THE STUDY OF ASSESSED FARM VALUES IN GREY COUNTY

By

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ABSTRACT

The problem studied in this thesis is variations in assessed farm values in a selected area of Grey County, Ontario. A random sample of eighty farms was taken from four townships located in the vicinity of the city of Owen Sound.

Data was collected on distance to the city, farm size, quality of buildings, soil, land use and type of road. Hypotheses were developed and tested with the use of multiple regression. The analysis provided empirical proof of the validity of the a priori hypotheses. The directional impact of the variables can be predicted.

Two of the variables, quality of buildings and size of farm were found to be statistically significant. The low level of explanation of the variation in farm values is related to the size of the sample and to the relative uniformity of conditions in the area being investigated.

The use of actual sale values, a larger sample and a more diverse area near a city that is an important market centre is recommended as a basis for further research.

ACKNOWLEDGEMENTS

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Thanks must also be extended to Dr. M. Taylor for his helpful instruction in the data analysis and to Rick Hamilton for his help with the cartography involved. My thanks are also given to the staff at the Owen Sound Regional Assessment Office for making the necessary assessment records available to me.

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CHAPTER ONE

INTRODUCTION

The problem being investigated is a study of variations in farm values in a selected area of Grey County, Ontario, comprising the four townships of Derby, Sydenham, Holland and Sullivan. The objective is to ascertain the relative significance of the various factors that are thought to influence the differences in farm values in this part of the province that is located near the city of Owen Sound.

Farm appraisal is the process of classifying and evaluating the characteristics of a farm in order to make a well reasoned judgment of its value. The work of a County Assessor demands a high degree of skill, good judgment, and knowledge of property values. Uniform methods of assessing property in determining their values are adopted by all Assessors in "order to achieve a genuine equalization of assessment in the local municipalities and in the county." (Assessment Manual, 1964) The unit values stated in the Assessment Manual are intended to serve as basic values and are subject to adjustment and allowances.

The appraisal or price formulation of farm land is a complicated matter. The price of land should reflect the capitalized value of the future income due to the increase in the production from the land. When the Assessor inspects the property, he or she will indicate all details of the land and buildings as well as the values applied to the property on a field sheet. The field sheets are then forwarded to the County Assessor who will check them and transfer all the information to permanent records.

In the Assessment Manual, farm land is valued on a per hectare basis according to classification and use. There are six classes of farm land, and three classes of pasture land. Pasture land that could be cultivated to produce crops is valued as if under cultivation. Under each classification, there is a short description of the appropriate soil type, drainage, and topography for each class of land. There is also a price quoted for the land on a per hectare basis.

Allowance is made according to a zone map of each municipality. A zone map is prepared with regard to location, present land use, type of highway, accessibility to markets, schools, and other factors which may affect values. (Assessment Manual, 1964)

The method of appraisal of buildings as outlined in the Assessment Manual, involves a lengthy list of classifications. The first basic factor in arriving at the cost is the farm replacement cost. From the replacement cost, it is necessary to make allowances for depreciation and obsolescence.

According to the 1961 enumeration manual, the farm value reported should be the market value as agricultural property. The real estate values near urban centres should not be reported, but rather the value of the property when used for the production of agricultural products. It is difficult to obtain a value which properly reflects the farm's use. If one expects the land use to change in the future, then this will likely be reflected in the value of the farm land. Therefore, areas not affected by the transition of agricultural land to other uses reflect more closely the true agricultural value. This value is a vital aspect of ecomonic viability and may be used as an indicator of the future permanence of the enterprise as a full-time operation.

According to recent statistics, the value of farm land in Ontario has dropped 3.6 billion since early 1982. This decline can be attributed to the recession which took place in 1981. It has been estimated that the value of Ontario farm land dropped between ten and twenty-five per cent in the first half of 1983. As a result, "the price of farm land is considerably higher than its income earning ability." (Owen Sound Sun Times, 1983)

Farm land values are important in understanding the spatial changes in agriculture which are constantly occurring today. Variations in farm values can be attributed to different variables. An analysis of the relative importance of different variables such as; farm size, soil quality, distance to Owen Sound, quality of the farm buildings, present land use and the location of the farm on; a provincial highway, a paved county road or on an unpaved sideroad are factors in determining variations in farm values.

STUDY AREA

The area chosen for this study is an area in Grey County situated in the northern part of Western Ontario. (Figure 1) Its northern boundary is on the shores of Georgian Bay and it is bounded on the west by Bruce County and on the east by Simcoe and Duffering Counties, and on the south by Wellington County.

Grey County is comprised of fifteen townships. The townships included in this study are Derby, Sydenham, Holland and Sullivan. Figure 2 is a location map for the study and illustrates the area selected in this investigation.

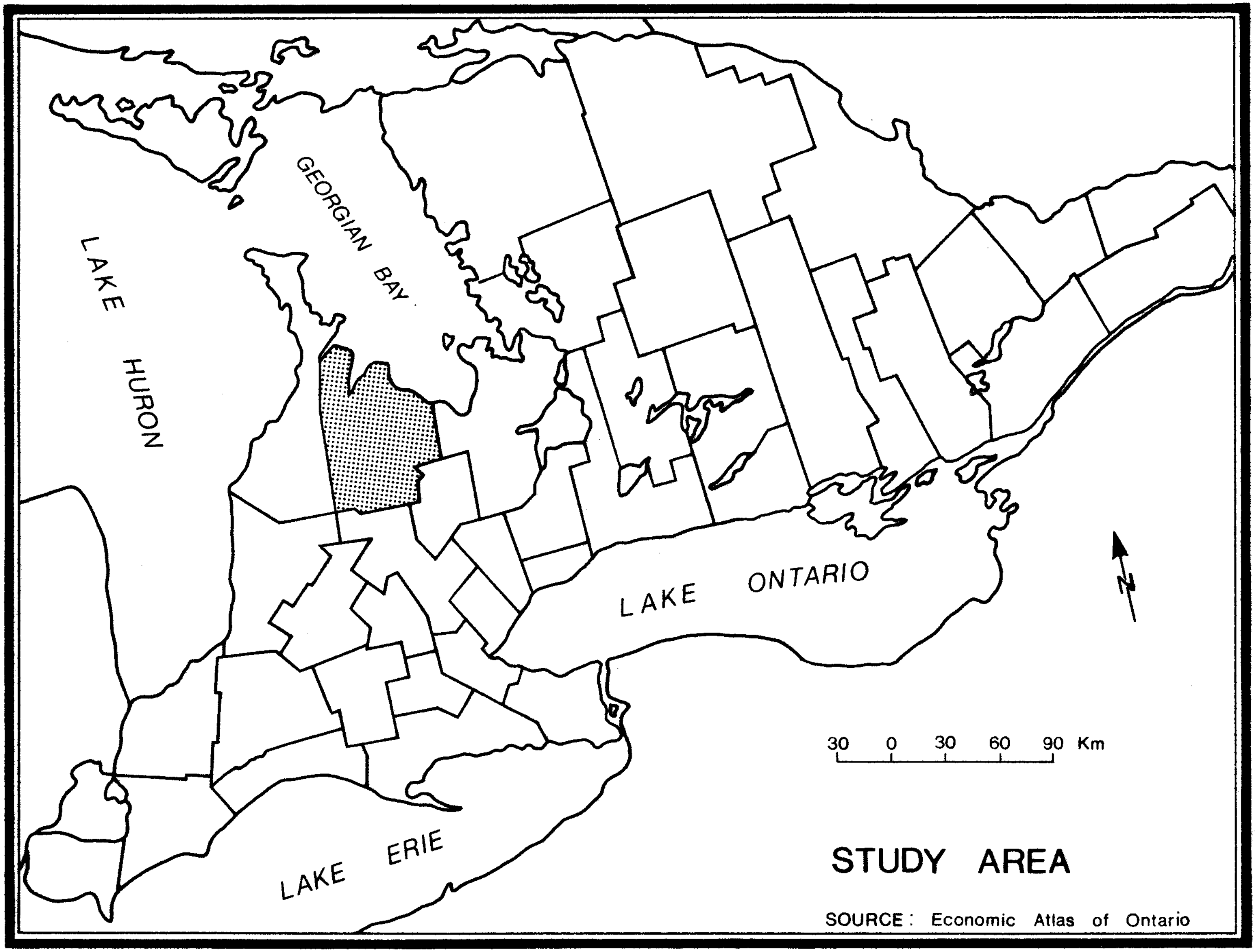
These particular townships were chosen because they represent a good sample of the variation in assessed farm values. A choice of townhips near Owen Sound was made to determine the effects of proximity to a city on farm values.

In 1981, the total area of Grey County was 450,487 hectares of which 273,289 hectares were classified as occupied farm land. (Census 1981) Over the past years, the amount of occupied farm land has been decreasing in Grey County. In 1971, the total amount of occupied farm land was 304,077 hectares, a drop of 30,788 hectares in a ten year period.

In addition to a decrease in the amount of occupied farm land, there has been a decrease in the number of farms and the size of farms in Grey County. In 1971, there were 4,304 farms in Grey County which dropped to 3,678 by the year of 1981. (Census 1971 and 1981) Similarly, in 1971 the average size of farms was 353.5 hectares which decreased to 278.6 hectares by 1981. (Census 1971 and 1981)

Unimproved land in Grey County comprises 77,203 hectares of the total land. (Census 1981) Nearly half of the unimproved land is in natural pasture. This includes numerous large cleared areas too hilly or stony for successful cultivation and many poorly drained areas. In the northern part of the county there are large areas where the shallow soils result in outcrops making cultivation very difficult.

In the northern region of the county, climate, soil materials, and age, or a combination of all three have resulted in the development



STUDY AREA

SOURCE: Economic Atlas of Ontario

FIGURE 1

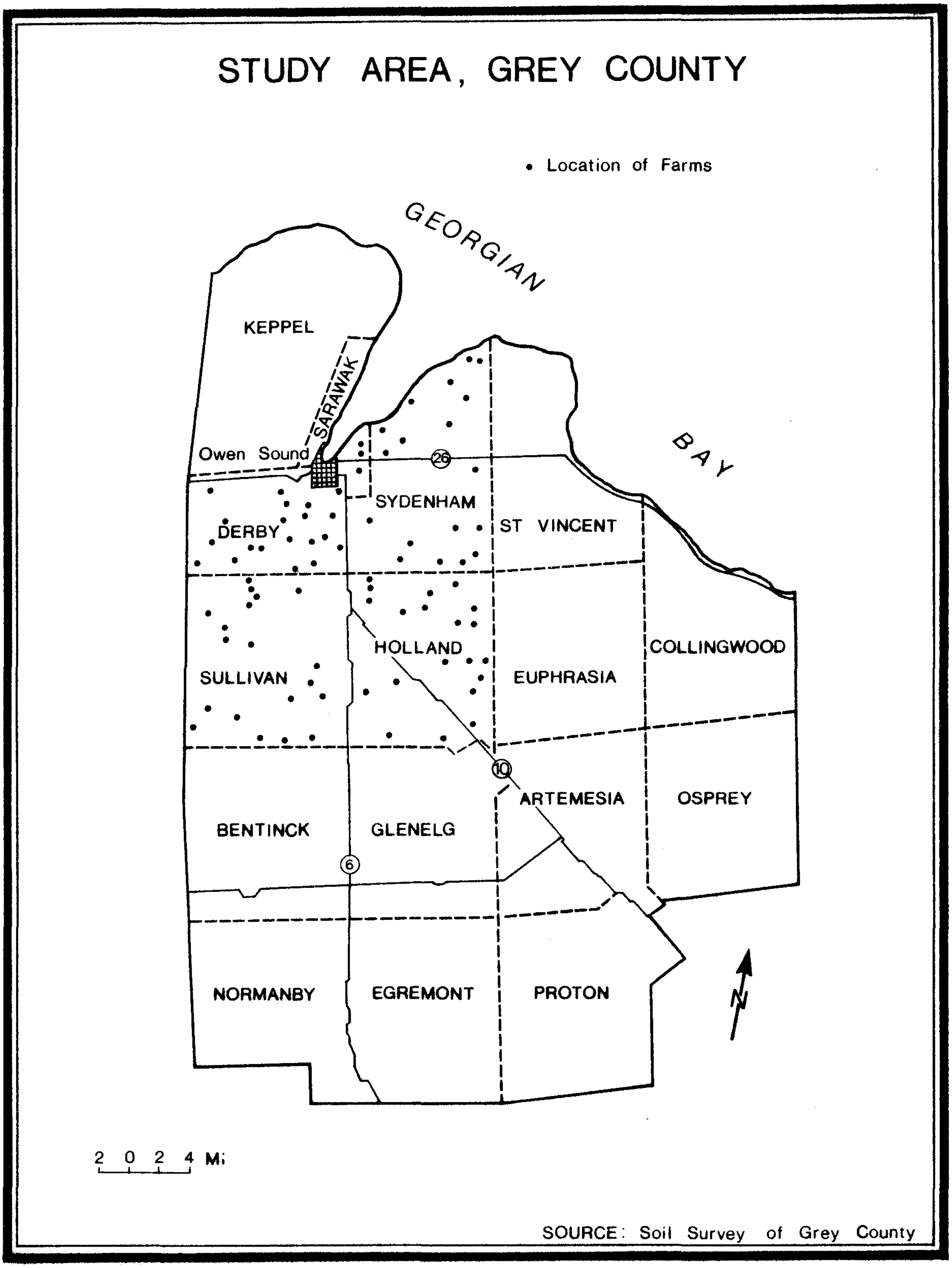

STUDY AREA, GREY COUNTY
• Location of Farms
GEORGIAN
BAY
KEPPEL
SARAWAK
Owen Sound
26
SYDENHAM
ST VINCENT
DERBY
HOLLAND
COLLINGWOOD
SULLIVAN
EUPHRASIA
10
ARTEMESIA
OSPREY
BENTINCK
GLENELG
6
NORMANBY
EGREMONT
PROTON
N
2 0 2 4 Mi
SOURCE: Soil Survey of Grey County

FIGURE 2

of shallow soils. The clay loam till soils are found in a belt running east and west around Georgian Bay. The stonefree fine-textured deposits which are clays and silts are found in Sullivan Township.

Grey County is essentially a live-stock raising county. Confirmation of this is by the large acreage of hay, clover, oats and mixed grains in the area. Important supplementary income for most farmers is derived from poultry products, sheep and hogs, with an increase in grain and seed production since the 1950's. The small acreage of these high value cash crops reflects the unsuitable climatic environment for specialty crops.

The changeable weather in Grey County results from a regular procession of high and low pressure weather systems that cross Southern Ontario from west to east. The mean annual temperature for Grey County is 5°C to 8°C. It has an extreme temperature range of 79, from -40°C to 39°C with a frost-free period of 125 to 140 days. The growing season in Grey County varies from 180 to 195 days, being the shortest in the most elevated part of the region.

In spite of the changeable weather, the Owen Sound area enjoys the moderating influence of the waters of Georgian Bay, surpassing the other parts of the county in snowfall. There is less precipitation in the Owen Sound area during April, May, June, August and September than in the rest of the county. In the Georgian Bay area up to 94 millimeters of precipitation has been recorded. The moisture deficiency occurs in Grey County early in July and lasts until September. This is an important factor as it limits the growth of all crops.

The topography of Grey County is most variable. Sullivan and

Sydenham townships consists mainly of smooth rolling landscape. Contrary, Holland and Derby have a dominantly irregular hilly topography. Over 1,500 distinct drumlins have been mapped in the Georgian Bay area from the ice which once advanced from Georgian Bay. North of Durham in Grey County there are large drumlins with steep sides, composed of very bouldery till.

The local environment in Grey County offers a range of possible responses, from specialty crops to dairying and mixed livestock operations. This range of farming found in Grey County may be a factor in the variable farm values. This variation of farm values will be explained through an analysis of six variables that are hypothesized as affecting assessed farm values.

CHAPTER TWO

REVIEW OF THE LITERATURE

The basic theory pertaining to the spatial structure of agricultural production originated a century and a half ago in the work of a German Economist, J. H. Von Thunen. Since then other researchers have produced modifications of his theory. The purpose of this chapter is to review previous studies that relate to spatial variations in farm land values. The values being investigated in this study are assessed values and not actual sale values.

A review of the literature indicates that studies can be grouped into two categories; single-factor and multi-factor approaches.

A. Single-Factor Studies

The work of Von Thunen represents one of the first attempts to discover laws which influence the prices of agricultural products and the way in which price variations are translated into agricultural land use.

Von Thunen's hypothetical model assumed the market was located at the centre, soil was equal in quality and agricultural production of specific plots of land did not vary from one location to another. This isolated city had transportation routes emanating in straight lines from any point to the one central market place. The results of his study indicated that a series of concentric circles would be formed with each having a different land rent and use.

The importance of Von Thunen's model to this study is the established relationship between the effect of distance and land use around a central market place. This is of interest in this study because farm land closer to Owen Sound might be farmed more intensively than farm land further away, which might imply higher farm values. It is not relevant in the sense that Owen Sound is not a central market place.

Once Von Thunen realized his model was spatially unrealistic, he relaxed the rigid assumptions. He did this by allowing for variation in topography, soil productivity and modes of transportation.

As changes took place, the validity of Von Thunen's theory began to be questioned. Investigations by other researchers were carried out to look at the importance of location. One such study was done by Stewart in 1936 who reconsidered the effect of location on farm land values. The effect of road type and distance from towns were the two variables Stewart measured in several American States. Similar to Von Thunen, Stewart emphazied the importance of roads in assessing the impact of location on agricultural land values. Stewart concluded that road type and distance to an urban area were of critical importance in determining the valuation of farms. Distance exhibited a linear rent function, which caused economic rent to decrease with increased distance from market centres. Stewart indicated that more than one factor should be considered in trying to approximate what happens in the real world.

While research was being done to establish a rural land value theory, researchers were applying Von Thunen's theory to studies on urban land values. Similar to the agricultural location patterns around towns, we do not find a neat concentric pattern within cities. Studies were done by Alonso, Hurd and Haig who analyzed the effect of location on residental land values. Land values declined significantly with increase distance from the central business district. A similar study was done by Yeates in Chicago (1965). Similar conclusions were reached; that location was important in determining urban land values.

Researchers for a long time considered only location for variations in farm values. Then other determinants were considered to be relevant.

A study done by Wendt with regard to urban land values proposed that land values were equal to the average expected land rent divided by the capitalization rate. Since Wendt's model was not backed by empirical evidence it was quickly disproved by Ratcliff who stated that accessibility or location was more important in determining land values.

B. Multi-Factor Studies

Studies of land values soon took on wider dimensions. Instead of concentrating on one variable as a determinant of land values, several factors were being considered.

One of the earliest studies was done be G. Haas (1922) who looked at farm land values in Blue Earth County in Minnesota. Haas' study concentrated on several variables which were distance to market, size of city or village, type of road, value of buildings, type of land, crop yields and soil quality. Through his analysis, he found that four variables explained eighty-one per cent of the variation in farm land values. These variables were; depreciated costs of buildings per acre, land type, soil productivity and distance to market.

Meek and McBride (1967) studied factors which affected rural land values. Three hundred and twenty-six farms in five areas of Ontario were studied; Kent, Bruce, Oxford, Wellington, Dufferin and Dundas. Ten factors were examined in each area in order to show the relationship and trends in farm land values. Some of the variables Meek and McBride used to include in this study were the effect of proximity to urban areas, size of farm and soil quality. Meek and McBride's study was not particularly valuable in terms of a contribution to land value theory as their analysis was sketchy and not verified properly.

A study conducted by Feuerstein (1974) analyzed factors affecting farm land prices in Germany. For this particular study, Feuerstein used time-series and cross-sectional analysis in order to quantify the factors which affected the land values from 1954 to 1968. The time-series analysis was used to observe which independent variables influenced average farm land prices over a given period of time. The cross-sectional analysis was used to obtain information about the dependence of single plot prices. Feuerstein argued that land values were not influenced by farm income, inflation rates and interest rates, but rather were influenced by non-agricultural land demand, farm indebtedness, acquisition for rural settlement purposes, soil quality, population density and technological advances. Feuerstein's contribution to the theory of land values was the importance of an urban impact on the rural land values.

Similarly, Ruttan's study in 1961 concentrated on looking at the impact of urban development on rural land values. More specifically, Ruttan was looking at rural land values and how they reflect the impact of variations in population pressure. Ruttan's method of testing his hypothesis was to measure the amount of non-irrigated cropland harvested per county, the amount of irrigated pasture per county, and the total county population. Ruttan argued that population pressure was an important factor in accounting for variations in land values. Ruttan explained within his study that the apparent weaknesses in his model were due to the large area unit of study he used for his observations. However, the results of the analysis did emphasize the importance of population pressure on rural land values.

C. Summary

The variables used in this study are; farm size, soil quality, distance from Owen Sound, quality of the farm buildings, present land use and whether or not the farm is located on a major highway, a county road or on an unpaved township road.

Instead of conducting a separate analysis on each of the variables, this investigation considers the variables together. Thus, it is a multi-factor study.

CHAPTER THREE

METHODOLOGY

The first step in the analysis was to formulate the problem and to specify the characteristics of the study area. Secondly, a review of the literature was used to confine the types of factors and methods of analysis considered by researchers. In this chapter, the methodology is outlined and the operational definitions of the major variables are discussed. In addition, a priori hypotheses are presented. (Table 7)

This study uses a model in order to deal with the problem of studying the variation of assessed farm values in Grey County.

Data for the study was obtained from three sources; field research, the Owen Sound Regional Assessment Office, and relevant literature. Hypotheses were generated in order to predict the relationship of the six variables to the assessed farm values.

The variables utilized in this study are; farm size, soil quality, distance to Owen Sound, quality of the farm buildings, present land use and the location of the farm; on a provincial highway, a paved county road or on an unpaved township road.

Rather than conducting separate analysis on each of the variables, this investigation considers the variables together.

Thus, it is a multi-factor study.

The factors of site attributes are measured by farm size, quality of the buildings and the present land use. Additionally, there are two factors which deal with location. The variables which are utilized to assess the importance of location are distance to Owen Sound and location of the farm; on Highway 21, 26, or Highway 6 & 10. Finally, the variable of soil quality is organized under the physical attribute factor. The six variables are incorporated into the model of farm value analysis and the reliability of the analysis is assessed by multiple regression.

In this section, information regarding the dependent and independent variables is presented. The source of data and the method of measurement is presented for the dependent variable. Similarly, for each of the independent variables the source is listed, the method of measurement is given and a table of descriptive statistics is presented. In addition, an hypothesis is developed for each variable for testing purposes.

The approximate location of the eighty farms is shown on Figure 2. Listed by township, there are twenty farms in each of the chosen townships; Derby, Sydenham, Holland and Sullivan. The eighty farms were randomly chosen because they represent a good sample of the variation in assessed farm values.

A. Dependent Variable

Assessed Farm Value Per Hectare

The individual assessed farm values were obtained from the Owen Sound Regional Assessment Office. The values were quantified and standardized by using the assessed value in dollars per hectare.

B. Independent Variables

Farm Size

It was hypothesized that farm size will be inversely correlated with the assessed farm value, as there is a greater demand for the smaller less expensive farms. However, when value is considered on a per hectare basis, the larger size farms will have a lower value per hectare. With reference to Chapter Two, a study by Meek and McBride (1967) examined the effect of rural land values with farm size. The study investigated the inverse relationship between the two variables. The Owen Sound Regional Assessment Office was the source of data for the farm size.

Soil Quality

With reference to the study conducted by Meek and McBride (1967), it was established that land values varied directly with soil quality. Therefore, it is hypothesized that the assessed farm value will increase with increasing quality of land. The quantitative assessment was achieved in the following manner .

TABLE 1

SOIL CAPABILITY CLASSIFICATION FOR AGRICULTURE

Class 1 - Soils in this class have no significant limitations that restrict their use for crops.

Class 2 - Soils in this class have moderate limitations that restrict the range of crops or require special conservation practices.

Class 3 - Soils in this class have severe limitations that restrict the choice of crops or require special conservation practices.

Class 4 - Soils in this class have severe limitations that restrict the choice of crops; require special conservation practices and very careful management or both.

Class 5 - Soils in this class have very severe limitations that restricts their capability to producing perennial forage crops and improvement practices are feasible.

Class 6 - Soils in this class are capable only of producing perennial forage crops and improvement practices are feasible.

Class 7 - Land is unsuitable for agriculture.

Source: Canada Land Inventory Soil Capability Map.

First, the eighty farms were located on the Soil Classification Map published by Canada Land Inventory. Refer to Table 1 for the soil classifications. Subsequently, a rating was given to the seven classes of soil capability indicating the quality and value of the land. Refer to Table 2 for the soil capability weightings.

TABLE 2

SOIL CAPABILITY WEIGHTINGS

Land Class	Weightings
1	1.00
2	0.87
3	0.75
4	0.50
5	0.25
6	0.10
7	0.00

Source: L. G. Reeds and the Ontario Department of Agricultural and Food.
D. W. Hoffman, Agricultural Land Use Capability in Southern Ontario, (1970).

Distance

Distance has been given considerable attention in both rural and urban land value studies as indicated in Chapter Two. According to a study conducted by Stewart (1936), distance from an urban centre was of critical importance in determining the valuation of the farms. Distance was shown as a linear rent function, which caused economic rent to decrease with increase distance from urban centres.

It is hypothesized that farm value will increase as distance to Owen Sound decreases. The rationale behind this hypothesis is to see whether farm land is more valuable closer to Owen Sound than farm land further away. Thus, as a farm has greater access to services, the value will increase as these particular services become part of the farm's market value.

The distance from each farm to Owen Sound was measured in kilometres from a topographic map. The measurement was the direct distance from the farm site to the edge of the built-up area of Owen Sound.

Land Use

A study conducted by G. Haas (1922) concentrated on land use and its affect on rural land values. Through his analysis, he found that four variables explained eighty-one per cent of the variation in farm land values, one of which was land use.

It is hypothesized that land use varies directly with assessed farm land values. The source of the data was obtained through field research and the data was quantified by assigning a numerical value to four land-use categories. (Table 3)

Dummy variables were employed in the analysis to properly measure the land use variable. Refer to Table 3. Land that was designated as waste was assigned the value of one, while the remaining two categories were assigned zero. Similarly, land designated as general crops were assigned the value of one with the two other categories assigned zero. The same criteria was

TABLE 3

ASSIGNMENT OF DUMMY VARIABLES FOR BUILDING QUALITY

Building Quality	Dummy Variable Assigned
Poor	1 0 0 0
Fair	0 1 0 0
Good	0 0 1 0
Excellent	0 0 0 1

ASSIGNMENT OF DUMMY VARIABLES FOR LOCATION

Location	Dummy Variable Assigned
Major Highway	1 0 0
Paved County Road	0 1 0
Unpaved Township Road	0 0 1

ASSIGNMENT OF DUMMY VARIABLES FOR LAND USE

Land Use	Dummy Variable Assigned
Waste	1 0 0 0
Pasture	0 1 0 0
General Crop	0 0 1 0
Special Crop	0 0 0 1

Source: P. MacDonald

performed on the land designated for special crops.

TABLE 4

LAND USE CATEGORIES

Land Use	Assigned Value
Waste	0
Pasture	1
General Crops	2
Special Crops	3

Source: P. MacDonald

Location

Location according to Stewart was critical in determining the valuation of farm land. In this particular study, location has been considered to be a function of accessibility.

Accessibility was quantified by observing the location of the farms; on a major highway, a paved county road, or on an unpaved township road. The three major highways involved in the study are; Highway 21, 26 and Highway 6 & 10. Refer to Figure 3 for the location of the provincial highways, paved county roads and the gravel sideroads.

It is predicted that assessed farm value will increase with increasing quality and conditions of the road. Thus, a farm located on Highway 6 & 10 will have a higher assessed value than a farm located on a paved county road or a gravel sideroad. Similarly, a farm located on a paved county road will have a higher farm value than a farm located on a gravel sideroad.

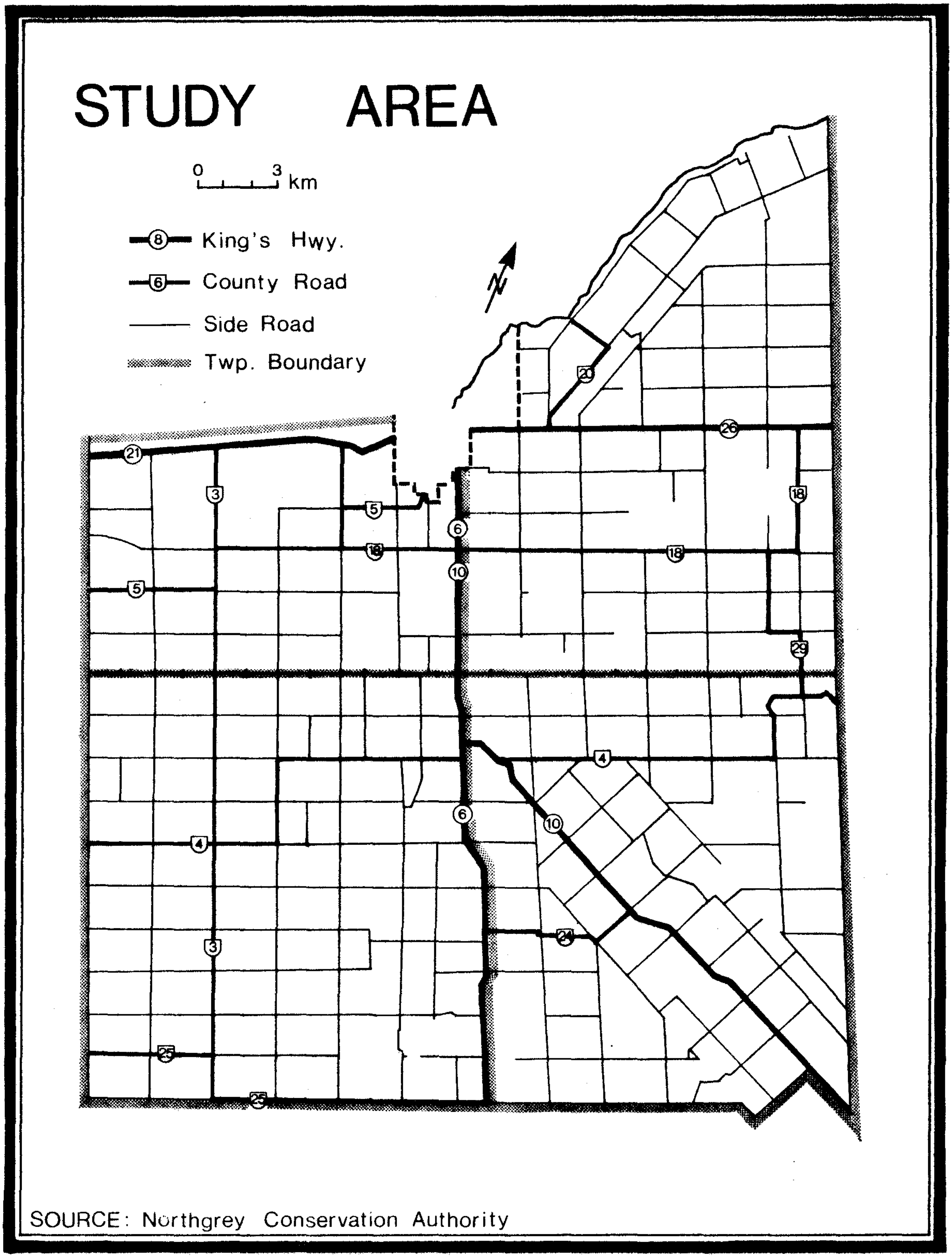

STUDY AREA
0 3 km
King's Hwy.
County Road
Side Road
Twp. Boundary
SOURCE: Northgrey Conservation Authority

FIGURE 3

Dummy variables were utilized to represent categories for the nominal data. Refer to Table 3. The data was obtained through field research of the eighty sampled farms.

TABLE 5

LOCATION

Location	Assigned Value
Gravel Sideroad	0
Paved County Road	1
Provincial Highway	2

Source: P. MacDonald

Quality of Farm Buildings

It is hypothesized that quality of farm buildings varies directly with assessed farm values. Therefore, farms with well kept and better quality buildings would have a higher assessed value. A multi-factor study conducted by G. Haas (1922) concentrated on several variables, one being the value of buildings as having an affect on land values.

As the value of buildings forms an integral part of the entire value of the farm, it can be expected that the relationship of the quality of farm buildings to the assessed farm value is positive.

The buildings were assessed through field research. Each farm was evaluated objectively in terms of its quality and was given a rating of poor, fair, good or excellent. These ratings were assigned a numerical value for purposes of the analysis. (Table 6)

TABLE 6

QUALITY OF BUILDINGS

Building Categories	Assigned Value
Poor	1
Fair	2
Good	3
Excellent	4

Source: P. MacDonald

Once again, dummy variables are utilized in order to categorize the nominal data for testing purposes. (Table 3) For the analysis, each category is assigned a one while the remaining three variables are assigned a zero.

Chapter Four presents an interpretation of the results of the analysis. A summarized conclusion follows in Chapter Five.

TABLE 7

SUMMARY OF A PRIORI HYPOTHESIS

Dependent Variable - assessed value of farm land per hectare

Independent Variables	Predicted Hypothesis
1. Farm Size	Assessed farm values vary inversely with farm size
2. Soil Quality	Assessed farm values vary directly with soil quality
3. Distance	Assessed farm values vary inversely with distance
4. Land Use	Assessed farm values vary directly with land use
5. Location	Assessed farm values vary directly with location
6. Quality of Farm Buildings	Assessed farm values vary directly with quality of the farm buildings

CHAPTER FOUR

INTERPRETATION OF RESULTS

The technique of Multiple Linear Regression is used to test the hypotheses proposed in Chapter Three. The statistical technique of multiple regression is used to analyze the relationship between the assessed farm values and the set of independent or predictor variables, namely, farm size, distance soil quality, building quality, location of the farm and land use. The general equation for multiple linear regression is;

$$Y = a + b_1 x_1 + b_2 x_2 \cdot \cdot \cdot \cdot + b_n x_n + u,$$

where

Y is the dependent variable;

each x is an independent variable;

a is the constant term;

each b is a regression coefficient which indicates the change in Y expected for a unit change in the associated x, while holding all other independent variables constant;

and u is the residual or error term. (Hubert, 1975)

Following the first and second iteration of the model, the most significant variables were chosen. By using the coefficients and the r^2 values the best measures were selected to enter the subsequent regression. Finally, a stepwise multiple regression is performed to obtain the order of significance of the six variables in the regression equation.

A. Initial Multiple Regression

Initially, a multiple regression was performed on the three independent variables consisting of ordinal data. The three variables were; farm size, distance, and soil quality. Subsequently, the remaining three variables were of nominal level data, therefore, dummy variables were utilized in order to incorporate the nominal scale variables in the regression equation. A multiple regression was then executed on the remaining variables. These variables were; building quality, location of the farm and present land use.

The results from the initial multiple regression indicate that farm size is the only variable that is significant at the .05 level. (Table 8) With regards to the remaining two variables, soil quality is of marginal significance while the distance variable is insignificant. Two of the variables, farm size and distance exhibit a negative coefficient direction, as expected. With reference to farm size, this negative direction indicates that with each additional hectare, the assessed farm value per hectare declines by 2.56 dollars. Similarly, the negative direction of the distance variable demonstrates that with an additional kilometre, the assessed farm value declines by 4.76 dollars. The third variable included in the regression is soil quality which exhibits a positive influence of 181.76 dollars on the assessed farm values.

The explanatory level of the three variables is relatively low. The farm size variable exhibited the highest level of explanation with an r^2 values of .04688. The distance and soil quality variables demonstrated a higher level of explanation, .07466 and .08567 respectively. This higher level of explanation is due to the fact that the r^2 values are a cumulative explanation level. Therefore, when the distance and soil quality variables are analyzed with regard to the incremental amount explained, their contribution is minimal to the level of explanation. This is evident from the results as soil quality contributed .02777 to the level of explanation while distance contributed only .01102 to the explanation of the variation in assessed farm values. Refer to Table 8 for the pertinant statistics.

TABLE 8

REGRESSION RESULTS

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
Farm Size	- 2.56	2.55 *	.04688	.04688
Soil Quality	181.75	2.03	.07466	.02777
Distance	- 4.76	.92	.08567	.01102

F value - 2.73

* Significant at .05 level

Source: Computer Printout

B. Second Iteration of the Model

The second iteration executed involved the utilization of dummy variables. In order to properly incorporate building quality, location of the farms and present land use, a series of dummy variables were employed. (Table 3)

With reference to the building quality, it was found to be significant at the .05 level. The utilization of the dummy variables generates categories representing the different ratings produced in the field research. D1 through to D4 represents the ratings given to the farm buildings; poor, fair, good or excellent, respectively. (Table 3) When using dummy variables in the analyzes, the number of categories utilized is always one less than the actual number of ratings. The excellent building quality category was found to be the most significant, while the remaining categories were of marginal or no significance. Refer to Table 9 for pertinant statistics.

The coefficient for excellent building quality exhibits a positive direction which coincides with the a priori hypotheses. This positive direction indicates that farm buildings which are very well maintained increase the assessed farm value by 378.08 dollars. Contrary, the coefficient for poor quality of buildings exhibits a negative influence indicating the assessed farm value decreases by 46.67 dollars.

The cumulative level of explanation was relatively low, .09305, with excellent building quality contributing .04550 to the regression equation. The remaining categories contributed .00781 and .03974, respectively to the level of explanation. The descriptive statistics are presented below.

TABLE 9

REGRESSION RESULTS

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
D1	- 46.67	.94	.00781	.00781
D4	142.20	5.08*	.05331	.04550
D3	378.08	3.33	.09305	.03974

F Value - 2.59

* Significant at .05 level

Source: Computer Printout

The location variable indicating whether the farm is located on a provincial highway, a paved county road or an unpaved sideroad was found to be insignificant in this investigation. The cumulative amount of explanation for the three locational categories was relatively low. The category representing paved county roads (D6) presented the highest level of explanation with an r^2 value of .00403. Refer to Table 10 for the decriptive statistics.

TABLE 10

REGRESSION RESULTS

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
D5	34.56	.166	.00327	.00327
D6	- 87.28	.312	.00731	.00403

F Value - .28

Source: Computer Printout

Similarly, the present land-use variable was found to be insignificant in this study. The cumulative level of explanation for the land-use categories was extremely low. The category of specialty crop (D10) yielded the highest level of explanation with an r^2 value of .02640. Table 11 presents the pertinant statistics.

TABLE 11

REGRESSION RESULTS

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
D8	573.70	2.04	.01830	.01830
D10	282.08	2.18	.04470	.02640
D9	559.37	.73	.05380	.00910

F Value - 1.44

Source: Computer Printout

The explanatory power from the first two iterations of the model were relatively low. The two variables that were found to be significant were farm size and building quality, however, their contribution to the level of explanation was not great. In order to achieve a better measure, thus, a higher contribution to the regression equation, a stepwise regression was executed. Through analysis of the coefficients and r^2 values the best measures were selected to incorporate in the stepwise regression. The variables chosen were; farm size, distance, soil quality, building quality (D4), location (D6), and land use (D10).

C. <u>Stepwise Multiple Regression</u>

A stepwise multiple regression was performed to observe the order the variables entered the regression equation, thus, indicating the order of significance.

The first variable to enter the regression equation was building quality. This indicates that building quality is the most significant variable in explaining the variation of assessed farm values in Grey County. The second variable to enter the equation was farm size. Both farm size and building quality were significant; however, the level of explanation was low. The third variable to enter the equation was land use which exhibits a marginal significance. With the addition of the land-use variable to the regression equation, the first and second variables became less significant. Therefore, the best measure of the regression is obtained when farm size and building quality variables are found in the equation. The remaining variables which entered the equation were of little or no significance to this investigation.(Table 13) Through observation of the correlation matrix it is clear that the six variables are not highly correlated with assessed farm values. Table 12 presents the statistics for the best measure of the regression equation.

TABLE 12

STEPWISE REGRESSION RESULTS

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
Building Qu.	390.58	5.58 *	.04750	.04750
Farm Size	- 3.69	5.51 *	.11236	.06477

F Value - 4.88

* Significant at .05 level

Source: Computer Printout

Validity of the Hypotheses

It is now appropriate to examine the model and to indicate in detail its performance with regard to the a priori hypotheses.

With regard to distance, it was hypothesized that assessed farm values vary inversely with distance. The negative direction of the distance coefficient sbustantiates this hypothesis. (Table 7) The direct distance from the farm site to Owen Sound is responsible for explaining .5 per cent of the variation in assessed farm values in Grey County.

Assessed farm values were hypothesized to vary directly with soil quality. The quality of the soil exhibits a positive influence and explains 1.1 per cent to the explanation of the variation in assessed farm values.

The farm size coefficients indicate a negative direction which confirms the hypothesized explanation that assessed farm values vary inversely with farm size. Thus, as farm size increased in Grey County, the value per hectare decreased. Farm size contributes 6.5 per cent to the explained variation.

It was hypothesized in this investigation that the assessed farm values vary directly with the quality of the farm buildings. The building quality contributes 4.7 per cent to the overall explanation.

Similarly, it was predicted that assessed farm values vary directly with land use. The land-use coefficients exhibits a positive influence, thus, the statistical analysis verifies that farm values vary directly with land use. Land use contributes 3.7 per cent to the explanation in this study.

Finally, the assessed farm values were hypothesized to vary directly with location. One of the coefficients exhibits a positive direction while the other exhibits a negative direction. In the final stepwise regression location contributes 0.6 per cent to the explanation of the variation in assessed farm values in Grey County. The cumulative explanation level of the variation in assessed farm values for the six variables is 17 per cent.

The following chapter summarizes the conclusions from this investigation.

TABLE 13

SUMMARY TABLE OF FINAL REGRESSION

Variable	Coefficient	F Value	Cumulative Amount Explained	Incremental Amount Explained
Building Qu.	365.15	4.83	.04760	.04760
Farm Size	- 3.60	5.00	.11236	.06477
Land Use	285.22	2.31	.14731	.03495
Soil Qu.	113.82	.81	.15878	.01147
Location	- 108.50	.54	.16442	.00564
Distance	- 3.32	.46	.16968	.00526

Source: Computer Printout

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

This study was undertaken to investigate the spatial variations in farm values in a selected area of Grey County, Ontario. In this section of the County, there is some variation in soil type, distance to the city of Owen Sound, quality of buildings and type of road on which the farms are located. A random sample of eighty farms was taken for the investigation and data was collected on the six independent variables that were believed to be most important in determining differences in farm values.

Hypotheses were developed to suggest the relationship of these variables to farm values. Multiple regression was used to obtain the quantitative assessment of the model. After the first iteration of the model, dummy variables were formulated in order to incorporate the nominal data and regressions were performed.

Following the second iteration, the most significant variables were selected to enter into the subsequent regression.

Finally, a stepwise multiple regression was executed to establish the order of significance of the six independent variables. The results of the regression indicated that the site attribute measured by building quality was the most significant variable in explaining the variation in farm values. This was followed by the farm size variable which was responsible for 6.5 per cent to the level of explanation.

The results obtained through the regression analysis provided empirical proof of the validity of the a priori hypotheses. Therefore, the directional impact of the variables can be predicted.

Results of the investigation might have been different if time were available to make a more accurate assessment of soil quality. This would involve several hours being spent at each farm to estimate how much of the total area of the farm would be classified in the seven soil capability categories. The data used in the analysis was based mainly on information provided by the County Soil Map which presents a very generalized picture of spatial differences in soil type and is not sufficiently detailed for individual farm evaluation.

Similarly, the classification of quality of buildings was based on a rather rapid site observation. A more accurate method of evaluation of building quality would have meant that the validity of the data would have been enhanced.

The classification of land use into four categories was a fairly satisfactory method although it is not a precise way of determining intensity of use. Yield data for each farm or gross value of production are better measures but could not be obtained readily and were not within the scope of this research.

The measures of distance to Owen Sound and size of farm holdings were accurate as was the location on a particular type of road. However, since Owen Sound is not a primary market centre for produce from the area, the main advantages in proximity relate to accessibility to services provided by the city. The main benefit of location on a major highway in contrast to an upaved sideroad is related again to accessibility and improved visibility of the farm to potential buyers.

In spite of some of the inadequacies of the data, the study has thrown some light on the factors that affect farm values in this part of Ontario. The low level of explanation in this investigation is related to the small sample and to the relative uniformity of conditions in the area being studied.

One should note that the building quality and size of farm variables were statistically significant and that the correlations supported the direction of the hypothesized relationships.

It would be of interest to repeat this study using actual farm sales values with a larger sample and in an area of greater diversity of conditions and in the vicinity of a city that is a more important market centre.

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APPENDIX

APPENDIX

DATA 2A

Farm Value	Farm Size	Building Quality	Location	Distance	Land Use	Soil Quality
453.60	39.68	2	0	15.5	2	0.87
255.00	20.00	3	1	2.7	2	0.00
1129.68	32.00	3	1	5.0	2	0.87
502.71	58.90	2	0	5.9	2	1.00
1011.25	40.00	4	0	10.6	2	1.00
210.00	20.00	3	0	2.7	2	0.00
502.60	80.00	3	1	10.7	2	1.00
800.51	39.10	3	1	3.5	2	1.00
108.00	42.60	2	2	5.6	2	0.75
899.00	37.60	3	1	3.2	2	0.25
545.62	64.00	3	0	8.2	2	0.10
415.45	89.30	3	0	5.1	2	0.75
702.00	83.20	4	0	10.9	2	1.00
800.00	40.00	3	2	11.7	2	1.00
213.19	78.80	4	1	11.2	2	1.00
332.52	20.60	2	0	11.4	2	1.00
756.02	33.20	2	0	4,6	2	0.75
1217.40	20.70	3	1	3.7	1	0.87
215.40	39.60	2	0	9.8	2	1.00
360.00	40.00	2	2	0.8	2	1.00
879.46	22.40	1	2	29.4	2	0.25
157.50	40.00	3	0	26.7	2	0.87
755.00	20.00	2	0	9.5	2	1.00
339.40	51.20	2	0	10.2	2	1.00
1770.00	20.00	3	0	11.0	2	1.00
735.00	30.00	2	0	15.4	2	1.00
553.13	40.00	3	1	17.9	2	0.87
859.57	31.76	2	1	20.3	2	0.87

APPENDIX

DATA 2A (con't)

Farm Value	Farm Size	Building Quality	Location	Distance	Land Use	Soil Quality
620.47	44.20	2	0	20.0	2	0.25
267.91	128.40	3	0	19.7	2	0.00
712.85	39.70	3	1	20.3	2	1.00
746.02	31.40	2	0	21.3	2	0.87
628.94	38.00	2	0	26.2	2	1.00
534.87	39.00	3	1	20.9	2	1.00
1522.84	39.40	4	0	16.0	2	1.00
328.39	57.40	2	0	19.4	2	0.87
315.49	119.40	3	0	16.2	2	1.00
367.03	45.50	2	1	19.0	2	0.87
418.48	40.50	2	0	22.9	2	0.25
539.72	37.00	2	0	24.2	2	0.25
410.00	80.00	2	0	24.5	2	1.00
539.19	51.93	2	0	28.1	2	1.00
775.00	40.00	2	0	26.2	2	1.00
474.78	54.13	3	1	19.5	2	0.87
857.87	19.70	3	0	16.5	2	0.87
226.25	80.00	1	0	25.5	2	0.25
485.41	39.76	2	1	13.6	2	0.87
549.88	83.00	2	1	13.1	2	0.87
470.85	44.60	2	1	12.8	2	0.87
657.93	37.20	3	1	13.4	2	0.87
160.00	20.00	2	0	12.6	2	0.87
346.50	40.00	3	0	16.3	2	0.87
201.25	40.00	1	1	24.6	2	0.87
158.68	33.40	2	0	26.0	2	0.25
288.33	60.00	2	0	27.2	2	1.00
437.03	79.40	3	0	21.6	2	0.75
346.25	80.00	2	0	18.0	2	0.25

APPENDIX

DATA 2A (con't)

Farm Value	Farm Size	Building Quality	Location	Distance	Land Use	Soil Quality
998.75	20.00	2	0	17.9	2	1.00
430.15	45.74	2	0	20.8	2	0.87
927.50	40.00	3	0	18.1	2	1.00
353.75	40.00	2	1	15.2	0	1.00
324.00	40.00	2	0	9.9	2	1.00
1061.80	36.72	3	1	5.3	3	1.00
313.70	62.16	2	0	6.7	2	1.00
233.90	15.39	2	1	15.2	2	1.00
755.07	78.80	3	0	15.8	3	1.00
517.50	80.00	2	0	12.5	2	1.00
145.87	18.92	1	2	14.6	2	0.75
336.82	40.60	2	1	13.8	2	1.00
695.00	50.00	1	0	7.7	2	1.00
622.50	40.00	2	0	10.9	3	0.87
315.00	20.00	3	0	15.0	2	0.87
210.00	40.00	2	0	18.8	2	1.00
326.30	19.00	2	0	15.4	2	1.00
437.50	28.80	2	0	3.7	1	1.00
1243.75	16.00	2	0	2.9	2	1.00
1078.68	30.50	2	0	1.6	2	1.00
87.50	16.00	3	0	5.4	2	0.87
245.00	20.00	2	0	3.4	2	1.00
532.50	40.00	3	0	15.4	2	1.00

Source: P. MacDonald