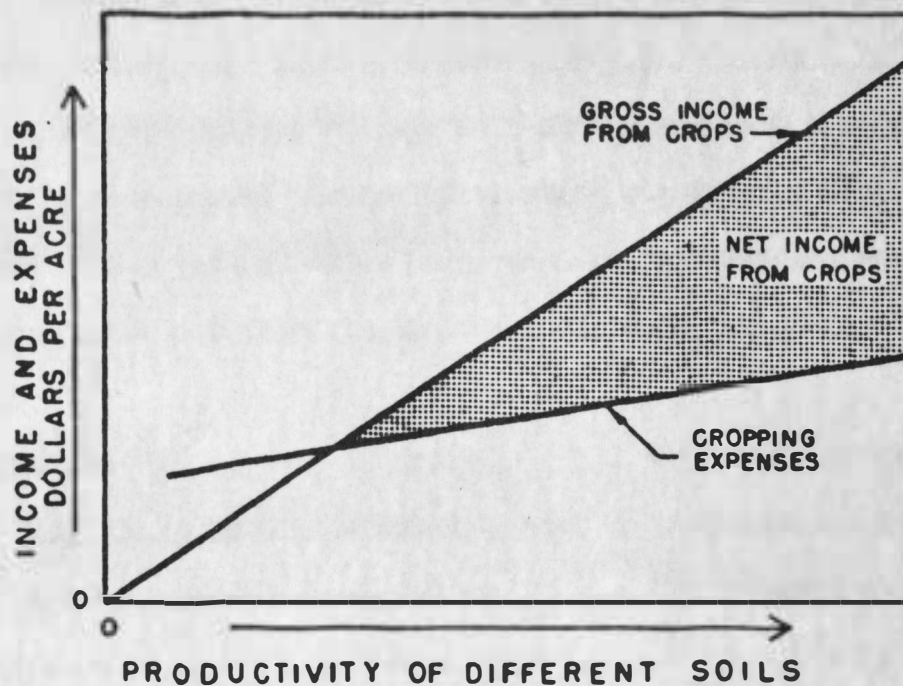


Figure II. The general relationship of gross income, expenses, and net income from crops on soils of different productivity

Source: Andrew R. Aandahl, William G. Murray, and Wayne Scholtes, "Economic Rating of Soils for Tax Assessment," Journal of Farm Economics, Vol. 36, No. 3, August 1954, p. 489.

The cost-price relationships selected should be the best estimate of the conditions which might confront the farmer in the near

future.⁴⁰ The immediate years should receive more emphasis than those in the more distant future. Possible changes in the farm program such as support prices, acreage allotments, and marketing quotas should also be considered. Census data, state statistical reports, publications of the United States Department of Agriculture, and the state agricultural experiment stations are the main sources of this material.

Since farm prices tend to fluctuate with the supply of farm products, they are difficult to predict even for the years in the immediate future. Wide disagreement can be expected regardless of the level of prices used. Once selected, however, the same price is applied to all units of a particular crop regardless of the soil on which it was grown.

The expense of producing a crop includes charges for field operations, handling, and storage plus an allowance for supplies such as seed, fertilizer, and chemicals. The cost of the various field operations can be taken as the prevailing custom rate or compiled by summing the expenses associated with machine and tractor cost per acre,

⁴⁰These estimates are critical since the cost-price relationships used in figuring net income affect the relative economic ratings between soils. During a period of years in which prices are rising, crop prices will ordinarily be high relative to costs. Under these circumstances, the economic rating of a soil with low earning capacity, figured periodically over a series of years, would tend to rise faster than that of a soil with high earning capacity. Conversely, when crop prices are declining, they tend to fall more rapidly than costs. The relative rating of a low income soil computed at intervals over such a period of years would tend to decrease faster than the rating of a high income soil. (Ottosen *et al.*, *op. cit.*, p. 21.)

labor, and management.⁴¹ Custom rates are considered to be fairly reliable expense estimates in areas where there is an active demand for a particular service. However, they must be used with judgment.

Economic Ratings for Permanent Pasture⁴²

The development of economic ratings for permanent pasture requires a separate approach from that used for cropland because of the different income-expense relationships. Figure III shows that gross income and pasture expenses maintain a fairly close relationship as soil productivity increases. This occurs because the value of pasture and the expenses associated with it are directly related to carrying capacity.⁴³ The expense of maintaining a given number of animals on pasture remains fairly constant regardless of the quality of the pasture. As carrying capacity increases, the expenses associated with the larger herd also increase.

⁴¹While the owner-operator method entails many subjective estimates, it allows recognition of any differential between soils in the cost of producing a crop. Allowances can be made for the number of operations required and any variation in the cost of each. For instance, more tillage operations are required to prepare a clay soil for seeding than for a sandy soil; the cost of tractor power is probably greater on hilly land as compared to level land.

⁴²Ottemson et al., op. cit., pp. 22-24.

⁴³Carrying capacity refers to the number of days a cow can be pastured on an acre during a normal grazing season. The yield of a pasture capable of supporting one cow for each three acres during a six month grazing season would be 60 cow-days per acre.

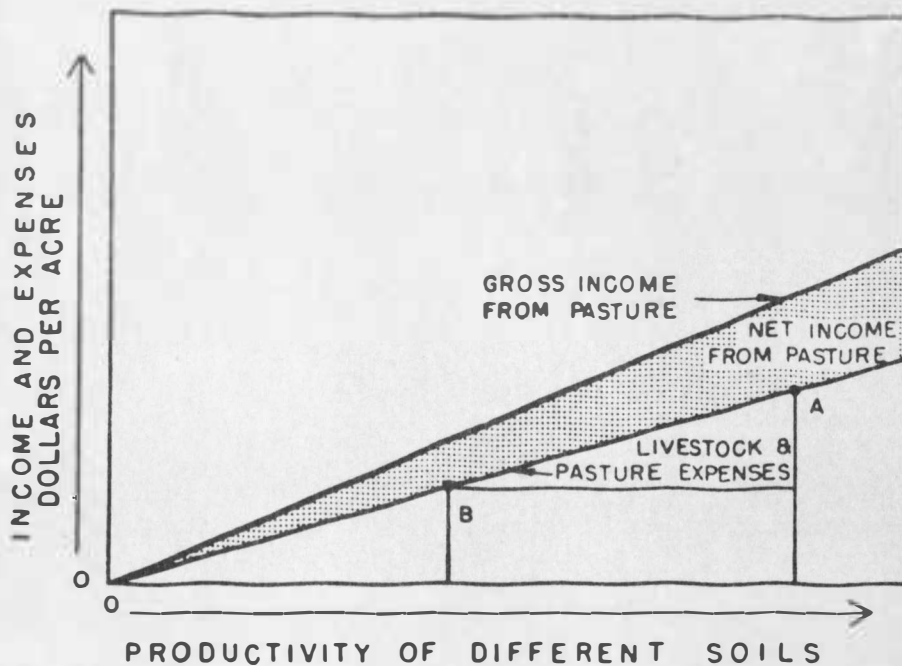


Figure III. The general relationship of gross income, expenses, and net income from permanent pasture on soils of different productivity

Source: Andrew R. Aandahl, William G. Murray, and Wayne Scholtes, "Economic Rating of Soils for Tax Assessment," Journal of Farm Economics, Vol. 36, No. 3, August 1954, p. 490.

The contrast between net income from cropland and from permanent pasture on soils of varying productivity is shown in Figure IV. To the right of the "balance point," crops should yield more profit than pasture; to the left, the opposite is true. At this point the soils become marginal for crop production, and net receipts are about the same regardless of whether they are used for pasture or crop production. In a particular county the "balance point" can be determined largely by observation. About half of the area of a soil which fits

this portion of the productivity scale will be cropped while the rest will be used for pasture.

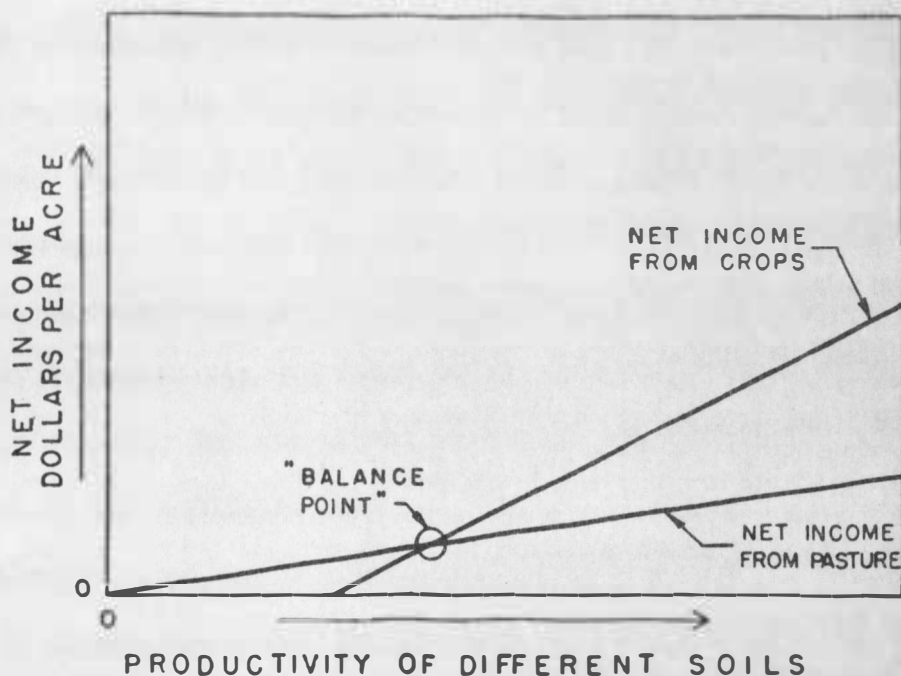


Figure IV. The general relationship of net income from crops and from permanent pasture illustrating the "balance point"

Source: Andrew R. Aandahl, William G. Murray, and Wayne Scholtes, "Economic Rating of Soils for Tax Assessment," Journal of Farm Economics, Vol. 36, No. 3, August 1954, p. 491.

Once determined for a county, the "balance point" can be used to obtain a pasture rating for each of the other soil units. First, the ratio between carrying capacity in cow-days per acre and the relative economic rating for crops must be figured for the soil judged by observation to be at or near the "balance point." The pasture rating for any other soil can be obtained by multiplying this ratio by the

pasture yield (cow-days per acre). If more than one "balance point" soil is involved, the average ratio is used as the conversion factor.

The Spink County Application

The net income figures computed for each soil in Spink County were used as the basis for developing the economic ratings for crop production. The soil with the highest income potential per acre was given a rating of 100, and the crop ratings for the other soils were determined by expressing the net income from crops as a percentage of the income estimated for the first soil. Pasture ratings based on the balance point ratio for the county were also calculated for each soil unit shown on the published map.

Assessment policy in South Dakota requires that every quarter section of agricultural land or fraction thereof be evaluated separately. Therefore, each soil unit or delineation within each taxable tract in Spink County was measured and given the appropriate economic rating. The composite or weighted average economic rating for each tract was then derived as illustrated by the hypothetical example presented in Figure V. The unadjusted assessed value for each tract of land in Spink County was obtained by multiplying the sum of the products (Figure V) by a conversion factor or constant.⁴⁴ The factor (.538) was obtained by comparing the assessed values and sale prices

⁴⁴The market value of the most productive soil in the county was conservatively set at \$100 per acre for tax purposes. Since the economic ratings also relate to a top of 100, they convert directly to relative dollar values.

of quarter sections of land without buildings sold over a two-year period previous to 1960. The figure is based on an average of verified sale prices with a judgment allowance for inflation.

Owner _____				Property No. _____	
Legal Description _____					
				Acres _____	
SOIL NO.	ACRES	RATING	PRODUCT		
1	49	67	3283	Total.....	11694
15	17	98	1666	X Constant.....	538
44	6	27	162	Unadjusted Assessed	
49	21	58	1218	Valuation.....	6291
55	56	85	4760	Other Factors	
92	11	55	605		
				Adjusted Assessed	
				Valuation.....	
Total....		160			11694
Average Relative Rating					73.09

Figure V. Computation of assessed valuation

The problem of selecting a conversion factor is essentially one of deciding what level of value best serves the purpose of taxation.

If the same factor is used for all taxable tracts, any differential between Properties expressed in the economic ratings will be translated into relative dollar values. In tax base determination, the proper relationship between properties is of prime importance.

Other factors aside from soil productivity must be considered in tax base determination.⁴⁵ Preliminary dollar values must often be adjusted for income factors not included in the economic ratings. Flood hazard, for instance, cannot be interpreted from the soil map since the magnitude varies with areas of the same soil. Additional adjustments are generally made for the non-income elements of value such as location and accessibility.

In Spink County, the 1960 assessment of agricultural land was based on the unadjusted assessed values without modification. Since then, adjustments have been made for the flood hazard on some of the bottomland soils and pasture ratings have replaced crop ratings in a

⁴⁵With respect to the farm as a unit, consider the case where the enlargement of an existing unit results in decreasing costs of operation. The acquisition of an additional 80-acre tract may result in a higher net income for the whole operation without appreciably increasing the present outlay for labor and machinery. If the increase in net receipts were substantial, the average value of the unit might rise above the estimated value of the 80-acre tract alone. Should this land be assessed at a higher dollar value than an adjoining 80-acre tract with similar soils which stands by itself? In the writer's opinion, the potential administrative difficulties preclude this approach. A thorough analysis of each farm business would be required and more judgment decisions would be necessary. In the case of leased land, the assessed value would be subject to change each time a new rental agreement was made. The constant fluctuations in assessed values necessitated by short term leases would be difficult to justify.

number of areas where cultivation was restricted by stones. Further refinement with respect to both income and non-income factors is anticipated by the county director of equalization as the need arises and time permits.

CHAPTER V

SOLVING THE PROBLEM

Selection of the Study Area

In order to evaluate the soil survey as a means of attaining equity in the assessment of farm land, it was necessary to select a county in which local officials were using soils data rather than sale values as the basis for assessment. At the time this study was initiated, Spink County was the only county in South Dakota which met the requirements. Other counties have since begun to base their assessments on soil survey information.

Description of the Study Area

Location and Extent

Spink County, with an area of 963,840 acres, lies in the east-central portion of the state and is bordered by Brown, Day, Clark, Beadle, Faulk, and Hand Counties.⁴⁶ Redfield, the county seat, is located in the west-central part of the county at the junction of United States Highways Number 212 and 281.

Physiography and Drainage

Spink County is centrally located in the northern part of the James River Basin. Surface drainage is from north to south via the

⁴⁶P. C. Westin, G. J. Buntley, W. C. Moldenhauer, and F. E. Shubeck, Soil Survey of Spink County, South Dakota, Bulletin 439, Agronomy Department, Agricultural Experiment Station, South Dakota State College, Brookings, June 1954, p. 1.

James River and its tributaries. The county includes areas with contrasting surface features and soil materials which correspond to the areas of Figure VI. Area A, formerly covered by Glacial Lake Dakota, is a level plain except for a few shallow stream valleys. The soil materials are mainly laminated lake sediments of silt and clay. Area C is a nearly level to hummocky plain consisting mostly of sandy glacial meltwater deposits. Areas B, D, and E are gently undulating to rolling uplands of glacial till characterized by many short, convex slopes. Numerous poorly drained depressions occur in the low portions of the landscape, particularly in Areas B and E.⁴⁷

⁴⁷Ibid., pp. 1-5.

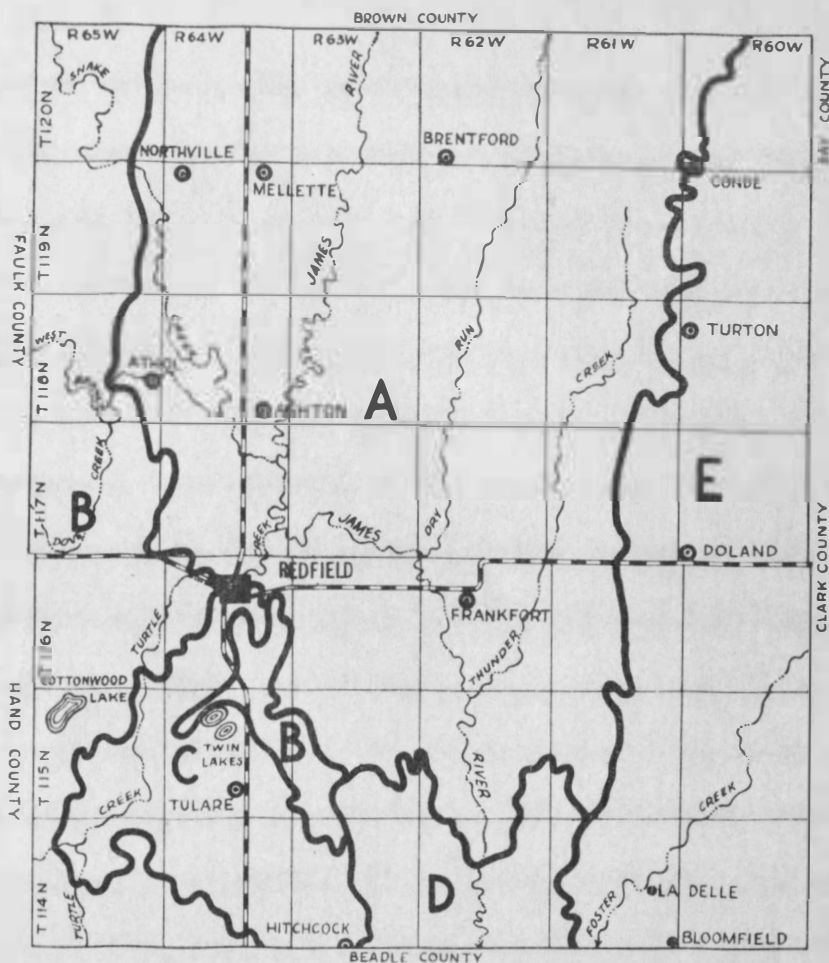


Figure VI. General soil areas of Spink County

A. Nearly level, medium to fine-textured soils of the Lake Bed. (Chiefly Aberdeen, Beotia, and Harmony)

B. Undulating to rolling, medium-textured soils of the upland. (Chiefly Houdek and Bonilla)

C. Nearly level to hummocky sandy soils. (Chiefly Hecla

and Wessington)

D. Nearly level, moderately fine-textured soils of the upland. (Chiefly Beadle soils with non-saline parent materials)

E. Undulating to rolling, moderately fine-textured soils of the upland. (Chiefly Houdek, Beadle, and Cavour)

Source: F. C. Westin, G. J. Buntley, W. C. Moldenhauer, and F. E. Shubeck, Soil Survey of Spink County, South Dakota, Bulletin 439, Agronomy Department, Agricultural Experiment Station, South Dakota State College, Brookings, June 1954, p. 2.

Soils

Many of the soils in Spink County strongly reflect the environmental influence of the dry subhumid climate and native grass vegetation under which they have developed. The regional influence of these two factors is fully expressed in a group of well drained soils called Chernozems which have thick, dark surface layers high in organic matter and brownish subsoils which grade into layers of lime accumulation. In addition to the Chernozems, each of the major soil areas shown in Figure VI contains other groups of soils—Regosol, Alluvial, solonchak, Humic Gley, Calcium Carbonate Solonchak—which exhibit the regional characteristics of the Chernozem soils to a limited degree. In the development of these soils, the effect of climate and vegetation was modified by factors such as relief or drainage, variations in the parent material, and age. When one of these factors became the dominant influence, soils with different and often contrasting features were formed. Members of these broad soil groups developed from a variety of materials, including loamy glacial till, lake sediments of silt and clay, sandy materials deposited by water, and silty sediments laid down by the wind.

The Regosols, a group of soils with thin surface layers, generally occupy the steep slopes where runoff is high. These soils retain many features of the Chernozems but are less sensitive to the regional environment because of their position in the landscape. They often occur in close association with the Chernozems in rolling and hilly terrain.

Alluvial soils occur on the flood plains and low terraces of rivers and streams. These positions are normally inundated every few years and receive fresh deposits of sand, silt, and clay. The imprint of regional climate and vegetation on the soil material has been restricted due to the short period of time that it has been exposed to the forces of nature.

An extensive group of soils, designated collectively as solonetzic soils, owe their development to conditions of impeded drainage and an excess of sodium salts which caused the clay fraction of the soil to disperse. A dense, slowly permeable claypan, formed within a few inches of the surface, restricts moisture penetration and root growth in many of these soils. With improved drainage, the sodium salts are removed from the soil and the dispersed layer is altered, gradually becoming more permeable. The properties and productive capacities of the soils in this group vary over a wide range depending on the stage of development. They may occur in small patches associated with the Chernozems, or they may dominate large portions of the landscape.

The Humic Gley soils occur in the closed depressions of the upland and on the flat bottomlands of the James River drainage system. Relief or landscape position accounts for the poorly drained condition of the soils in this group.

The Calcium Carbonate Solonchaks have developed under the influence of a high seasonal water table on low-lying flats adjacent

to sloughs. A layer of accumulated carbonate or lime occurs directly beneath the plow layer.

Collection of Data

Much of the data used in testing the hypothesis was available from secondary sources. Information on each farm real estate transfer occurring in 1955, 1956, and 1957 was obtained from records of the Department of Economics at South Dakota State College. Similar data for the transactions occurring during 1958, 1959, and 1960 were obtained from county records at Redfield. A copy of the form used for recording the data is shown in Appendix A.

Only warranted sales and contracts for deed which seemed to represent "arms length" transactions between willing buyers and willing sellers were used as indicators of value. A number of recorded transactions which did not appear to reflect the action of the free land market were eliminated. The following types of transfers were presumed to be unsuitable.

1. Transfers between related individuals.
2. Transfers resulting from condemnation proceedings, foreclosures, or judicial orders⁴⁸ which might involve an element of compulsion on the part of either buyer or seller.
3. Transfers of convenience (i.e., to correct defects in title, create joint tenancy, reorganize or reconvey property).

⁴⁸Warranty deeds given by the executor of an estate were presumed usable only if they could be verified.

4. Sales to nonprofit organizations.
5. Trades or exchanges of property.
6. Sales involving any government agency.
7. Sales to lending agencies.
8. Sales made subject to long-term leases or when essential rights, such as life estates, were reserved by the deed.
9. Sales involving partial interests.

The sale price for each transfer which seemed to meet the tests of a fair and voluntary transaction was estimated from the federal revenue stamps if not definitely stated in the deed.⁴⁹ Law requires that 55 cents in stamps be applied for each \$500 of consideration or fraction thereof. For purposes of estimation, it was assumed that the consideration was midway between the minimum and maximum values indicated by a specific amount of stamps. This was done to minimize any error introduced by estimation.

⁴⁹Discrepancies between the actual consideration stated in the deed and the amount indicated by the attached stamps were noted in a few cases. This indicates that the regulations governing the use of stamps have not been uniformly interpreted by those furnishing advice to property owners. A Report by the Committee on Sales Ratio Data of the National Association of Tax Administrators, Guide for Assessment-Sales Ratio Studies, June 1954, p. 12, states that systematic and sometimes deliberate errors have been made in the determination of the Federal tax liability on deeds in certain areas of the country. In discussing this problem, Fisher suggested that more valid sales ratio studies could be made if the persons involved in the transaction were required by law to disclose the actual price and terms of the sale. (William E. Koenker and Glenn W. Fisher, Tax Equity in North Dakota, North Dakota Economic Studies No. 4, Bureau of Business and Economic Research, University of North Dakota, Grand Forks, September 1960, p. 59.)

In the case of small tracts, the possible discrepancy between the true sale price and an estimate based on federal revenue stamps was much greater. For this reason, transfers involving less than 80 acres were not used unless the actual consideration was stated in the deed or could be determined by other means.

Since the procedure for assessing farm buildings was not standardized at the time the data were collected, only those tracts without buildings were used in the main analysis.⁵⁰ This approach was justified because the building values in use reflected the judgments of the various township officials by whom they were established. It is probable that discrepancies in the assessed values of buildings

⁵⁰ Two recent studies in Spink County provide some justification for disregarding buildings completely. A land market study by Kenneth J. Binkley, An Analysis of Farm Enlargement by Owner-Operators in Spink County, South Dakota, 1958, Unpublished Master's thesis, South Dakota State College, Brookings, December 1959, showed that 44.2 percent of the farm real estate which sold in 1958 was purchased for the purpose of enlarging farms which were operating as units. It seems unlikely that extra buildings apart from the established headquarters, especially partial sets, would add much to the efficiency of the farm business.

An analysis of the contribution of buildings to farm real estate values in Spink County was made by Joshua P. Robinson, A Farm Building Evaluation Technique for Tax Assessment, Agricultural Economics pamphlet 70, Agricultural Experiment Station, South Dakota State College, College Station, April 1956. Statistical comparisons were made between different productivity groups for 320 and 160 acre tracts, with and without buildings. The study indicated that buyers as a group had not consistently paid a significant premium for land with buildings as compared to land without buildings.

Buildings may be either an asset or a liability to a particular buyer depending on whether they contribute to or detract from the efficiency of his operation. Therefore, it does not seem valid to make a general assumption that farm buildings contribute nothing to market value. Neither can it be assumed that their worth is adequately reflected in the sale price.

existed between townships and between farms within townships. Verifying this hypothesis would involve a project in itself.

The economic rating and the 1959 and 1960 assessed values for each parcel of land were secured from the office of the county director of equalization at Redfield, South Dakota. Agricultural Experiment Station Bulletin 439, Soil Survey of Spink County, South Dakota, was used to identify the soils involved in each transaction.

Verification of Data

The presumptions cited in the previous section which were applied in determining the usability of a sale served to eliminate the obvious family transfers, trades, and compulsion sales. The transfers which took place between May 1, 1957 and April 30, 1960 had undergone further editing by Mr. Leon Hanson, Spink County Director of Equalization, prior to their use in an assessment-sales ratio study for the South Dakota Department of Revenue. By contacting local abstractors, bankers, and real estate agents, he attempted to ascertain the validity of each transfer. The less obvious family transactions, an occasional warranty deed granted on settlement of a

contract for deed,⁵¹ and a few sales involving other property were uncovered by this method. The remainder of the sales received a less intensive check by the writer with the help of Mr. Hanson in personal interview with the local abstractor.

A more thorough study of the entire group of sales was made by the use of a questionnaire.⁵² Each buyer whose present address could be found received an inquiry. If the buyer failed to respond, a second attempt at verification was made by contacting the seller. In this manner 47.8 percent of the 182 sales included in the sample were verified. Those for which no reply was obtained from either buyer or seller were retained if they seemed to meet the criteria stated in the previous section.

While it was not possible to learn the terms and details of every sale, the accuracy of the whole body of sales data for the

⁵¹In this study it was necessary to establish the approximate date of the original agreement between buyer and seller so that an index of value could be developed for each of the six years included in the sample. The date of transfer shown on a warranty deed is not always reliable because all warranty deeds do not represent current sales. Some are given on fulfillment of a contract which was negotiated months or years before the deed was granted. Hence, the date of the contract corresponds to the date of the original purchase agreement. Unless a contract has been recorded in the public records, and many are not, the analyst cannot ascertain the actual date of the sale without additional help from one familiar with it.

⁵²A copy of the original questionnaire and the accompanying letter of explanation are shown in Appendix B and C. The response from the first group of buyers indicated some misunderstanding in the case of items Number 2 and 3. The phrasing of these questions was changed in subsequent questionnaires to read as indicated in the sample copy found in Appendix D.

selected period was greatly improved by the verification procedure. The basis for drawing valid conclusions was also strengthened, since they were developed from the entire fund of information. One sale is of little value because of the wide variety of circumstances under which sales are negotiated.

Adjustment of Sale Prices

Since the sales data used in this study covered a span of six years, it was necessary to account for the changes in the general level of the land market during that period. All sales were adjusted to a common level (1960) by the use of the index numbers for Spink County shown in Table 4.

Table 4. Number of Sales, Average Sale Price, and Value Indexes, Land Without Buildings, Sold 1955-1960, Spink County, South Dakota, and Farm Real Estate Value Indexes, South Dakota, 1955-1960

Year	Number of sales	Average sale price	Index numbers	
			Spink County	South Dakota ^a
1955	34	\$43.13	100.0	139
1956	38	42.35	98.2	140
1957	33	45.40	105.3	146
1958	28	48.16	111.7	156
1959	31	60.94	141.3	171
1960	18	58.21	135.0	173

^a These index numbers were obtained by personal communication with Mr. Floyd E. Rolf, Agricultural Statistician, Acting In Charge, South Dakota Crop and Livestock Reporting Service, Sioux Falls, S.D. They were developed by the Agricultural Research Service from data supplied by The South Dakota Crop and Livestock Reporting Service, real estate dealers, and others in contact with the land market. They are based on subjective estimates and reflect the average market value of all farm land and buildings sold within the State of South Dakota. The numbers relate to March 1st of each year and to the 1947-1949 base period. They are listed here merely for comparison with the index numbers developed in connection with this study.

Quality of Land in the Sample

The use of a sample of the sales occurring in one year as the basis for an index of value might be criticized on the grounds that the range in the quality of land found in Spink County was not adequately represented in the sample. Further, it could be argued that such an index was merely a composite of the transfers included in the sample. The index numbers used in this study reflect the selling price of every unimproved tract of land sold during that particular year which met the requirements of a valid sale. The randomness of

the sample was conditioned by the natural selection of forces in the market place.

Table 5 shows the yearly variation in the quality of the land included in the sample as measured by the economic ratings of the various tracts. It is apparent that good quality farm land was offered for sale along with the poor in each of the years studied.

Table 5. Number of Sales and Statistical Measures for the Distribution of Economic Ratings, Land Without Buildings, Sold 1955-1960, Spink County, South Dakota

Year	Number of sales	Economic rating ^a			Average economic rating for all tracts (weighted by acres)
		High	Low	Median	
1955	34	98.0	35.3	68.0	67.6
1956	38	92.9	32.2	68.4	56.4
1957	33	93.1	40.7	66.0	68.0
1958	28	93.5	44.2	72.8	71.8
1959	31	97.0	40.6	76.0	72.7
1960	18	89.1	40.6	70.6	69.0

^aHighest possible rating = 100.0.

Figure VII indicates that the economic ratings for tracts of land included in the sample approach a normal distribution.

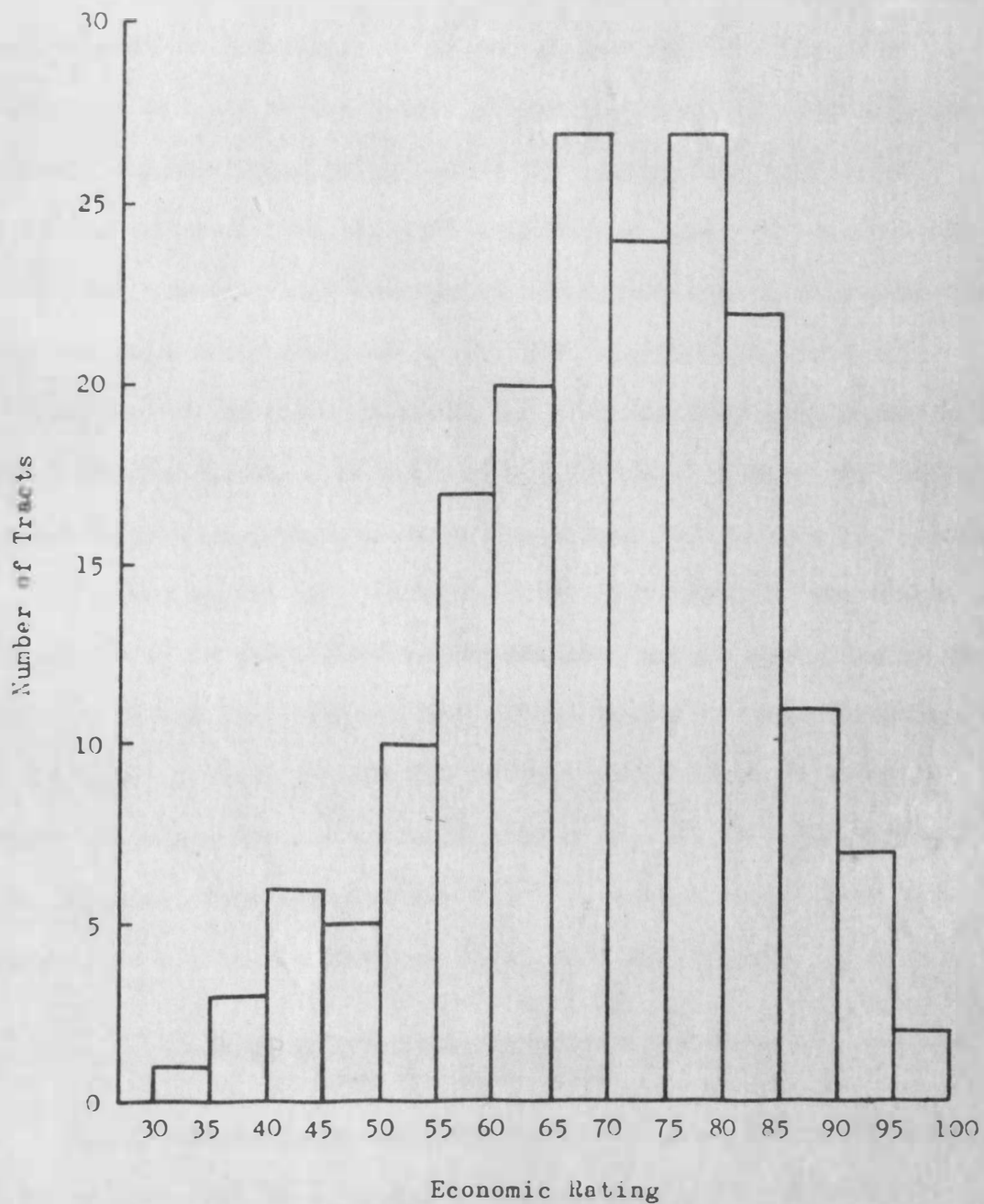


Figure VII. Distribution of economic ratings, 182 tracts, land without buildings, sold 1955-1960, Spink County, South Dakota

Computation and Use of Assessment-Sale Ratios

Two assessment-sale ratios were calculated for each piece of land included in the sample. The ratios derived from the 1959 assessments and the adjusted sale prices were used to determine the degree of uniformity existing before the reappraisal took place. The ratios computed from the 1960 assessments based on the soil survey and the same adjusted sale prices were analyzed to determine the degree of uniformity attained by the 1960 assessment. Ratios for the entire group of sales based on the 1959 and 1960 assessments were plotted against adjusted sale price and economic rating. The median and coefficient of dispersion were determined for each set of ratios.

Similar charts and statistics were developed for the transfers occurring in two separate physiographic areas, specifically the glacial till and lake plains. Regression equations were determined and the lines plotted to show the average relationship between assessment-sale ratio and economic rating in each area for 1959 and 1960. Further stratification based on the nature of the soil was accomplished within the group of till plain properties.

Relationship between Adjusted Sale Price and Economic Rating

The relationship between adjusted sale price and soil productivity as indicated by economic rating was studied for the two physiographic areas. Regression analysis was used to determine the influence of soil productivity on adjusted sale price in each area.

**Distribution of the 1959 and 1960 Assessed Values
for Selected Townships**

The effect of the reappraisal on the distribution of assessed values was studied on a limited basis. Four townships were selected to represent particular physiographic areas or combinations of areas. The mean assessed land value, standard deviation, and coefficient of variation for the 1959 and 1960 assessments were computed for each township. Column diagrams showing the concentration of values for the two assessments were also compiled.

CHAPTER VI

RESULTS AND DISCUSSION

Relationship between Assessment-Sale Ratio
and Adjusted Sale Price

In studying the relationship between assessment-sale ratio and sale price, tax investigators generally find that ratio declines as market value increases. This is due to a concentration of assessed values around the average and results in regressive taxation of property. The tendency to overassess property of low quality and underassess property which commands a higher price on the market has been repeatedly cited as one of the major inadequacies in the field of property tax administration.

Figure VIII shows that this relationship existed for the properties studied in Spink County when the ratios were based on the 1959 assessment. The same general tendency was evident when the ratios based on the 1960 assessment were plotted with adjusted sale prices (Figure IX). In the latter case, however, the points were more dispersed, indicating that the regressive nature of the property tax had been somewhat relieved. A tendency for the assessment-sale ratios to concentrate along a horizontal line would indicate that a high degree of uniformity had been achieved.

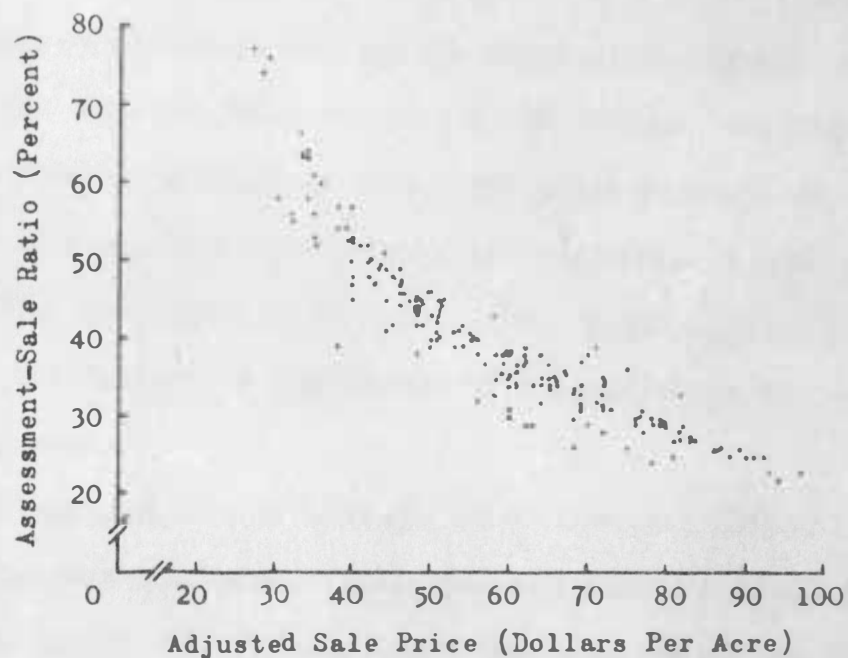


Figure VIII. Relationship between assessment-sale ratio based on 1959 assessment and sale price, 182 tracts, land without buildings, sold 1955-1960, Spink County, South Dakota

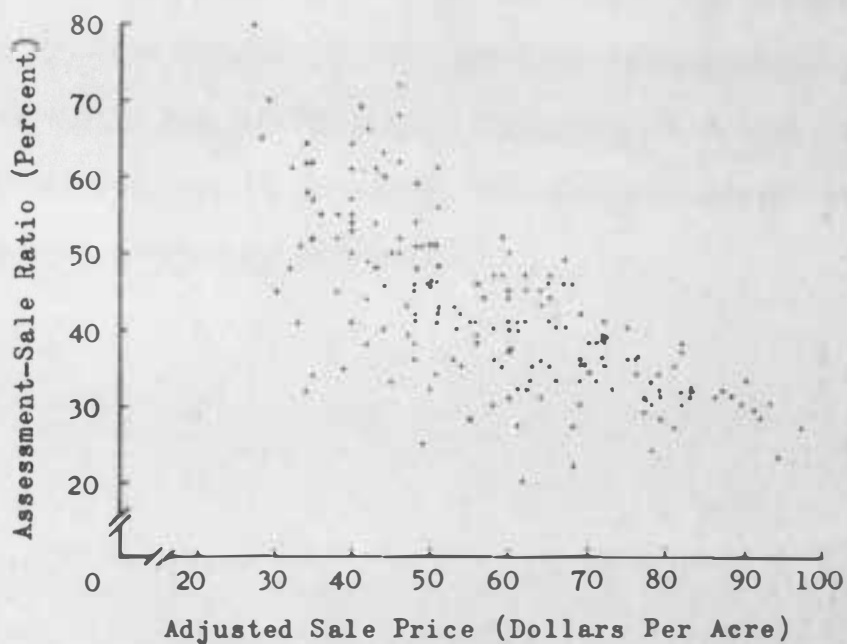


Figure IX. Relationship between assessment-sale ratio based on 1960 assessment and sale price, 182 tracts, land without buildings, sold 1955-1960, Spink County, South Dakota

Figures X through XIII provide similar comparisons for the glacial till and lake plain areas of Spink County. The regressive feature prevailed strongly in both areas prior to 1960. However, the 1960 appraisal did more to break the regressive tendency in the glacial till plain than in the lake plain. Using adjusted sale price as the standard, a high degree of uniformity was not achieved in either case.

In comparing assessment-sale ratios and sale prices of farm land, it is generally assumed that the more productive land brings the higher price. This is not always true even though the productive capabilities of the land have been correctly evaluated. Sale price includes an allowance for the intangible as well as the tangible features of the land resource. Because of individual preference, the intangible features occasionally receive more emphasis than the tangible or income earning features. Therefore, sale price and productive or earning capacity cannot be used interchangeably in comparison with assessment-sale ratio.

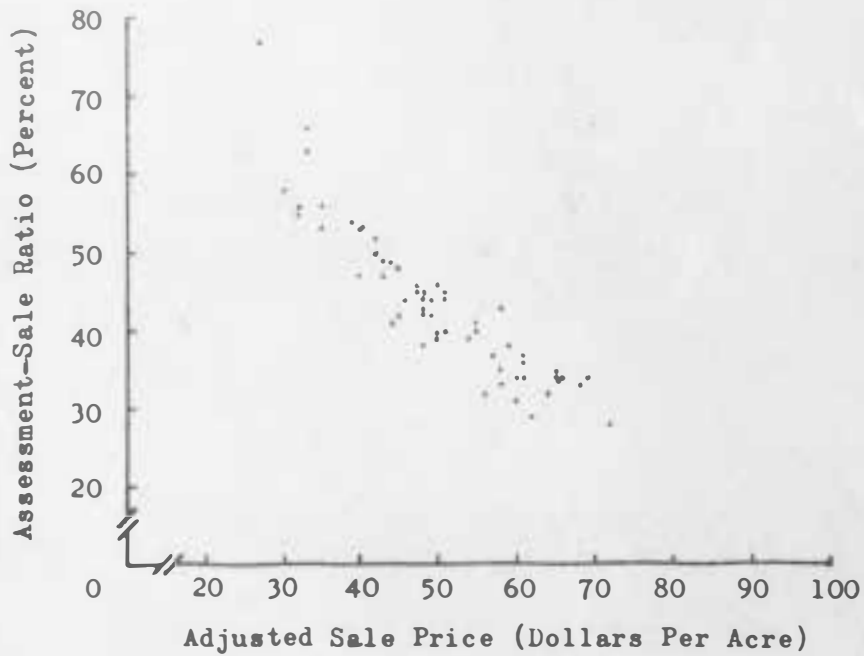


Figure X. Relationship between assessment-sale ratio based on 1959 assessment and sale price, 59 tracts, land without buildings, sold 1955-1960, glacial till plain, Spink County, South Dakota

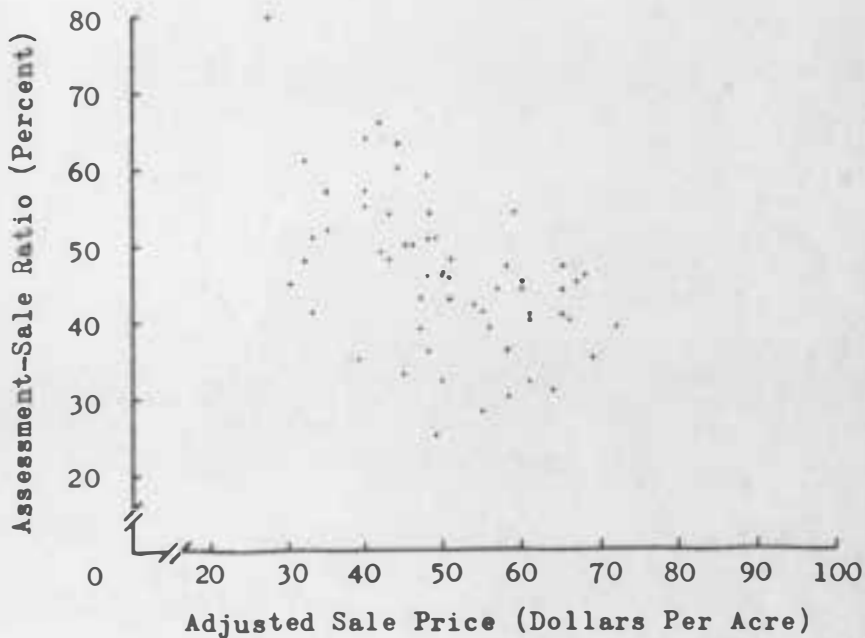


Figure XI. Relationship between assessment-sale ratio based on 1960 assessment and sale price, 59 tracts, land without buildings, sold 1955-1960, glacial till plain, Spink County, South Dakota

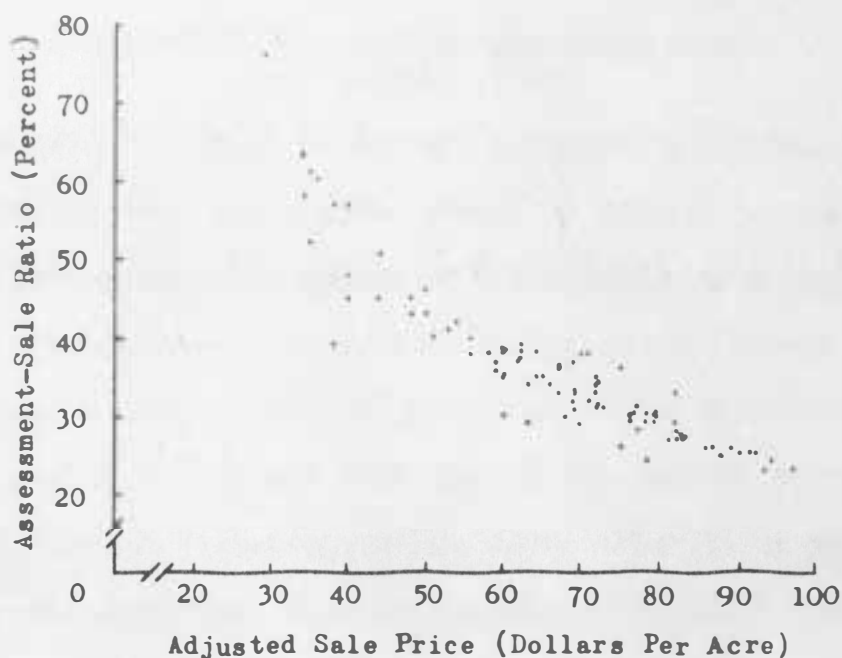


Figure XII. Relationship between assessment-sale ratio based on 1959 assessment and sale price, 94 tracts, land without buildings, sold 1955-1960, lake plain, Spink County, South Dakota

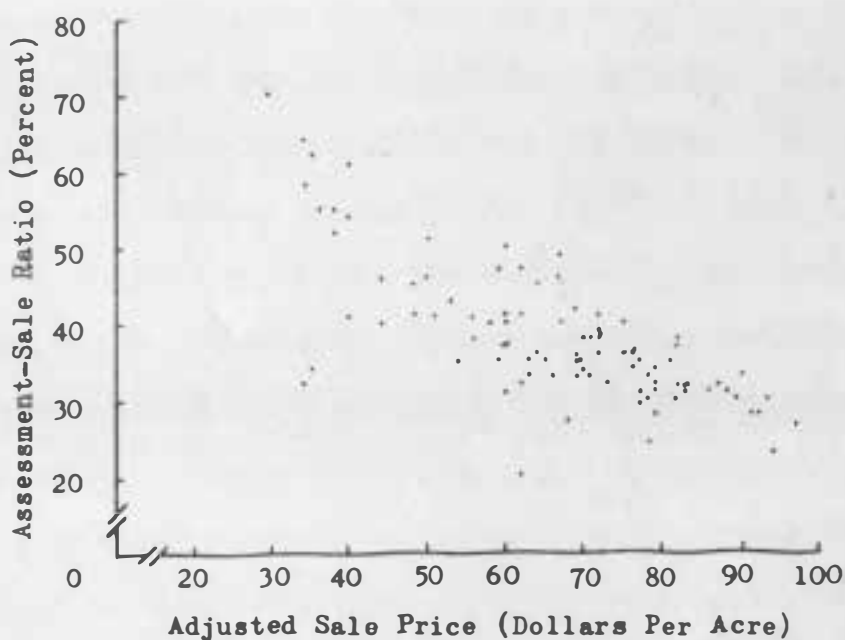


Figure XIII. Relationship between assessment-sale ratio based on 1960 assessment and sale price, 94 tracts, land without buildings, sold 1955-1960, lake plain, Spink County, South Dakota

Relationship between Assessment-Sale Ratio and Economic Rating

Figures XIV through XIX provide a comparison between assessment-sale ratio and economic rating for each of the categories discussed previously. The regression lines (Figures XVI through XIX) were drawn merely to indicate an average for the series and with the realization that the identity of the individual observations would be lost in the process. The equation for each of the regression lines is shown on the appropriate chart. The "b" values of the equations are of interest since they provide an absolute measure of the slope of each regression line.

In every case, the regressive pattern was solidly established by the 1959 assessment (Figures XIV, XVI, and XVIII). Considering all of the properties in the sample as one series, a progressive pattern developed with the 1960 assessment (Figure XV). The 1960 distribution of assessment-sale ratios for the glacial till plain followed a similar pattern (Figure XVII). For the lake plain, however, the regression line for the 1960 distribution was nearly horizontal, indicating a high degree of uniformity (Figure XIX). The validity and usefulness of this average line as an indicator is subject to question because of the dispersion of the ratios and the scarcity of observations below an economic rating of about 60.

The writer attributed these relationships to a pair of complementary factors. The first stems from the fact that assessments are often based on superficial examinations which fail to distinguish adequately between productive and unproductive land. The result is a

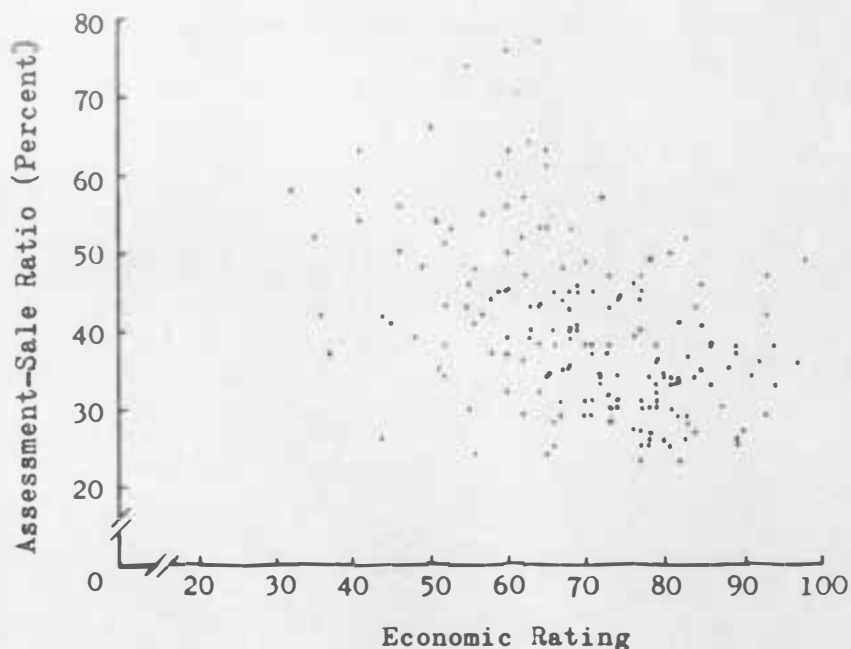


Figure XIV. Relationship between assessment-sale ratio based on 1959 assessment and economic rating, 182 tracts, land without buildings, sold 1955-1960, Spink County, South Dakota

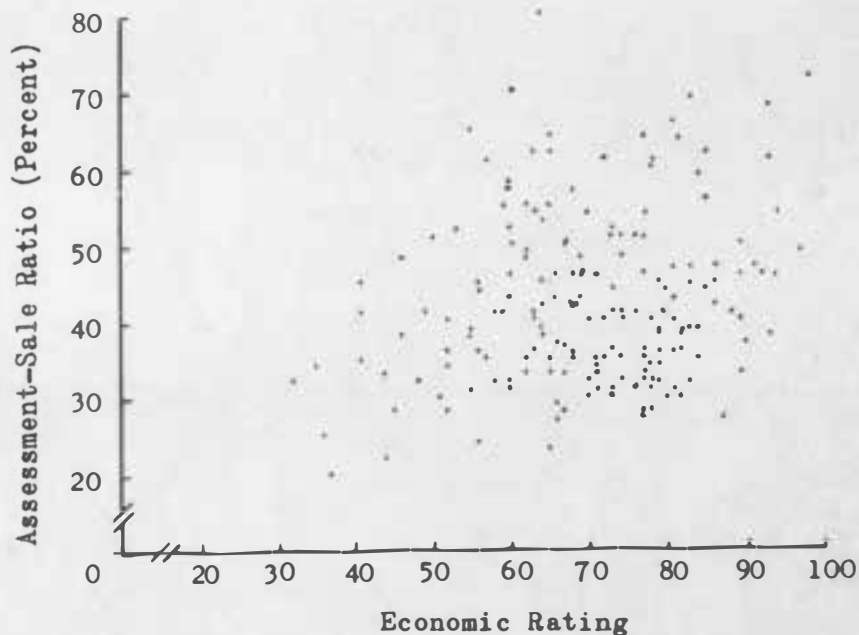


Figure XV. Relationship between assessment-sale ratio based on 1960 assessment and economic rating, 182 tracts, land without buildings, sold 1955-1960, Spink County, South Dakota

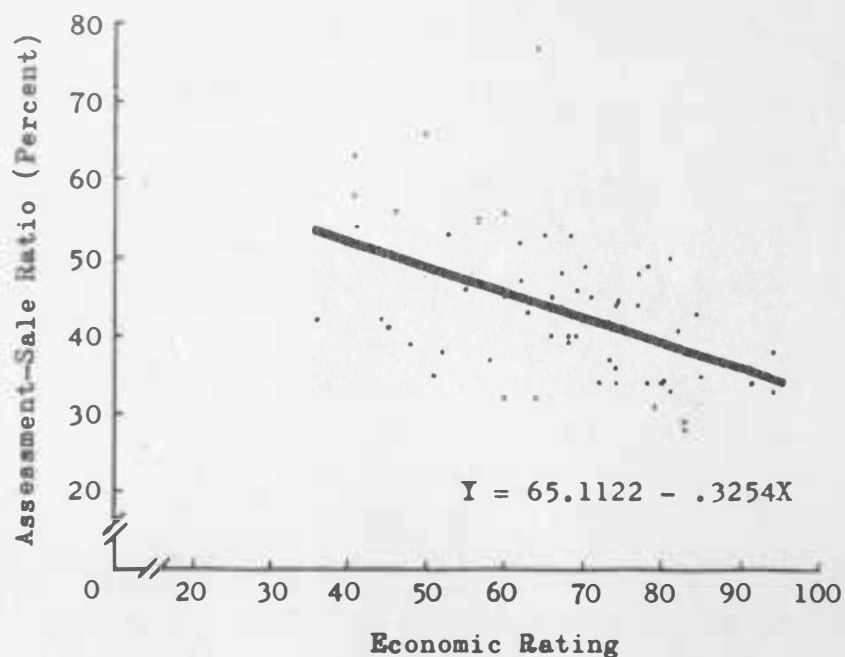


Figure XVI. Relationship between assessment-sale ratio based on 1959 assessment and economic rating, 59 tracts, land without buildings, sold 1955-1960, glacial till plain, Spink County, South Dakota

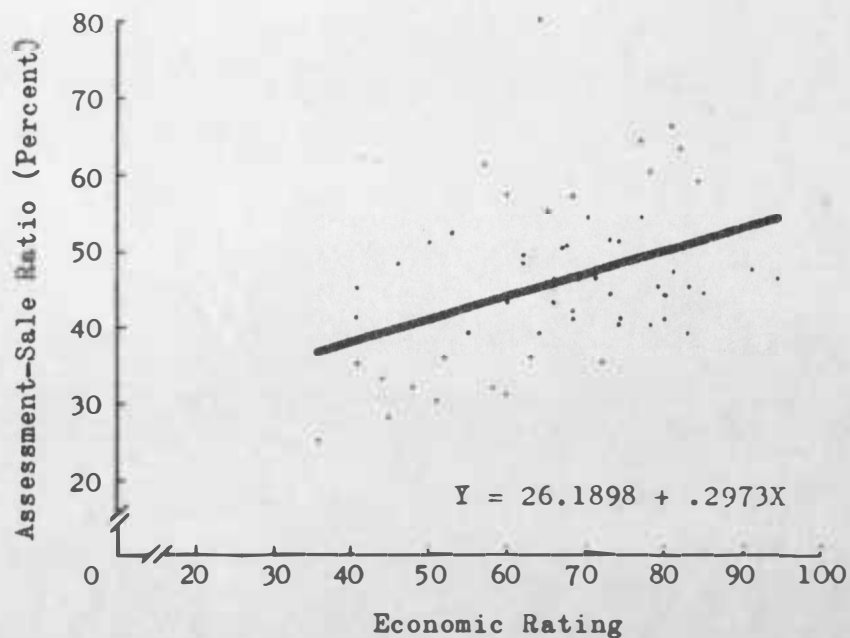


Figure XVII. Relationship between assessment-sale ratio based on 1960 assessment and economic rating, 59 tracts, land without buildings, sold 1955-1960, glacial till plain, Spink County, South Dakota

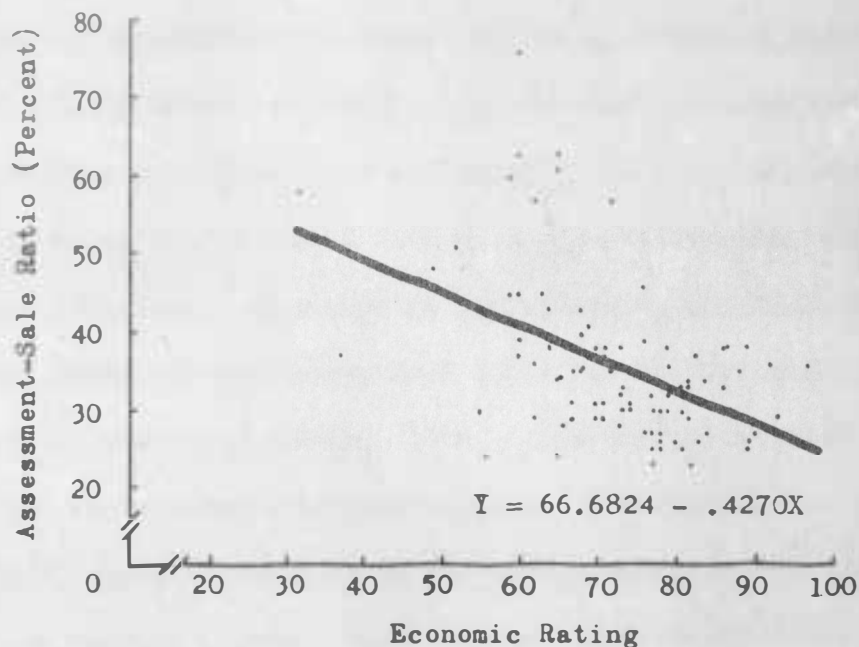


Figure XVIII. Relationship between assessment-sale ratio based on 1959 assessment and economic rating, 94 tracts, land without buildings, sold 1955-1960, lake plain, Spink County, South Dakota

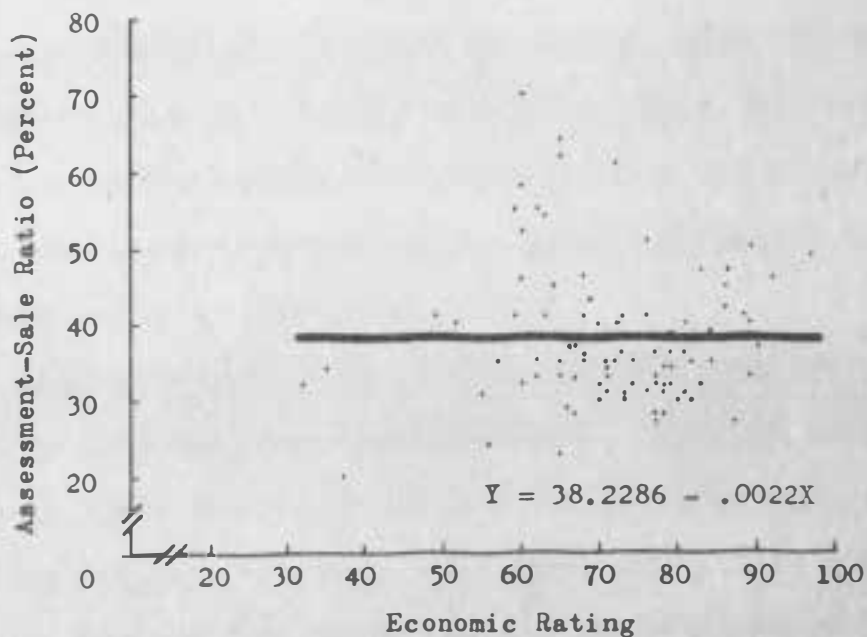


Figure XIX. Relationship between assessment-sale ratio based on 1960 assessment and economic rating, 94 tracts, land without buildings, sold 1955-1960, lake plain, Spink County, South Dakota

distribution of assessed values which tend to concentrate about the average for the district. Secondly, land is commonly bought with limited knowledge of its productive capacity. Sale price often reflects the prevailing price of land in a given community more than its economic potential. As a result, unproductive land often sells for a higher price and productive land sells for a lower price than is justified by earning capacity. Thus, individual sale prices tend to be spread over a relatively narrow range. Inconsistent as they are, the land values established by the market are probably more indicative of earning capacity than most assessed values based entirely on judgment.

With this background, consider the assessment-sale ratios based on the 1959 assessment. The assessed values were judgment estimates with little variation about the average, while the sale values covered a wider but somewhat restricted range. The resulting assessment-sale ratios tended to be relatively high for the less productive tracts and relatively low for the more productive tracts, thus contributing to the regressive pattern.

The assessment-sale ratios based on the 1960 assessment were influenced by a different set of circumstances. The assessed values were based on a soil survey from which the economic potential of each tract of land was estimated. They were spread over a wider range than the corresponding sale values. Many of the 1960 assessed values for the low quality properties dropped below the values assigned in 1959 causing the corresponding assessment-sale ratios to be somewhat

lower. Conversely, the economic potential of some of the properties warranted an increase in assessed value, and the resulting assessment-sale ratios were somewhat higher than previously. The degree of change in the size of the ratios at the extremes of the productivity scale was sufficient to cause a progressive rather than a regressive pattern.

The basic assumption in this type of analysis is that market price correctly reflects the elements of land value, and the validity of the assessment can be determined by comparing assessed values with sale prices. Even if sales data always provided the best estimate of value, one would not expect all of the ratios based on the 1960 assessment to be equal because buyers and sellers do not attach the same significance to each land feature. Personal preference or individual aggressiveness rather than expected economic gain may affect the sale price even though both buyer and seller have correctly determined the value of future land income.

Measures of Central Tendency and Dispersion⁵³

The data presented in the preceding charts were used to measure the degree of uniformity achieved by the 1959 and 1960 assessments. This was done by computing the coefficient of

⁵³The methods used in this portion of the study were those recommended by the Committee on Sales Ratio Data of the National Association of Tax Administrators, Guide for Assessment-Sales Ratio Studies, Federation of Tax Administrators, Chicago, June 1954, pp. 22-28.

dispersion,⁵⁴ an abstract statistic which measures the spread of the separate ratios in terms of the median of the distribution. The coefficient of dispersion was used as a measure of assessment quality within and between the 1959 and 1960 assessments. A relatively small coefficient of dispersion for a group of properties indicated a fairly uniform relationship between assessed value and sale price.⁵⁵

The medians and coefficients of dispersion computed from the sample are shown in Table 6. In every case, the median ratio for 1960 was somewhat higher than the corresponding ratio for 1959. In both years, the median ratio was higher for the glacial till plain tracts than for the lake plain tracts. Apparently, land values in the lake plain were somewhat inflated relative to the till plain.

⁵⁴The coefficient of dispersion is derived from the interquartile range of a distribution, i.e., the difference between the upper and lower quartiles. The figure representing the interquartile range divided by two is the quartile deviation. When the quartile deviation is expressed as a percentage of the median, the result is known as the coefficient of dispersion.

⁵⁵No objective measure exists for determining how good or bad coefficients of dispersion actually are. Groves stated that a good assessment may exhibit a coefficient of dispersion of ten percent due to imperfections in the data. (Harold M. Groves, Financing Government, 5th Ed., Holt, Rinehart and Winston, Inc., New York, 1958, pp. 71-72.)

Table 6. Results: Medians and Coefficients of Dispersion for Assessment-Sale Ratios Based on 1959 and 1960 Assessments, Stratified by Area and Soil Characteristics, Land Without Buildings, Sold 1955-1960, Spink County, South Dakota

Stratum	Number of tracts	Median ratio		Coefficient of dispersion	
		1959	1960	1959	1960
All tracts	182	38.0	40.8	17.2	17.9
Glacial till plain tracts	59	42.2	46.0	15.5	12.8
Till plain tracts with less than 15 percent solonetzic soils	35	41.2	44.5	14.0	13.9
Undulating to nearly level till plain tracts with less than 15 percent solonetzic soils	27	38.9	46.2	15.9	13.0
Lake plain tracts	94	33.9	35.8	13.7	13.0

Considering the entire sample as one series, the quality of the assessment decreased slightly as indicated by the larger coefficient of dispersion for 1960. Breaking the sample data into segments on the basis of physiographic area, an increase in uniformity was indicated within and between the two assessments. In 1960, stratification within the glacial till plain group according to the nature of the soil showed no increase in uniformity over that obtained for all till plain tracts. No stratification was attempted within the group of lake plain properties because most of them were dominated by solonetzic soils.

Twenty-nine of the properties did not fit with either of the two physiographic groups. Some were located in the sandy area south

of Redfield, but the number involved was too small to analyze as a group. Others lacked homogeneity of geologic origin, consisting of combinations of glacial till, lake sediments, stream sediments, and sandy glacial meltwater deposits. The variation in the individual assessment-sale ratios for the properties in this miscellaneous group was greater than for either of the two physiographic groups. This variation was reflected in the larger coefficient of dispersion which arose when all of the ratios were analyzed as a series.

Stratification with respect to physiographic area resulted in grouping together those properties which were similar in the broadest sense, namely landscape features and the nature of the soil parent material. The more heterogeneous properties were eliminated from the sample. Variations in soil and slope among the properties in each physiographic group contributed to a wide range in economic productivity. Some of these differences were related to the appearance of the landscape while others were not.

Prospective buyers within areas of similar surface features and soil parent material were confronted with fewer variables. As a group, their judgment appraisals of land value were more consistent with the 1960 assessed values based on estimated net income. This was suggested by the smaller coefficients of dispersion obtained by stratification within the 1960 assessment. The less apparent soil differences which were not well expressed in the appearance of the till plain landscape, but nevertheless affect earning capacity, were not adequately recognized. This was indicated by the smaller

coefficient of dispersion obtained for all till plain tracts as compared to that obtained for each stratum.

The difference between the 1959 and 1960 coefficients of dispersion for the four strata reflects the use of the soil survey as the basis for the 1960 assessment and the uniformity of the 1959 assessment. To explain this statement, the postulate that sales are generally more indicative of economic productivity than conventional assessments must be advanced. If the 1959 assessed values for a particular stratum were not closely related to the adjusted sale prices, the coefficient of dispersion would be relatively large. Substituting the 1960 assessed values which were based on economic productivity, one would expect a smaller coefficient of dispersion, indicative of greater uniformity. Conversely, if the 1959 assessed values were closely aligned with adjusted sale prices, a relatively smaller change in the coefficient of dispersion would occur when the 1960 assessed values were substituted.

No allowance has been made for location with respect to roads or proximity to the buyer's present headquarters, sociological factors, or hazards. All of these factors have a bearing on market value and will be reflected in subsequent assessments as time permits their evaluation by local officials. Consideration of these items will undoubtedly contribute further to assessment uniformity in Spink County.

The results were also dependent on the validity of the individual sales which composed the sample. As previously stated, the

sales were carefully screened and 47.8 percent were verified by communication with one of the parties involved. However, one could not hope to learn all of the details surrounding each transaction, including the exact purchase price. It is entirely possible that the erratic nature of some of the ratios could be explained if the conditions of every transaction were known.



Figure 22. Relationship between sales and cumulative sales.

Relationship between Adjusted Sale Price and
Economic Rating

The relationship between these variables for the glacial till and lake plains is shown by Figures XX and XXI. The average economic rating for the glacial till plain properties was 66.9 while the average adjusted sale price was \$50 per acre. The corresponding rating for the lake plain was 71.8 with an average adjusted sale price of \$66 per acre.

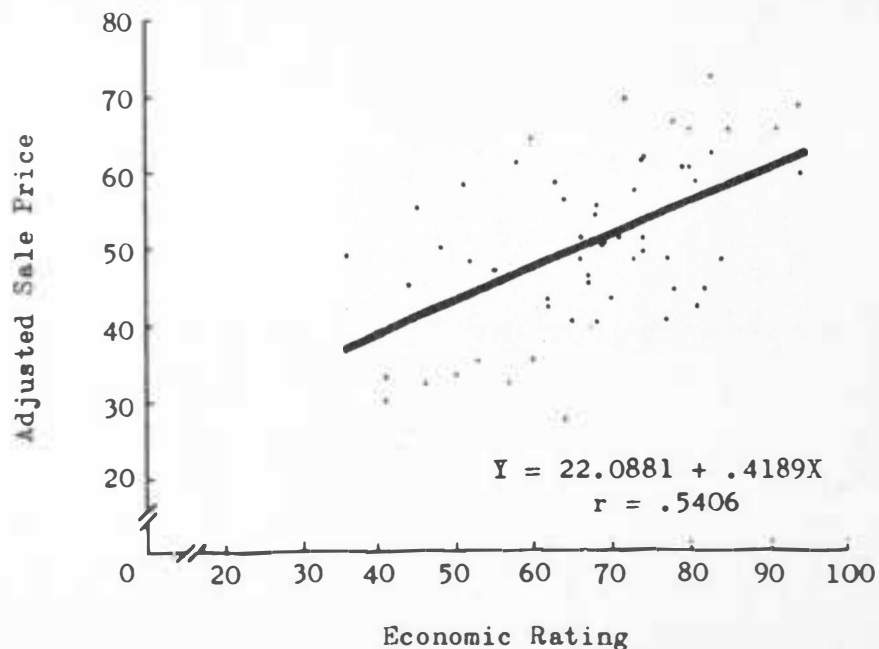


Figure XX. Relationship between adjusted sale price and economic rating, 59 tracts, land without buildings, sold 1955-1960, glacial till plain, Spink County, South Dakota

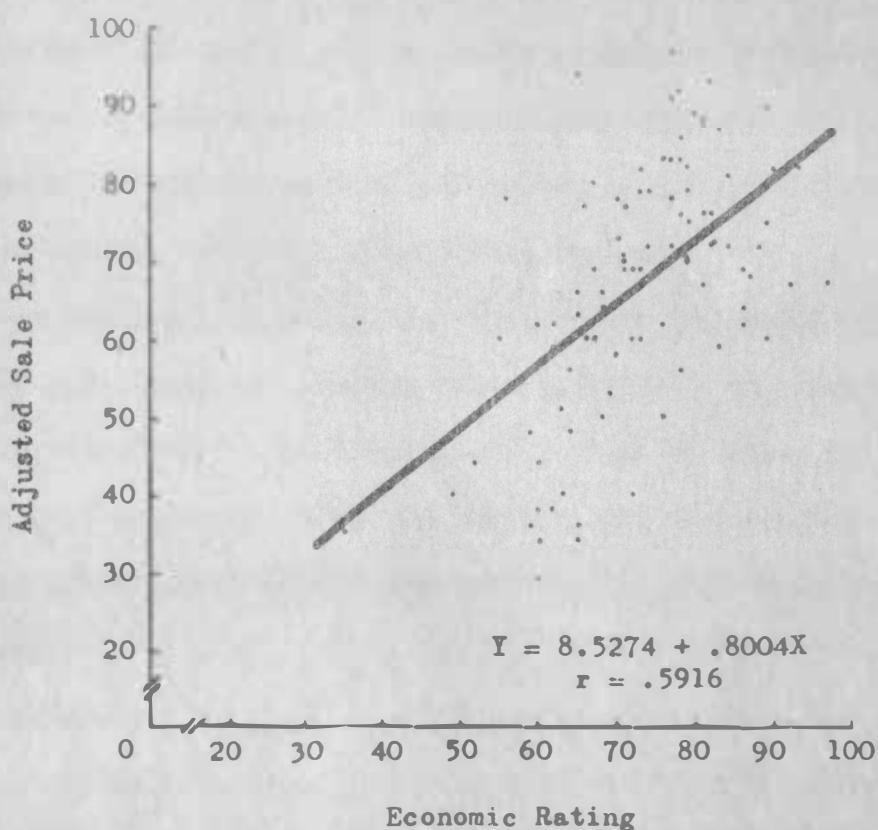


Figure XXI. Relationship between adjusted sale price and economic rating, 94 tracts, land without buildings, sold 1955-1960, lake plain, Spink County, South Dakota

Within each area the prices paid for similar land varied considerably as evidenced by the scattering of points about the line of regression. The writer attributed this to (1) differences in the knowledge, judgments, needs, and bargaining abilities of buyers and sellers; (2) the emphasis placed on the intangible aspects of property by some individuals; and (3) the possibility that the sale price used was not the actual consideration.

In comparing the two sets of data, the larger "b" value in the equation representing the regression line for the lake plain

distribution indicated a greater tendency for sale price to increase sharply over a narrow range in economic productivity. This lends support to the hypothesis that land values in the lake plain were inflated relative to other parts of the county.

An abstract measure of the degree of relationship between adjusted sale price and economic productivity was afforded by the "r" value or coefficient of correlation. The "r" value for the till plain distribution was .5406, and for the lake plain tracts an "r" value of .5916 was obtained. Both values were significant at the .001 level.

Since it is logical to assume a causal relationship between these two variables, a portion of the variation in the market value of Spink County farm land was attributed to differences in economic productivity. The square of the coefficient of correlation (r^2) was used as a measure of the variation in adjusted sale price which was explained by economic productivity.

In the glacial till plain, economic productivity accounted for approximately 29 percent of the variation in adjusted sale price; in the lake plain, the corresponding figure was 35 percent. These figures help to explain why a higher degree of uniformity (smaller coefficients of dispersion) was not attained by the 1960 assessment (Table 6). It is interesting to note, however, that some increase in uniformity was obtained even though only about one-third of the variation in adjusted sale price was explained by differences in economic productivity. Presumably, a higher degree of uniformity

would be evident in an area where market price was more consistently related to economic productivity.

The low correlation between these variables might be due to one or more of the following factors: (1) buyers cannot effectively judge the income earning potential of the land in Spink County, (2) the intangible elements of value and pressures within the current economic environment cause buyers to place less emphasis on soil quality, or (3) the differences in productivity among soils expressed by the economic ratings are not realistic.

There is sufficient evidence to indicate that the latter possibility is not the case. Favorable growing conditions and a high level of management tend to minimize soil deficiencies. However, yield variations among soils are apparent in typical or common management situations, particularly in seasons when crops are subjected to periods of moisture and/or nutrient stress. The crop yields used in calculating net income for the various soils were based on the expected results of typical management over a period of years sufficient to cover the range of climatic variation. They are the best estimates of soil productivity which can be made at the present time.

In comparing these distributions, one must consider the contrasting features of the respective areas. The relief or "lay of the land" in the till plain ranges from nearly level to hilly. Some parts of the area lack a well-defined surface drainage pattern as indicated by the many potholes which occur in the landscape. The

Glacial till in which the soils are developed is composed of variable proportions of sand, silt, clay, and some gravel. Certain areas contain sufficient stones on or in the soil material to restrict cultivation. In contrast, the lake plain is more uniform with respect to surface features. Most of the landscape is nearly level to gently sloping and contains few poorly drained depressions. The soils are formed in stone-free deposits of laminated silt and clay. Both areas contain sizeable acreages of solonetzic or claypan soils.

Surface appearance and relief are probably the most common criteria used by prospective buyers in estimating the productivity of land. In the till plain, this is a fairly reliable standard since slope, stoniness, and the acreage of poorly drained soils largely determine land use and soil productivity. An exception occurs in parts of the till plain where the less productive members of the solonetzic soil group dominate the landscape. The presence of these soils in cultivated fields is indicated by "slick spots" or gray, cloddy areas which lack suitable soil tilth. Fields of stunted, uneven plants may also indicate the occurrence of these soils.

The reliability of surface appearance as an indicator of soil productivity also holds for those portions of the lake plain which are relatively free of the infertile "slick spot" soils. As in the till plain, slope and drainage differences are apparent when present. In much of the lake plain, differences in productivity between tracts are largely related to varying kinds and percentages of

solonetzic soils. Buyers using surface criteria in the lake plain areas dominated by the solonetzic soils might experience more difficulty in judging the productive capabilities of a tract of land without the aid of a detailed soil map. These soils vary greatly in productivity, and a buyer might easily misjudge the extent of an undesirable soil condition even though realizing its existence. He might ultimately place about the same value on each parcel because of the apparent uniformity suggested by surface appearance. Therefore, sale price may often be unreliable as a standard of value where soil productivity is not particularly related to surface features.

Distribution of the 1959 and 1960 Assessed Values for Selected Townships

Two parcels of farm land which vary in economic productivity should not ordinarily carry the same assessed value. Previous studies, however, have shown a strong tendency toward a uniform dollar assessment of each quarter section within a township or taxing district. This tends to raise the effective rate at which land of low economic potential is taxed. Equity among landowners cannot be achieved by this type of administration.

Many of the soils which occur extensively in South Dakota have been characterized by field and laboratory studies. The effect of these measurable soil properties on plant growth is reflected in the crop yields obtained under experimental and actual farm conditions. The yield tables prepared for the Spink County soils indicate that the productive capacities of the different soils vary over a wide

range.⁵⁶ Therefore, when the land in a particular township is classified according to soil type and appraised systematically, one would expect a considerable spread in the distribution of assessed values. This is verified by the statistics presented in Table 7 which were computed for selected townships representing one or more different physiographic areas with characteristic differences in soil and surface features.

Table 7. Mean Assessed Land Value, Standard Deviation, and Coefficient of Variation, 1959 and 1960 Assessments, Selected Townships, Spink County, South Dakota

Township	Mean assessed land value		Standard deviation		Coefficient of variation	
	1959	1960	1959	1960	1959	1960
Athol (T118, R65)	21.10	24.93	.81	4.51	4	18
Belmont (T114, R63)	21.56	23.68	1.23	4.04	6	17
Spring (T117, R60)	20.54	22.89	.39	2.89	2	13
Tetonka (T119, R62)	22.82	25.97	.53	2.62	2	10

In each of the townships studied, the tendency toward concentration of the 1959 assessed values about the mean was evidenced by the relatively small standard deviation and coefficient of

⁵⁶F. C. Westin, G. J. Buntley, W. C. Maldenhauer, and F. E. Shubeck, Soil Survey of Spink County, South Dakota, Bulletin 439, Agronomy Department, Agricultural Experiment Station, South Dakota State College, Brookings, June 1954, pp. 112-120.

variation.⁵⁷ Comparable statistics computed from the 1960 distribution of assessed values indicated greater dispersion of values about the mean.

Figures XXII through XXIX show the distribution of assessed land values for each of four townships in 1959 and 1960. In every case, the 1959 data exhibit the same tendency toward a uniform dollar assessment of each quarter section while similar charts for 1960 show a more normal distribution.

This, of course, does not prove that the 1960 assessment based on economic productivity as interpreted from the soil map was responsible for a more equitable distribution of the tax burden. In few townships of any county, however, is the land so uniform in soil and slope as to justify placing the same assessed value on each quarter section.

⁵⁷The standard deviation of a distribution expressed as a percentage of the mean is equal to the coefficient of variation, which is a measure of the relative variability of specific observations. It provides a means of comparing the variation in distributions having different means and standard deviations.

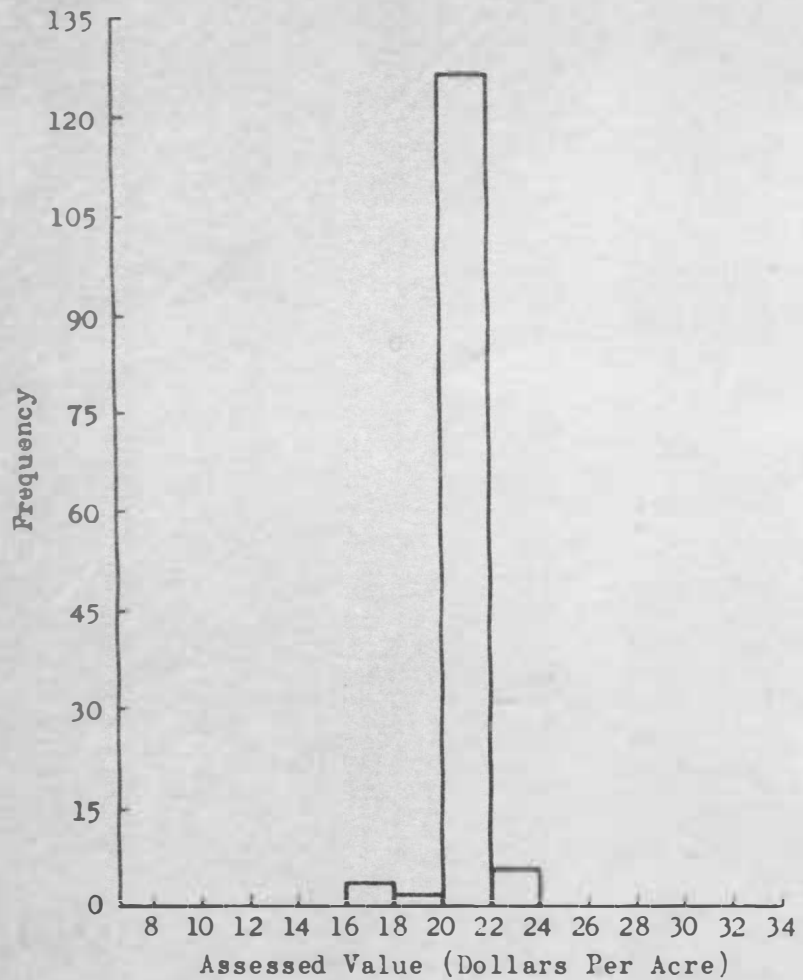


Figure XXII. Distribution of assessed land values, 139 quarter sections, Athol Township, Spink County, South Dakota, 1959

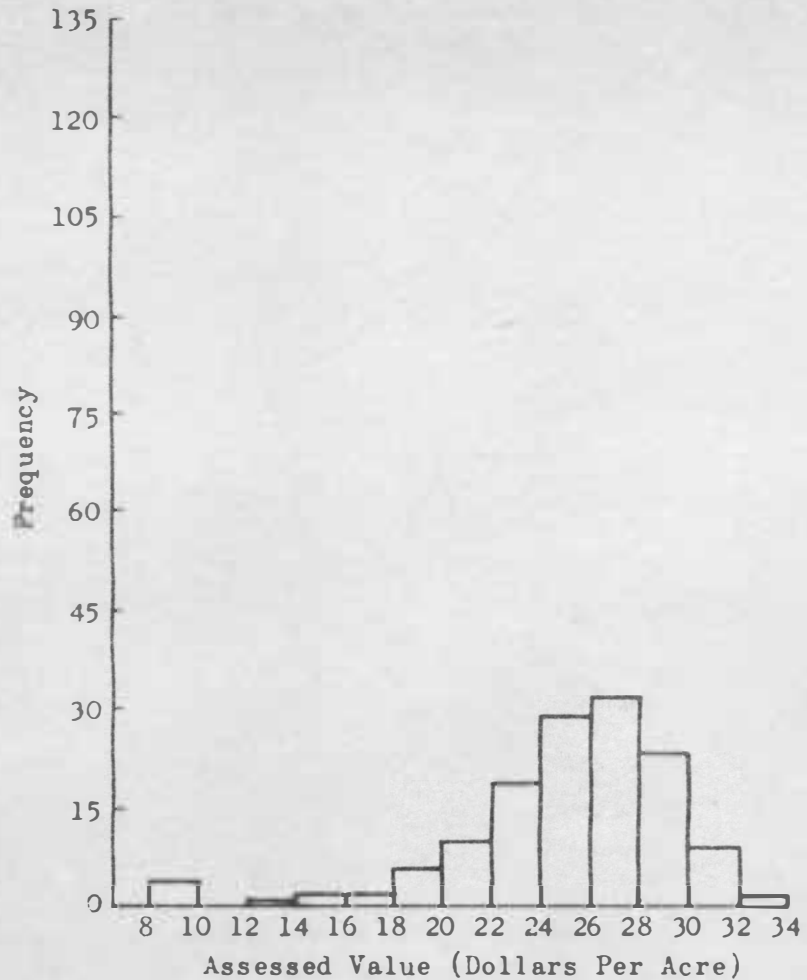


Figure XXIII. Distribution of assessed land values, 139 quarter sections, Athol Township, Spink County, South Dakota, 1960

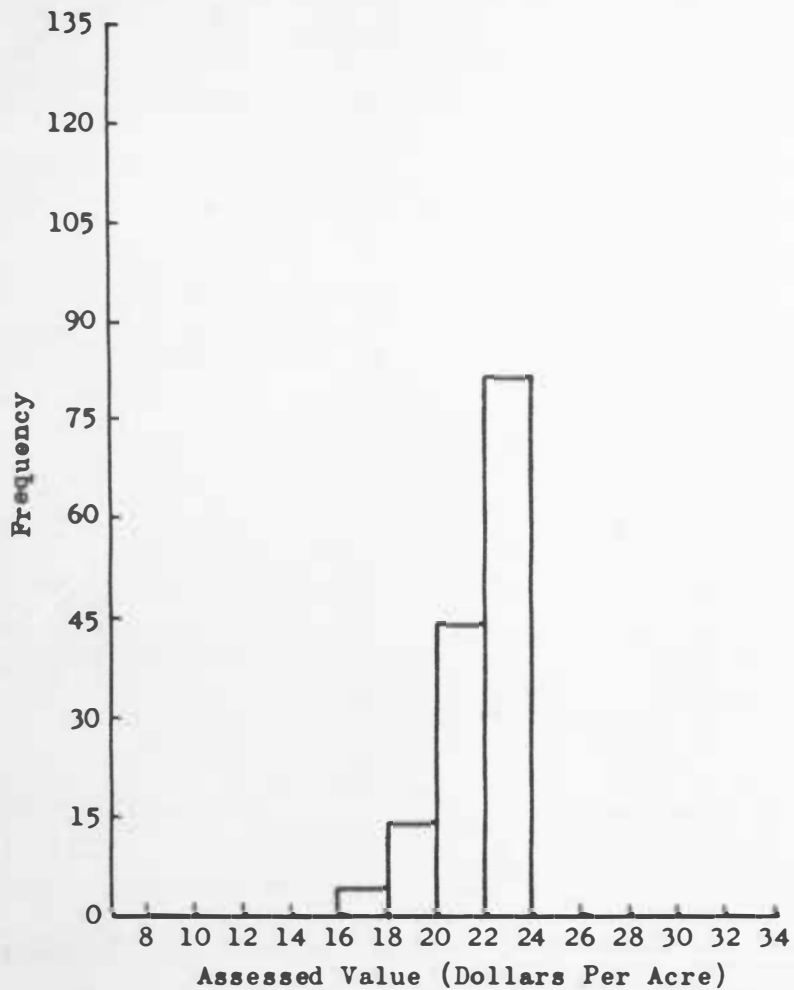


Figure XXIV. Distribution of assessed land values, 144 quarter sections, Belmont Township, Spink County, South Dakota, 1959

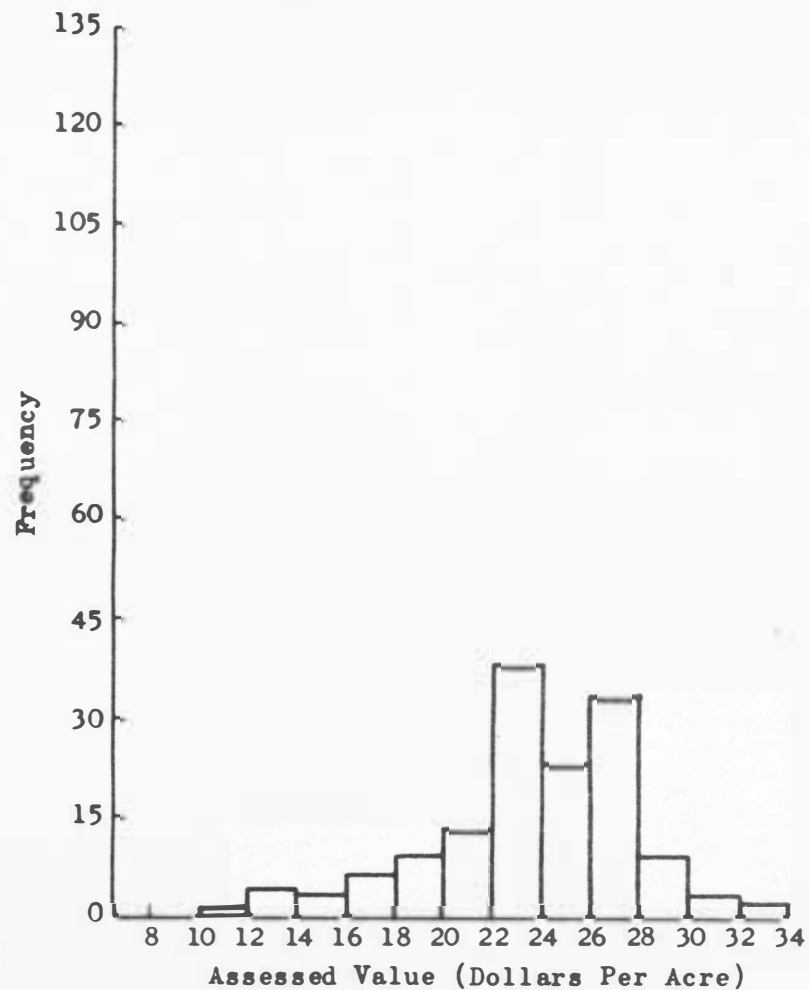


Figure XXV. Distribution of assessed land values, 144 quarter sections, Belmont Township, Spink County, South Dakota, 1960

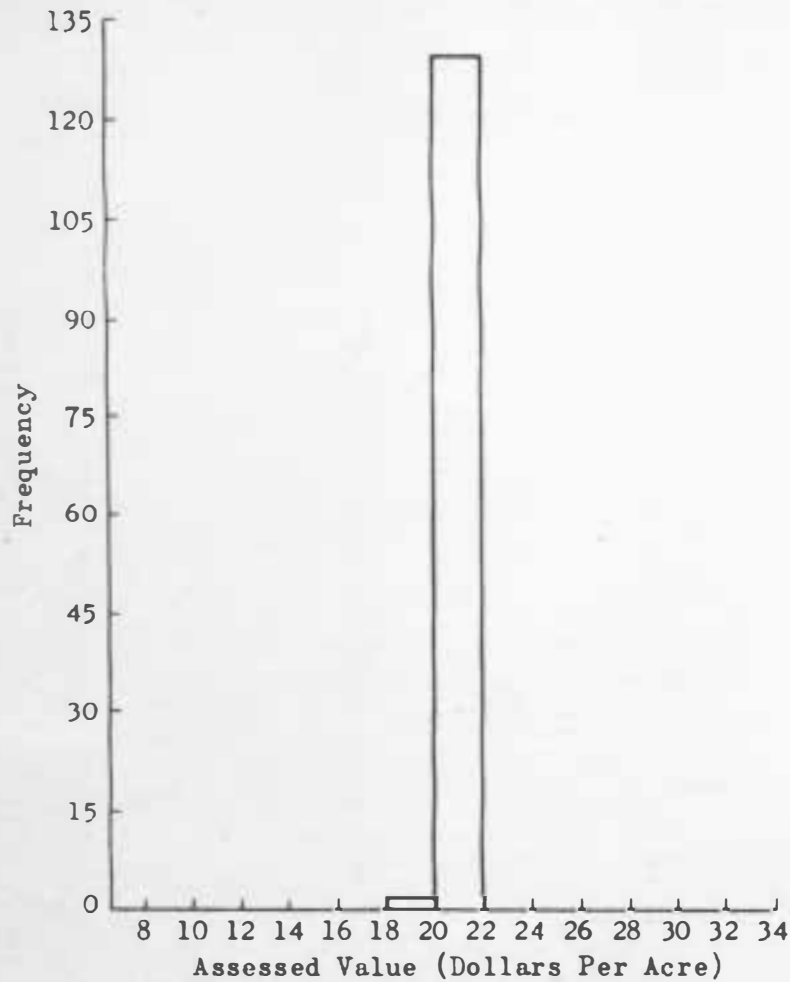


Figure XXVI. Distribution of assessed land values, 132 quarter sections, Spring Township, Spink County, South Dakota, 1959

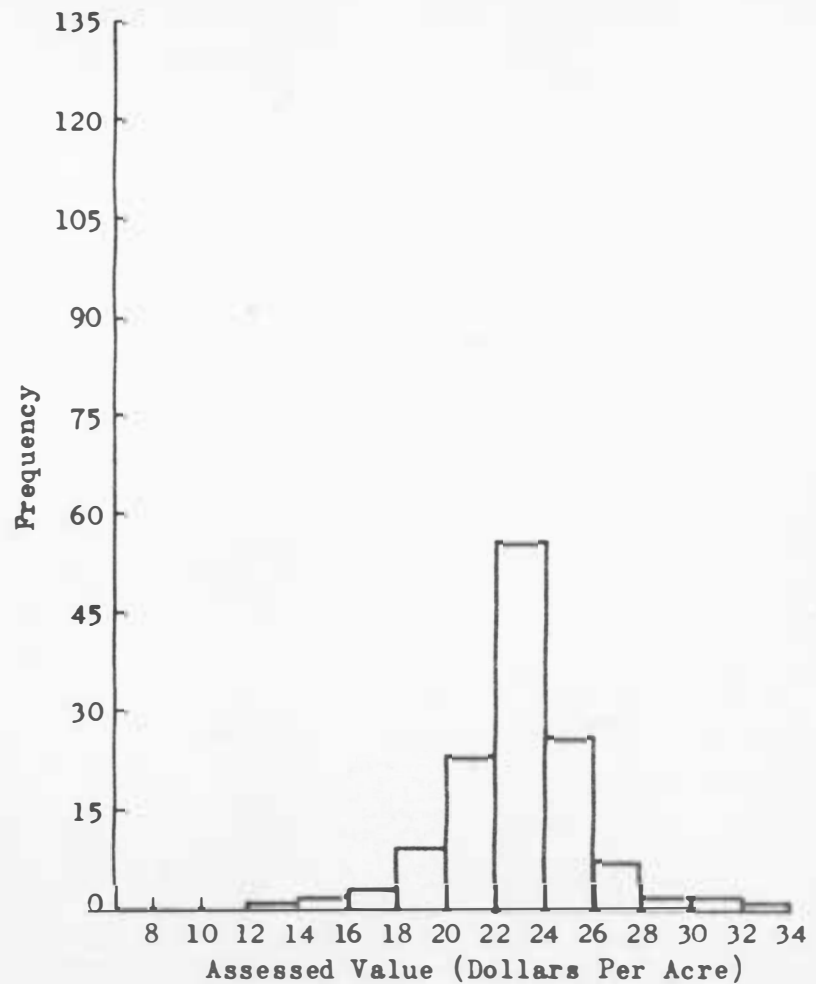


Figure XXVII. Distribution of assessed land values, 132 quarter sections, Spring Township, Spink County, South Dakota, 1960

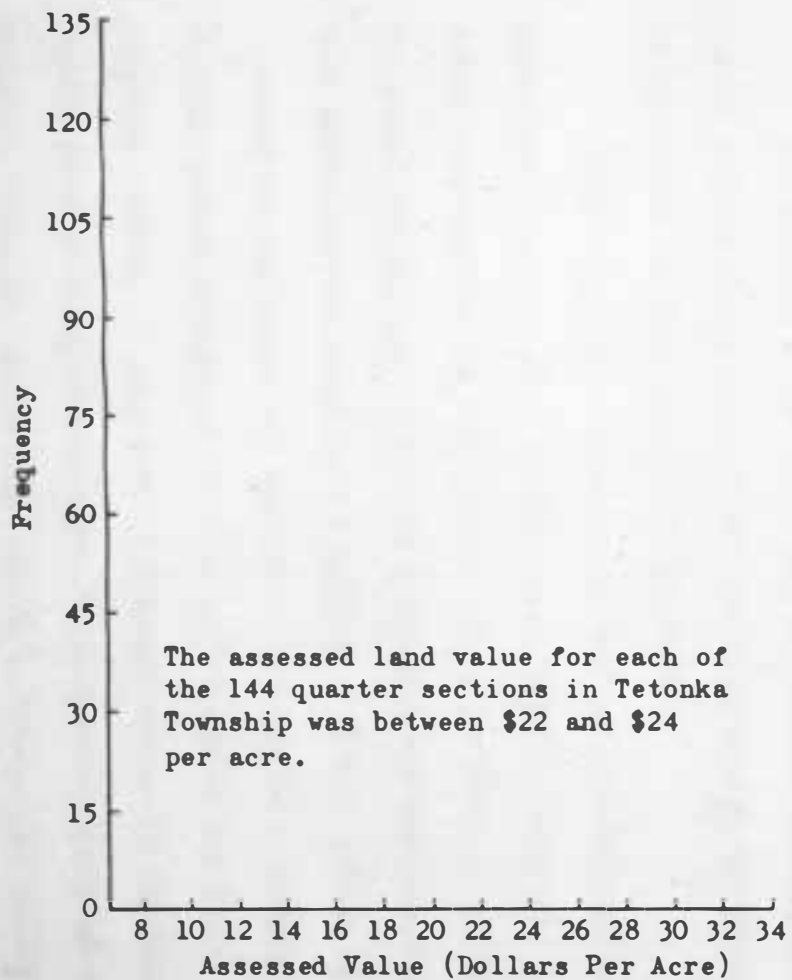


Figure XXVIII. Distribution of assessed land values, 144 quarter sections, Tetonka Township, Spink County, South Dakota, 1959

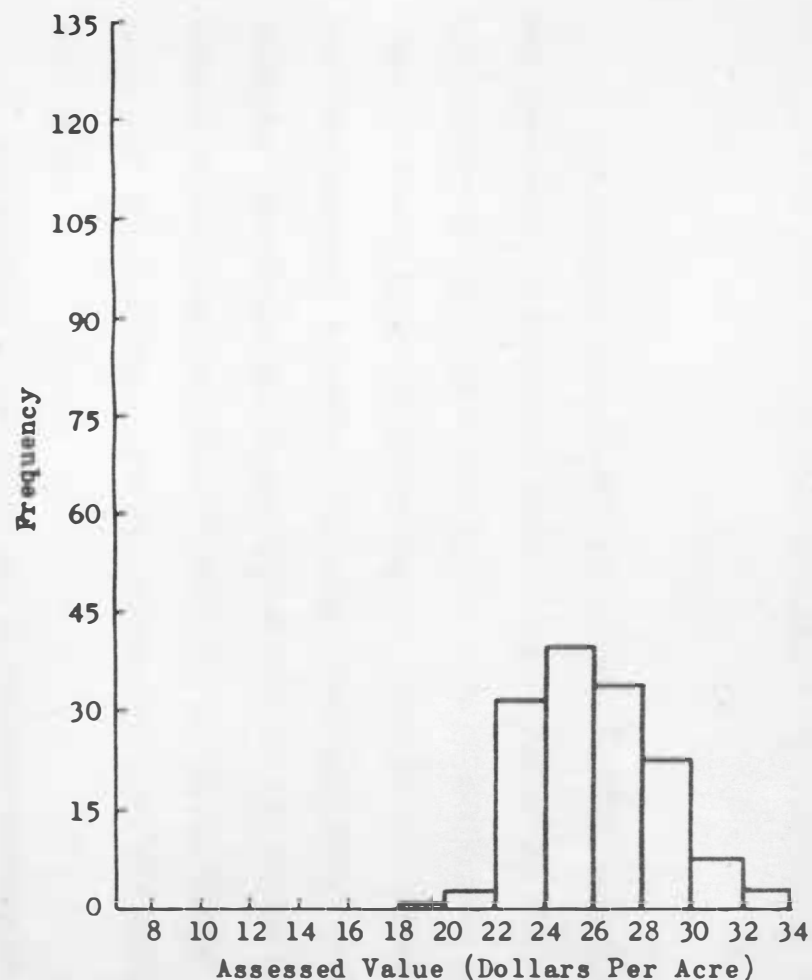


Figure XXIX. Distribution of assessed land values, 144 quarter sections, Tetonka Township, Spink County, South Dakota, 1960

CHAPTER VII

SUMMARY

The property tax represents a controversial tradition which has persisted virtually unchanged during a period of years in which the economy of the nation has changed from predominantly agricultural to the present industrial stage. Many of our present property tax problems have developed gradually along with these economic changes. Therefore, it seemed appropriate to relate the historical aspects of the tax, including fiscal trends and tax-income relationships, to the main topic of this study—equity in the assessment of farm land.

The purpose of the study was to evaluate the use of soil survey information as a means of attaining equity in the assessment of farm land in Spink County, South Dakota.

Basically, this approach involves an interpretation of soil characteristics in terms of net income earning capacity. Areas of soils with similar characteristics are delineated as separate units on aerial photographs, and yield estimates are made for each soil unit under defined management practices. Future prices and cropping expenses are estimated and applied to the physical production data. The net income calculated for each soil becomes the basis for an economic rating. A composite or average rating is derived for each parcel of land using the acreage of the various soils in the tract as weights. Finally, the average economic ratings are converted into

relative dollar values which may be adjusted further to reflect differences in location, operational hazards, and sociological factors.

This method of appraisal is in contrast with the comparative sales approach which employs actual sales data as the basis for valuing land. The similarities between these methods, along with their merits and deficiencies, were discussed in Chapter III.

South Dakota employs the market value concept as the standard governing the assessment of property. The legality of this concept has often been upheld by the courts. For this reason, bona fide sales were used as the standard of value in this study.

The sample was composed of 182 tracts of land without buildings which were sold in the six-year period from 1955 through 1960. Only those transactions which appeared to reflect the unrestricted action of the land market were included. The details of each sale were obtained from county records and verification was attempted by questionnaire. The assessed value and economic rating of each tract were obtained from the files of the county director of equalization. Bulletin 439, Soil Survey of Spink County, South Dakota, was used to identify the soils involved.

Index numbers were developed and used to adjust the sale prices to the 1960 level. The 1959 assessed values expressed as a percentage of these adjusted sale prices were used to measure the uniformity of the assessment prior to the systematic appraisal of 1960. The ratios of the 1960 assessed values to the adjusted sale

prices were used to determine the uniformity achieved by the 1960 assessment based on the economic productivity of the soil.

The 1959 and 1960 ratios for the entire group of tracts and for two physiographic areas—glacial till and lake plain—were plotted against adjusted sale price and economic rating. In all cases, the relationship between assessment-sale ratio and adjusted sale price was strongly regressive for both 1959 and 1960. A similar relationship was noted between assessment-sale ratio and economic rating for 1959. With one exception, the ratios based on the 1960 assessment showed progressive assessment tendencies when plotted with economic rating. Imperfections in the land market, the tendency for the 1959 assessed values to be clustered about the average, and the fact that the 1960 assessed values based on estimated net income reflect differences in soil productivity thereby covering a wider range, were cited as probable causes of the progressive patterns.

The median and coefficient of dispersion for the 1959 and 1960 distributions of ratios were identified for the entire group of tracts, for the physiographic areas, and for two groups of till plain properties. Using the coefficient of dispersion as an indicator of assessment uniformity and considering the entire sample as one series, the 1960 assessment produced a slight decrease in uniformity. An increase in uniformity was obtained within and between the 1959 and 1960 assessments when the properties were stratified according to physiographic area. No increase in the uniformity of the 1960 till plain assessment was achieved when the properties

were grouped according to the nature of the soil.

It is evident that only the more obvious soil differences which contribute to earning capacity were recognized by the market. The extent of these differences was often incorrectly evaluated. The reliability of the market as an indicator of soil productivity was somewhat greater in areas of similar surface features and soil parent material. Market price was more closely related to assessed value based on estimated net income when there were fewer soil variables to interpret. This relationship did not hold for the less apparent soil differences which were not well reflected in the appearance of the landscape. Presumably, a closer relationship between sale price and economic productivity would have resulted in a greater increase in uniformity when the soil survey was used as the basis for assessment in 1960.

The relationship between adjusted sale price and economic rating was determined for the glacial till and lake plain tracts. On the average, market price was directly and significantly related to economic productivity in each physiographic area. The soil differences which contributed to the range in economic productivity within these areas accounted for about one-third of the variation in sale price. The unexplained variation in sale price must be largely attributed to the intangible elements of value and the many variables related to human judgments and needs which influence the land market.

A study of the 1959 assessed values of the quarter sections in each of four townships representing different physiographic areas

or combinations of areas revealed a strong concentration of values around the township average. The range in the assessed values placed on the same parcels of land in 1960 was much greater, indicating that differences in economic productivity were recognized by the new appraisal.

CHAPTER VIII

CONCLUSIONS

On the basis of this study, one cannot conclude that land values based on earning capacity conform to those established by the market. This may be attributed to several factors.

1. The derived values were based entirely on the estimated net income producing capacity of the soil with no allowance for the intangible elements of value which presumably have some effect on sale prices.
2. It was not possible to verify the details of every transaction. Minor discrepancies between exact selling price and that estimated from revenue stamps are possible in some cases.
3. The market is not absolute in nature but represents a composite of human knowledge, judgments, needs, and bargaining abilities. Even with equal knowledge, individuals do not attach the same significance to each tangible or intangible land feature. Personal preference for a given aspect of property may affect sale price more than expected economic gain. Therefore, complete agreement between sale values determined under nearly perfect market conditions and assessed values based on estimated net income cannot be expected.

The validity of market value as a standard is subject to question since it includes, to some extent, the same inherent bias as conventional assessment. Therefore, the ratio of assessed value (based on the net income producing capacity of the soil) to sale price is not an exact measure of assessment quality. It indicates quality of assessment only to the degree that sale price reflects value in terms of ability to pay taxes.

Market value has not proved to be an adequate means of equalizing land values within and between taxing districts because local officials have been both unwilling and unable to use it effectively. This may be partially due to the fact that the South Dakota Code includes no specific instructions for its application. Even if appropriate guide lines could be drawn, it is doubtful that sale prices are sufficiently accurate for this purpose.

In contrast, the values derived by interpreting the soil survey give proportionate consideration to each soil difference which can be interpreted in terms of economic productivity. This serves to establish a value differential between properties—the main principle in appraising land for taxation. A more equitable distribution of the tax burden, levied in accordance with ability to pay, is then ensured.

As recorded events, sales retain the credibility of fact; and they have gained public acceptance as indicators of tax liability. Sales data constitute a good measure of compliance with the intent of the law which, one must remember, was enacted at a time when other standards were less reliable. Because of recent developments in land appraisal techniques and a growing interest in improving assessing procedure throughout the state, it appears that this law will eventually need to be re-examined. It is possible, however, that any change might entail both statutory and constitutional revision.

Sales data can and should be used as a check on the assessed values derived from estimates of net income. Any method of valuation

is subject to some degree of error, and the economic ratings for particular soils should be re-examined if market values and calculated values are widely separated. The average relationship between economic productivity and market value determined for separate physiographic or type-of-farming areas helps to establish the "true and full" level of value on which assessments are to be based.

In using sales data for assessment purposes, one must attempt to learn the specific circumstances of each sale so that its validity as a standard may be properly interpreted. A number of bona-fide observations are required to adequately characterize the reaction of the market to a particular kind of land, and little consideration should be given to any one sale. Once the standards are established, care must be exercised in making comparisons with other land on which sales data are not available. Trends in the land market must also be taken into account in some cases.

The economic ratings computed for each quarter section of land and the soil maps on which they were based may eventually help to relieve some of the imperfections in the land market which are due to lack of knowledge and errors in judgment. Prospective buyers may learn the advantage of bargaining with a definite knowledge of the quality of the land involved. This information would be particularly helpful in the lake plain area of Spink County where surface appearance provides fewer clues to soil productivity.

Any set of land values designed to reflect economic productivity should be regarded as transitory. They must be examined

periodically to ensure that the level at which land is assessed is consistent with the purpose to be served by taxation. Assessed values may need to be raised or lowered from time to time to keep pace with land market trends. The relative income earning potential of certain soils may eventually be affected by changing cost-price relationships. At some future date, major changes in agricultural technology may necessitate revision of the crop yield estimates. Any of these developments will require some degree of adjustment in the assessed values.

Undoubtedly, the use of soil survey information has improved the quality of the assessment of agricultural land in Spink County more than the results of this study indicate. The charts and statistics which describe the 1960 distributions of assessed values in each of four townships suggest a range in soil productivity which one might expect to find in such an area. If soil productivity reflects ability to pay taxes, this pattern of assessed values represents a step toward more equitable assessment. Public opinion, however, will eventually determine whether this approach to the assessment of farm land is accepted or rejected.

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APPENDIX A

FARM REAL ESTATE TRANSFER WORKSHEET

Seller _____ Book _____

Buyer _____ Page _____

Date Transferred _____ Date Filed _____ Revenue Stamps \$ _____

Description	Sec.	Twp.	Rge.	Acres	Consideration:
_____	_____	_____	_____	_____	Total \$ _____
_____	_____	_____	_____	_____	Cash \$ _____
_____	_____	_____	_____	_____	1st Mtge. \$ _____
_____	_____	_____	_____	_____	2nd Mtge. \$ _____
_____	_____	_____	_____	_____	Contract \$ _____
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	
_____	_____	_____	_____	_____	

Total Acres : _____

Kind of Instrument:

- _____ Warranty deed
- _____ Contract for deed
- _____ Other

Mortgage:

- Book _____ Page _____
- Seller _____
- New _____
- Assumed _____
- Other _____

Soils Data:

NE $\frac{1}{4}$ _____
NW $\frac{1}{4}$ _____
SW $\frac{1}{4}$ _____
SE $\frac{1}{4}$ _____

		<u>Assessed Value</u>		<u>Economic</u>
		<u>1959</u>	<u>1960</u>	<u>Rating</u>
NE $\frac{1}{4}$:	Land	_____	_____	_____
	Bldgs.	_____	_____	_____
NW $\frac{1}{4}$:	Land	_____	_____	_____
	Bldgs.	_____	_____	_____
SW $\frac{1}{4}$:	Land	_____	_____	_____
	Bldgs.	_____	_____	_____
SE $\frac{1}{4}$:	Land	_____	_____	_____
	Bldgs.	_____	_____	_____

APPENDIX B

RURAL LAND SALES QUESTIONNAIRE

Property Transferred _____ Sec. _____ Twp. _____ Rge. _____ Acres _____

_____ Sec. _____ Twp. _____ Rge. _____ Acres _____

Date of Transfer _____ Book No. _____ Page No. _____

1. At the time of transfer, were there usable buildings on the land?
____ Yes.
____ No.

2. Which of the following describes the transfer?
____ Sale between relatives.
____ Transfer of convenience to correct title or create joint tenancy.
____ Sale or transfer of property in connection with foreclosure or condemnation.
____ An ordinary sale between a willing buyer and seller.

3. Was the deed granted on termination or settlement of a contract for deed?
____ Yes.
____ No.
If yes, what was the month and year of the original contract?

4. The total price for the property was \$ _____, consisting of:
A. Cash payments (including short term notes) _____
B. Balance of old mortgage assumed by purchaser _____
C. New mortgage _____
D. Value of any property traded as part payment _____
E. Unpaid taxes assumed by purchaser _____
F. Other (please describe) _____

5. Did the sale price reported above include any personal property such as machinery, livestock, stored grain, growing crops, etc.?
____ Yes.
____ No.
If yes, indicate kind of property and approximate values:
_____ Value \$ _____
_____ Value \$ _____

6. Do you consider the sale price given in item No. 4 to have been a reasonable market price for the property on the date of transfer?

- Yes.
- No.
- Don't know.

7. Was this land purchased to enlarge another farm already operating as a unit?

- Yes.
- No.

APPENDIX C

LETTER OF EXPLANATION

1517 Third Avenue North
Fargo, North Dakota

As a part of my graduate program at South Dakota State College, I am making a comparison between soil productivity and sale prices of farm land in Spink County.

I have collected information about transfers of farm land from deed records at the county courthouse in Redfield. Frequently, these deed records do not indicate the actual selling price. Deeds are sometimes granted to correct titles of ownership and do not represent actual sales. Other deeds are given when a contract for deed is terminated, and the actual date of the agreement between buyer and seller may have been several years previous. In these cases, it is necessary to obtain more information from one of the parties involved in the sale.

From the public records I have secured information about a transaction with which you were connected. To verify and complete my information I request that you complete and return the enclosed questionnaire.

Your reply will be held in strict confidence. I am not interested in individual names but merely in the values which buyers and sellers place on particular pieces of land.

Since leaving Brookings, I have been employed by the North Dakota Agricultural Experiment Station at Fargo, North Dakota.

I sincerely thank you for the time required in answering these questions.

Very truly yours,

Donald D. Patterson

Enclosures

APPENDIX D

RURAL LAND SALES QUESTIONNAIRE (Revised)

Property Transferred _____ Sec. _____ Twp. _____ Rge. _____ Acres _____

_____ Sec. _____ Twp. _____ Rge. _____ Acres _____

Date of Transfer _____ Book No. _____ Page No. _____

1. At the time of transfer, were there usable buildings on the land?
 Yes.
 No.

2. Which of the following describes the transfer?
 Sale between relatives.
 Transfer of convenience to correct title, create joint tenancy or reorganize the property.
 Sale or transfer of property in connection with foreclosure or condemnation.
 A fair and voluntary sale between a willing buyer and seller.

3. What was the month and year of the sale agreement between buyer and seller? _____

4. The total price for the property was \$ _____, consisting of:
 A. Cash payments (including short term notes) _____
 B. Balance of old mortgage assumed by purchaser _____
 C. New mortgage _____
 D. Value of any property traded as part payment _____
 E. Unpaid taxes assumed by purchaser _____
 F. Other (please describe) _____

5. Did the sale price reported above include any personal property such as machinery, livestock, stored grain, growing crops, etc.?
 Yes.
 No.
 If yes, indicate kind of property and approximate value:
 _____ Value \$ _____
 _____ Value \$ _____

6. Do you consider the sale price given in item No. 4 to have been a reasonable market price for the property on the date of transfer?

Yes.

No.

Don't know.

7. Was this land purchased to enlarge another farm already operating as a unit?

Yes.

No.