AN ECONOMIC ANALYSIS OF THE WESTERN OKLAHOMA AGRICULTURAL LAND MARKET

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AN ECONOMIC ANALYSIS OF THE WESTERN OKLAHOMA

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CHAPTER I

INTRODUCTION

The agricultural land market in Oklahoma and the U. S. has generally been characterized by increasing prices since World War II with dramatic price increases in the 1970's. Farmland prices more than doubled during the six year period 1972 to 1978. The first half of this period (1972-1975) was characterized by rapidly increasing land values. During this period both U. S. and Oklahoma land prices increased by 61 percent (1). More recent real estate market developments (1975-1978) show more modest price increases and even land value declines in some areas of the country. Lower commodity prices, increasing farm production costs, and in some areas unfavorable weather conditions have softened some agricultural land markets in the country. For instance during 1977, Nebraska land values are reported to have declined by four percent (2). Because of low commodity prices and incomes, many Nebraska land buyers and sellers are reported to have adopted a wait and see attitude. More recently, Kansas land values have declined one percent from November 1977 to February 1978 (3). During the same period Oklahoma land values have increased a modest six percent.

These market fluctuations generally stimulate interest and discussion in future agricultural land market developments (4, 5). Most land market analysts would agree that a continued investment in agricultural land by investors as a hedge against inflation, a growing demand for land for nonagricultural related purposes, and generally favorable farm product prices would insure future land appreciation rates. But a reduction in the expected rate of land appreciation by land buyers or less supportive agricultural legislation coupled with low farm incomes could lead to land deflation. In light of these possible market movements, most reports expect small price increases at least in the immediate future (3). However, there are others who believe that the slowness in land market activity or the wait and see attitude of many buyers and sellers is coming to an end, especially for the southern part of the United States (6). They expect future agricultural land price increases to be even larger than those experienced in the early 1970's.

The recent and expected dynamics of the agricultural land market exert a significant impact on agricultural producers as well as many state and local economies. This suggests a need for current land market information. The general purpose of this research is to provide not only current information concerning land market trends but to provide information concerning the factors which inherently influence agricultural land values. This information should provide a better understanding of the agricultural land market and enhance sound land market decisions.

The Problem

In Oklahoma, farm real estate values are sought by tax assessors, appraisers, landowners, potential buyers and sellers, investors, accountants and many others interested in farmland. These people are frequently interested in current land trends and even more importantly, why one tract sells for more than another. Several previous Oklahoma studies have investigated this question by analyzing factors which affect inter-tract variations in per acre farmland prices (7, 8, 9). For the most part, these studies have shown the variation in per acre land values in some particular county or area to be largely explained by various land quality characteristics, locational advantages, and economic development factors. These studies have demonstrated the importance of many of the physical factors used in explaining land value variation but have failed to investigate land price variation in the spatial agricultural land market.[1] More specifically, very little information is available concerning why land in North Central Oklahoma is valued 40 percent more than similar land in Southwest Oklahoma (10). In addition what factors are responsible for these value differences?

An investigation of the factors associated with the spatial variation in land value differences, require an analysis of not only the physical factors but also an analysis of the nonphysical factors which influence agricultural land values.[2] This is generally because the characteristics of agricultural land buyers such as occupational status, type of farming operation, reasons for purchasing land, attitudes towards owning and managing agricultural land, and many others generally

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[1]Physical factors are defined in this analysis to be those factors which have been traditionally used in land value analyses. Examples include date of sale, size of tract, and many soil quality and locational factors. Nonphysical factors are defined to include the characteristics and attitudes of agricultural land buyers in the study. These factors are also referred to conditions relating to each land purchase.

[2]For the most part, previous agricultural land market studies have not included nonphysical factors in agricultural land market analysis.

determine the characteristics of agricultural land markets.[3] It is the competitiveness of these buyers in agricultural land markets that determines the relative valuation of the various tract physical characteristics. Moreover, a spatial variation in land buyer characteristics is expected to result in a corresponding variation in land values.

With increased attention being focused on tax assessment procedures, land use planning and low farm incomes, decision makers will be increasingly faced with many questions concerning land valuation. A thorough investigation of current land market trends as well as the inherent factors in the spatial markets would provide valuable insights for such land valuation questions. In addition, the analysis would provide policy decision makers and other market participants with a more complete conceptual understanding of future land market trends and land ownership patterns.

Objectives

The general objective of the study is to examine the factors that cause inter-tract variations in agricultural land prices with emphasis being placed on the examination of these variations in the spatial agricultural land market. The specific objectives are:

1. Identify and measure agricultural land market values in selected Western Oklahoma counties, areas, and general study area.

2. Identify and evaluate agricultural land market trends in selected Western Oklahoma counties, areas, and general study area.

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[3]Land buyer characteristics are expected to reflect area variations in general farming practices, nonagricultural influences on land values, and general attitudes toward land ownership between areas.

3. Identify and measure cropland and pastureland values in selected Western Oklahoma counties, areas, and general study area.

4. Identify agricultural land buyer characteristic distributions in selected Western Oklahoma counties, areas, and general study area.

5. Identify and quantify both physical and nonphysical (land buyer characteristics) factors associated with inter-tract variations in price in selected Western Oklahoma counties, areas, and general study area.

6. Estimate agricultural land value models to be used in the valuation of per acre land values in selected Western Oklahoma counties, areas, and general study area.

7. Isolate the factors which largely account for the differences in the spatial agricultural land market.

8. Establish bench mark data, procedures, and guidelines for collecting data for future land market studies.

An introductory discussion of the procedures used to meet these objectives will follow the description of the study area.

Study Area

The study area includes three selected Oklahoma areas. These areas are: (1) North Central Oklahoma represented by Alfalfa and Garfield Counties, (2) West Central Oklahoma represented by Blaine and Caddo Counties, and (3) Southwest Oklahoma represented by Jackson and Tillman Counties. These counties are shown in Figure 1 and selected characteristics of each county are presented in Table I. Primary considerations for selecting counties to represent each of the areas include the availability of accurate soil survey information, availability of agricultural land sales data and similarities existing among counties selected to represent spatial agricultural land markets.[4] For instance,

[4]Alfalfa County agricultural land sales data from January, 1972, through June, 1976, is obtained from (7).

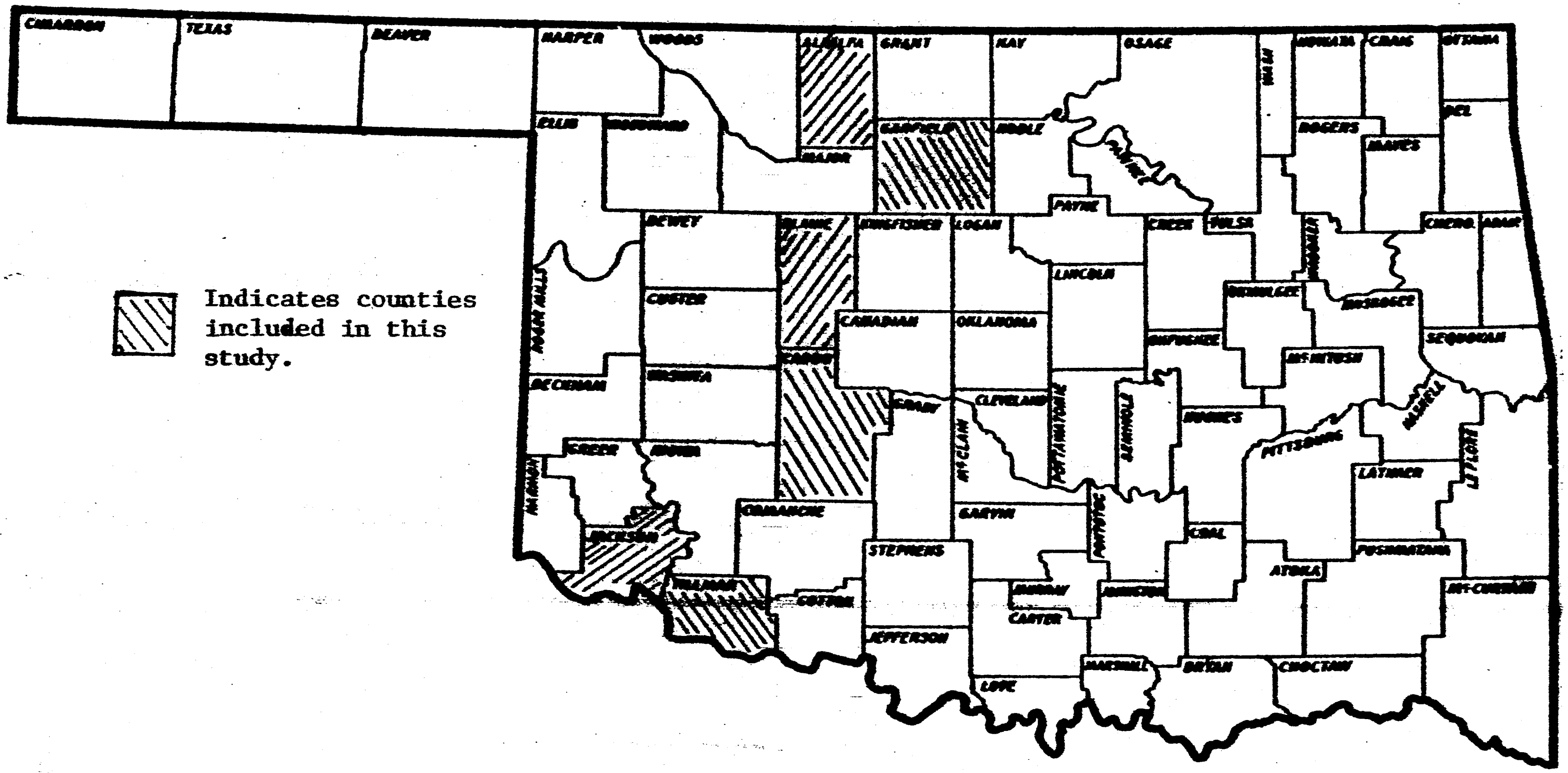

Figure 1. Western Oklahoma Agricultural Land Market Study Area

TABLE I

SELECTED CHARACTERISTICS OF STUDY AREA BY COUNTIES, OKLAHOMA

Selected Characteristics	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman
Land Use[a]						
Land in Farms, acres	489,395	656,728	532,613	760,017	517,211	525,189
Irrigated Land, acres	2,019	964	1,468	47,947	36,213	13,217
Cropland, %	74	72	57	54	67	73
Woodland, %[b]	1	1	5	6	1	1
Other Land, %[c]	25	27	38	40	32	26
Primary Crop Acreages[a]						
Wheat	281,271	366,798	209,127	167,702	166,961	220,742
Other Small Grains	1,920	5,354	6,021	6,048	1,692	3,473
Sorghums	3,871	1,951	5,403	24,192	7,904	6,223
Peanuts	0	0	146	29,581	644	0
Cotton	18	0	3,469	33,573	53,259	67,536
Hay	18,990	12,951	13,349	25,984	7,742	12,954
Other Characteristics[d]						
Mineral Production, $1000	23,185	53,416	44,053	34,230	5,423	1,179
1975 Per Capita Personal Income	6,809	5,635	4,789	5,091	4,625	5,147
1975 County Population	7,300	58,300	12,400	31,200	32,900	12,400
County Seat	Cherokee	Enid	Watonga	Anadarko	Altus	Frederick
County Seat Population	2,119	51,100	3,696	6,682	25,800	6,132

[a]U. S. Department of Commerce, Bureau of the Census. 1974 Census of Agriculture. Part 36, Volume 1.

TABLE I (Continued)

[b]Includes woodland pasture.

[c]Includes pastureland and rangeland other than cropland and woodland pasture, and house lots, barn lots, ponds, roads, and wasteland.

[d]Bureau for Business and Economic Research. Statistical Abstract of Oklahoma, 1977. Norman: University of Oklahoma Press, October, 1977.

many of the characteristics of Kiowa County including general agricultural productivity are similar to those counties representing North Central Oklahoma; however, this county is not chosen to represent the southwest area because detailed soil survey information for this county is not readily available. Jackson County is included in the analysis to represent the southwest area because many characteristics of this county including general agricultural productivity and potential non-agricultural economic development (associated with Altus) appear to be similar to Garfield County in North Central Oklahoma.

Agriculture and related industries provide the primary source of income for the study area.[5] As indicated in Table I, most of the land in the study area is used for crop and pasture. Cropland accounts for 70 percent of the land in farms for the north central and southwest areas while it accounts for nearly 55 percent in West Central Oklahoma. A greater percent of the land in the west central area is devoted to pasture and wooded land uses.

As indicated in Table I, most of the irrigation occurs in the west central and southwest areas. Irrigation in these areas has done much to stabilize producer's income. For instances, irrigation of the better soils in Jackson County can increase crop yields an average of two to four times over dryland farming (15). The primary sources of irrigation water in these counties are surface streams, well sources, and farm ponds. Sprinkler irrigation methods delivering water from well sources are most common in Caddo County while in Tillman County, irrigation water from well sources is most frequently delivered by way

[5]For a more complete description of the general characteristics of the study area counties as well as a complete description of county soil characteristics, see (11, 12, 13, 14, 15, 16).

sprinkling systems and a system combination of gated pipe and contour furrows. Much of the irrigated land in Jackson County is watered by flood or furrow methods from water provided through the Lugert-Altus irrigation district. This district first provided irrigation water to a few farmers in 1946 (15).

Agriculture in the study area is largely characterized by wheat and cattle production. However, longer growing seasons and irrigation potential contribute to a greater variety of crops grown in the southern parts of the study area.[6] Peanuts are produced extensively in Caddo County. Similarly, large acreages are devoted to sorghum and cotton production in Caddo, Jackson, and Tillman Counties.

As indicated in Table I, the area enjoys substantial income from mineral resource production. Mineral incomes range from more than one million dollars in Tillman County to a high of $53 million in Garfield County. Petroleum is produced in all counties while production of natural gas and natural gas liquids is confined to north central and west central areas. Gypsum is an important mineral produced in Blaine, Caddo, and Jackson Counties.

Population and per capita income statistics are given in Table I. Per capita incomes range from a high of $6,809 per year in Alfalfa County to a low of $4,625 per year in Jackson County. These data generally indicate per capita incomes to be larger in the north central counties of the study area. County population statistics show a large variation among counties. Moreover, it is interesting to note that each

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[6]The growing season ranges from 200 days in Alfalfa County to 225 days in Tillman County. Similarly, annual rainfall ranges from 25 inches in Jackson County to 29 inches in Garfield County.

area is represented by a county that is relatively more densely populated than the other corresponding county representing the area. For example, in North Central Oklahoma, Garfield County is densely populated when compared to Alfalfa County. Similarly in the southwest area, the population of Jackson County is well over twice that of Tillman County.

In general, the counties in the study area account for a small portion of the state's nonagricultural related industries. Industries in Tillman County consist of a leather goods plant, garment facilities, a monument company and an aircraft engine repair plant. Petroleum is processed in a single plant in Blaine County while a petroleum refinery and two large electrical generating plants are located in Caddo County. Nonagricultural related activity in Garfield County consists of oil refineries, machine shops, drilling equipment manufactures, and headquarters for oil companies.

The data in Table I shows that in most instances the populations of county seat towns (the largest town in each respective county) to be generally small. More specifically with the exception of Enid and Altus, the towns in the study area are generally small and primarily supported through mineral and agricultural related trade. Enid, the county seat of Garfield County is a major agricultural trade center in North Central Oklahoma. Large grain handling facilities located in this town serve a large portion of Central and Northern Oklahoma and bordering states. Altus is the second largest city in the study area with a population of 23,302. Altus along with Lawton located in nearby Comanche County provides major marketing services in Southwestern Oklahoma. Air Force bases located in both Enid and Altus provide employment and trade in their respective areas.

General Procedures

Data Collection

Data for the study includes not only physical characteristics of agricultural land sales but also nonphysical characteristics of agricultural land buyers. These data are collected in three related steps. These steps are: (1) collection of primary agricultural land transfer and other tract physical data, (2) collection of land buyer data through the use of a land market questionnaire sent to all land buyers, and (3) computation of additional tract physical data (tract quality, locational, and economic development variables) using a land market variable computation algorithm. The steps in the data collection process are illustrated in Figure 2.

The first step of the data collection process includes collecting the primary agricultural land transfer data. Detailed land transfer data were collected from County Clerk and Federal Land Bank offices. Only land transfers meeting the following criteria were included in the study.

1. Twenty acres or more in size.
2. Located outside the corporate limits of a city or town.
3. Primarily agricultural in their highest and best use.
4. Bona fide or arms-length transactions (sales of partial ownership, settlement of estates, changes in form of ownership, and intra-family transfers were not included in the analysis).

Other detailed information collected from these offices included name and address of grantee, date of sale, size of tract and proportion of mineral rights conveyed.

Assessed property values and when possible land type characteristics were obtained through County Assessor offices. Information concerning

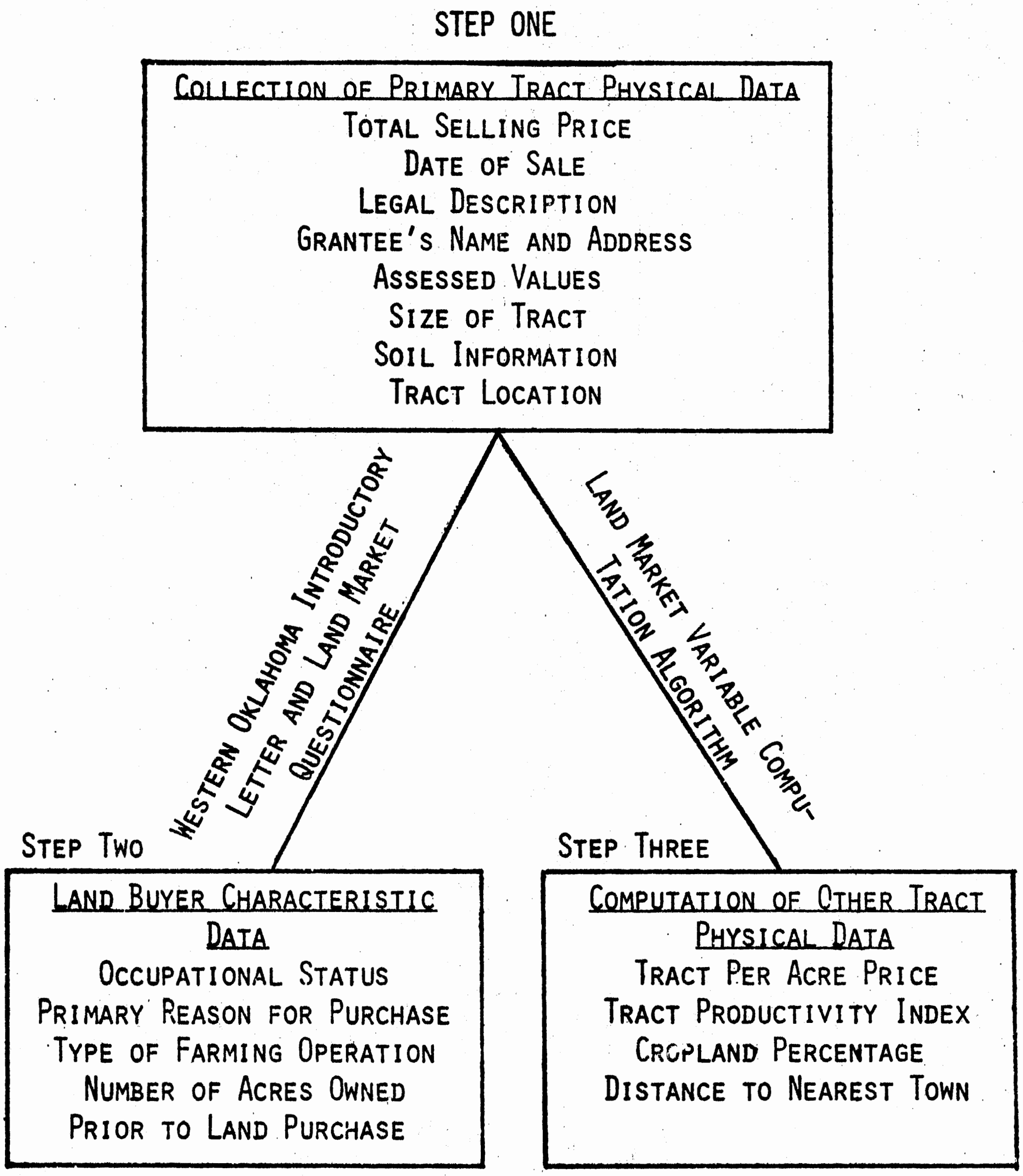

Figure 2. Illustration of Physical and Nonphysical Data Collection Procedures (a partial list of physical and nonphysical data)

government allotment acreages and land type acreages were obtained through county offices of the Agricultural Stabilization and Conservation Service. Demographic and location characteristics were obtained from County General Highway Maps published by the Oklahoma Department of Highways (17). Detailed soil characteristics were obtained from County Soil Surveys published by the Soil Conservation Service (11, 12, 13, 14, 15, 16). For a more complete explanation of these data collection procedures, see Appendix A.

The second step of the data collection process includes the collection of agricultural land buyer characteristic data. As shown in Figure 2, steps one and two are related in that essential information in the primary data set (step one) are used to collect land buyer characteristic data (step two). More specifically, primary tract physical data including the land buyer's name and address, size of tract purchased, and complete legal description of property are used in a computer algorithm to write agricultural land buyers a personalized introductory letter requesting their cooperation in completing and returning the land market questionnaire. Illustrations of the introductory letter and land market questionnaire, as well as a more complete explanation of these data collection procedures are presented in Appendix B.

The final step (step three) in the data collection and generation process includes computing many of the physical variables which describe the characteristics of a tract. Steps one and three are related in that information provided in the initial step is used to compute essential tract variables needed for later detailed land market analysis. For instance, in the later analysis the independent variable or the variable to be explained is the per acre price of land less the per acre value of improvements. Simple computations in step three are used to compute this value from estimated improvement values and the total selling price of the tract. Tract cropland and pastureland percentages and distance from the tract to the nearest town are a few of the many variables computed in this step. The complete set of tract variables are presented and discussed in the next chapter while a complete explanation of algorithm used for computing the variables is discussed in Appendix A.

Estimation Procedures

The identification and measurement of land market determinants associated with spatial variation in per acre land values as well as county agricultural land markets require the estimation of land value models. Model here refers to a formal description in terms of a mathematical equation of the existing relationships between important land market determinants and per acre land values. An appropriate technique and the technique used in this study for estimating land value models is multiple linear regression analysis.[7] In this analysis, multiple regression techniques are used not only to estimate the structural relationships between land market determinants and per acre values, but also the technique is used to test which land value determinants best explain the variation in per acre land prices.

Land value models in following chapters are for the most part estimated in two steps. The first step includes a preliminary analysis of the land market variables including the relationships existing among the variables. This includes both a correlation analysis and a stepwise

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[7]For a complete explanation of multiple linear regression analysis, see (18).

multiple regression analysis of the independent variables included in the study (19). The correlation procedure estimates simple correlation coefficients between pairs of numerical values in the analysis. This facilitates the identification of the relationship between per acre price and each independent variable as well as the correlations between the explanatory variables. The stepwise procedure produces multiple regression equations based on variables which explain the greatest amount of variation in the dependent variable (per acre price). The procedure gives an indication of the variation explained by adding alternative variables to regression models as well as the effects of adding new variables to an existing model.

The final step of the land value model estimation procedure includes specifying and estimating trial multiple regression models. This is necessary because in several instances more than one variable may be included in land value models to measure the same economic relation. Trial regression models help establish which variables most accurately explain the variation in per acre land values. Three criteria are used for selecting the best land value model: (1) the economic reasoning for including a variable in a model, (2) the amount of variation explained by including a variable in a model, and (3) the statistical significance of the equation and explanatory variables included in the model.

Organization of the Study

The study is divided into five remaining chapters. In the following chapter, the relevant theory pertaining to the agricultural land market as well as the findings of previous agricultural land market studies are reviewed. The agricultural land market variables which are expected to influence per acre land values in the study area are then hypothesized and discussed. Empirical findings are presented in Chapters II, IV, and V. Chapter III presents an analysis of the Western Oklahoma (six county area) agricultural land market while IV presents an analysis of the spatial analysis of the Western Oklahoma land market. The final empirical chapter (Chapter V) presents an analysis of the per acre land values by county. A summary of the study and a discussion of some of the broader implications of the study are presented in Chapter VI.

CHAPTER II

IMPORTANT FACTORS IN THE AGRICULTURAL LAND MARKET

The recent dynamic nature of the agricultural land market has stimulated interest in the factors which influence land values. The purpose of this chapter is to review previous agricultural land market research and to identify and discuss factors which are hypothesized to influence land values. Relevant theory applicable to agricultural land markets is discussed in the following section. The next section is a review of recent agricultural land market research. The final section presents a discussion of the land market variables which are hypothesized to influence land values in this study.

Relevant Theory

Microeconomic theory of the firm, location theory, and economic development theory underlie much of the modern agricultural land market research. Much of the early research efforts used location theory, as first discussed by Thunen (20), and microeconomic theory to explain variations in land values (21). These studies show soil quality and distance from markets to be highly correlated with land values. More recent research recognizes the influence of economic development on land values (22, 23). This research indicates the demand for agricultural land is strengthened by nonfarm influences such as urban, industrial, and recreational development.

When combined these theories suggest that agricultural land values are in general influenced by quality, locational, and economic considerations. In general microeconomic theory alone may be used to formulate hypotheses concerning the influence of these determinants on inter-tract land price variations. In following sections hypotheses concerning the relation between the value of agricultural land and tract quality, location, and economic development determinants are formulated using microeconomic theory.

Impact of Tract Quality

A large number of characteristics including fertility, underlying structure of subsoils, topography, drainage, and climate give each tract of land a unique productive capacity. The effect of these quality characteristics on agricultural land values may be analyzed through a production function. A production fundtion is defined by a single fixed unit of land to which variable inputs are applied to produce units of output. Given different qualities of land for some specific time, then, the production function for higher quality land is higher than the production function for lower quality land, indicating the same quantity of inputs applied to the higher quality land produces greater total production. The marginal physical product curves and marginal value product curves corresponding to the higher production function normally lie to the right and above those curves for the lower production function. Marginal value product curves for both higher and lower productive land are shown in Figure 3.

According to the classical capitalization formula, the value of land is determined by the capitalized value of all future net rents

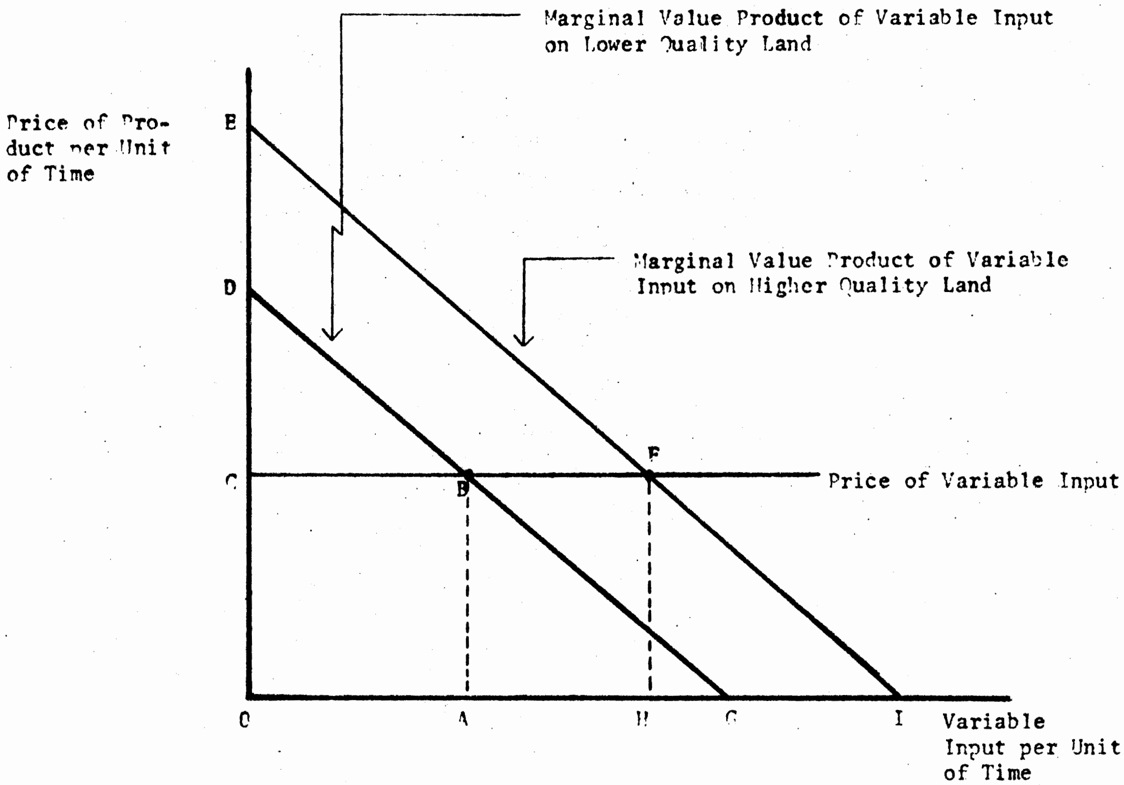

Figure 3. Marginal Value Products of a Variable Input Applied to Land of Two Different Qualities

accruing from the unit of land.[1] This net rent is shown in Figure 3 using the marginal value product curve and a price line for the variable input. For example, assuming competitive markets for both the product output and variable inputs, the quantity used of the variable input is OA units of input per unit of time on lower quality land. Area OABC represents expenditures on the variable input while the area BCD represents the rent to land. Through similar reasoning the rent for higher quality land is area CEF, a larger rent. Under the same market conditions, this larger rent is capitalized into land values and in turn leads to a higher price for higher quality land. Thus, a positive relationship is expected between tract land quality and the price of land.

Locational Impacts

Services from agricultural land must be utilized in place. This requires that other resources for a farm must be brought to the land from supply sources and products produced from the enterprise must be transported to available markets. As distance between the farm and markets increase, the per unit input and output costs increase. The effect of transport cost associated with different locations may be analyzed through firm cost functions.[2] A firm's average cost curve is defined as the total of average fixed cost (land) and average variable cost for each of the firm's various output levels. Marginal cost is

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[1]The classical capitalization formula is: $V = \frac{R}{i}$ where V equals dollar value, R = annual return, and i equals the capitalization rate.

[2]The following discussion of firm costs are in terms of a specific time period or the short run.

defined as the change in total cost resulting from a one unit change in output. Given farms homogeneous in every respect but location, then the average and marginal cost curves for a less favorably located farm with respect to input and output markets is higher than similar cost curves for a farm that has a better location indicating per unit cost advantages for the favorably located farm. Short run average and marginal cost curves for favorably and unfavorably located farms are shown in Figure 4. In this figure, SAC2 and SMC2 represent short run average and marginal cost curves for the unfavorably located farm while SAC1 and SMC1 represent these per unit cost for the favorably located farm. Moreover the distance between SAC curves at each level of output represent per unit transportation cost differences.

Again as indicated in the previous section, the value of land is determined by the capitalized value of the net rents from land. This net rent is shown in Figure 4 using the firm cost curves and the price of the product represented by line PD. For example, assuming competitive markets, the less favorably farm produces OA units of output while the better located farm produces OB units of output. The analysis indicates a normal rental rate (a normal rate of return to land) for the less favorably located farm while economic rent or pure profits exist for the better located farm.[3] Economic rent for this farm is area PEDC. Assuming all conditions remain the same, this economic rent is capitalized into land values and in turn leads to a higher price for farms favorably located to market centers. Thus a negative

[3]Economic rent or pure profits represent the returns to the farm after all cost of production have been paid. For a more complete discussion of economic rent, see (24).

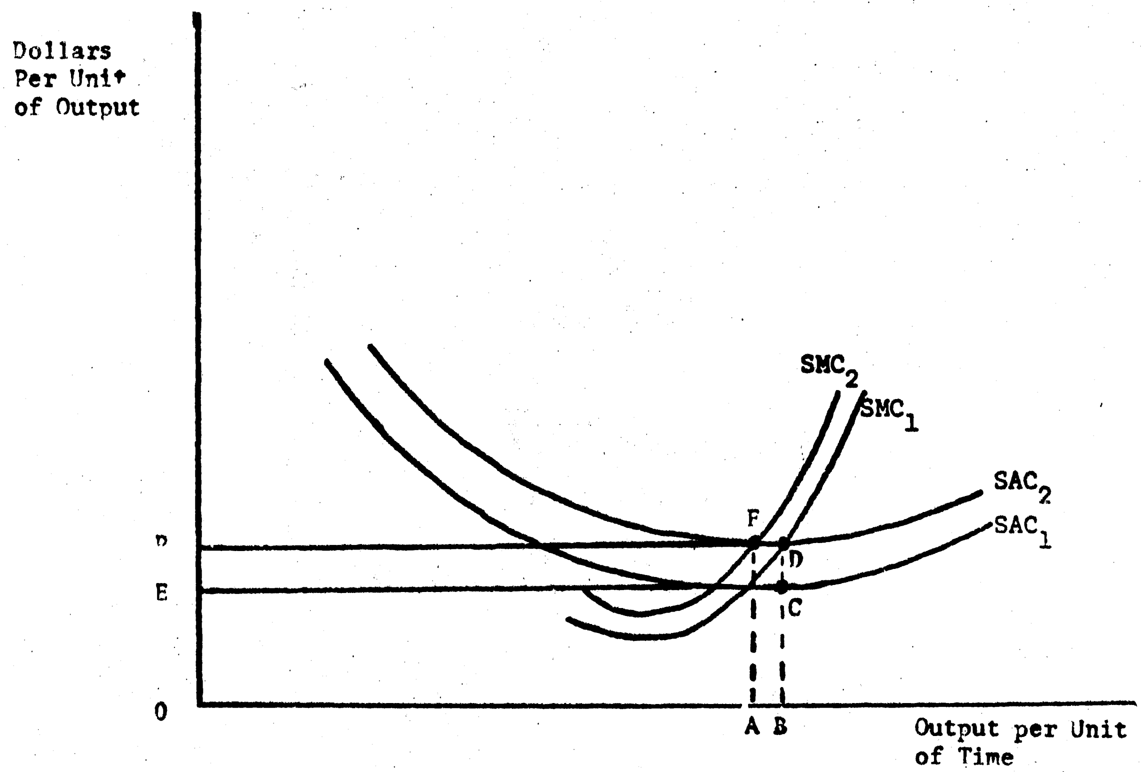

Figure 4. Short Run Average and Marginal Cost Curves for Two Similar Farms with Differing Locations

relationship is expected between distance from markets and the value of agricultural land.

Economic Development Impacts

Economic development is defined here to be a process whereby an economy's real income increases over time (25). This development or growth results from an increase of kinds and quantities of economic resources together with an improvement in techniques of production. In most cases, this growth results in general increases in population The impacts of economic development and associated population changes on agricultural land values may be shown through an analysis of the demand and supply of land. Generally the supply of land is thought to be fixed while the demand for land depends on a wide range of factors including economic development, demand for food and fiber, customs, traditions, education and cultural backgrounds, incomes, tastes, and preferences.

The demand and supply of agricultural land for some particular localized economy at two points in time are shown in Figure 5. A fixed supply of land is represented by SS while D_1D_1 represents the demand for land in period one and D_2D_2 represents the demand for land in period two. The initial situation indicates that L_1 units of land are bought in the agricultural land market at price P_1. However, general economic development and growth in the area cause the demand for land to shift to D_2D_2. The price of L_1 units of land taken off the market is now P_2, a larger price. The new demand and the resulting increase in price for land occur because of the greater need for land for such purposes as industrial location, housing, transportation, wholesale and retail

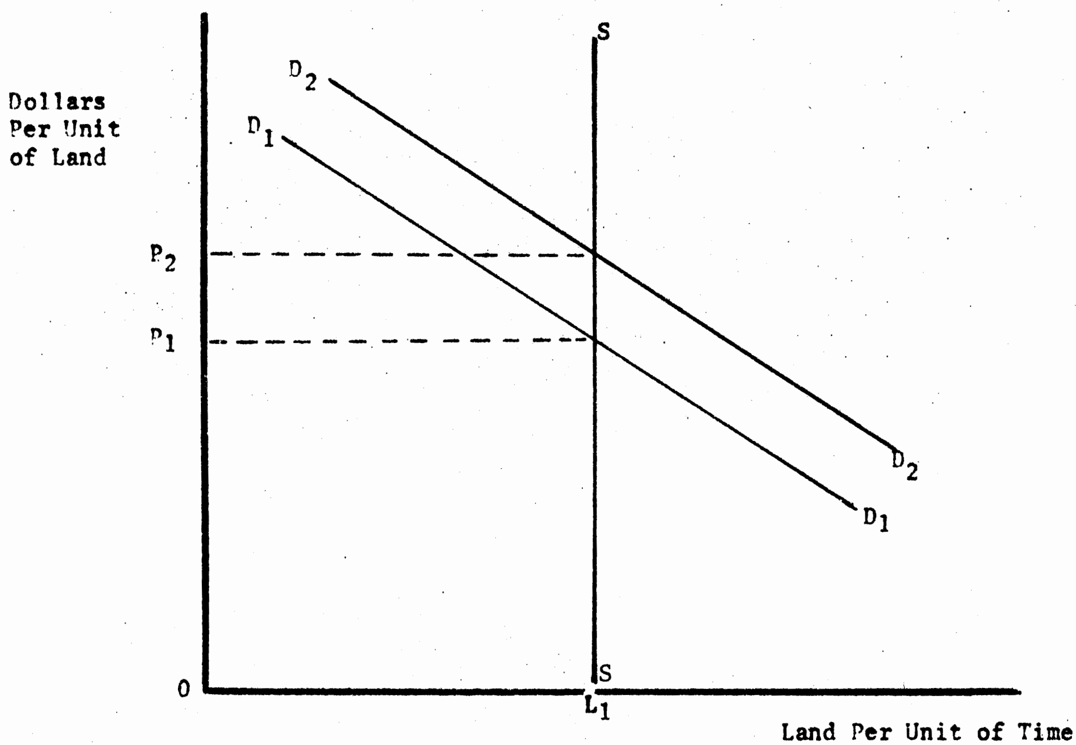

Figure 5. Demand and Supply of Agricultural Land

trade establishments, and recreational facilities. These results show that economic development through increased demand for land lead to higher land prices.[4] Thus a positive relationship is expected between economic development and the price of land.

Review of Literature

Research in the Oklahoma agricultural land market has revealed several factors which influence the per acre value of agricultural land. In an early study of the Woods County land market, Ahmed and Parcher (9) found four factors which explained a large proportion of the variability in per acre land prices. They found the size of tract, soil productivity, population of nearest town, and distance to the county seat explained a large percentage of the variation in the per acre price of farmland in Woods County, Oklahoma.

In a study of ten Western Oklahoma Counties, Abdel-Badie and Parcher (8) found the number of acres of wheat allotment and land quality variables to be highly significant in explaining land values. They also found the proportion of mineral rights conveyed and the type of road adjacent to the tract to be positively correlated with per acre values while size of tract, distance to the nearest paved road, and distance to Oklahoma City varied inversely with per acre farmland values.

A more recent study by Jennings (7) of a four county area in North Central Oklahoma reported that time alone explained the greatest

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[4]An additional result not shown is as the nonagricultural demand for land increases over time, this causes shifts in the supply of agricultural land to the left which in turn puts upward pressure on price in agricultural land markets.

proportion of variation in agricultural land values. The time variable was used to represent the influence of inflation, net rent increases, expanding nonfarm use of rural lands, and advancing levels of technology on farmland values.

Additional findings from the Jennings' study included the increasing importance of tract size and proximity to nearest principal market as determinants of per acre prices of agricultural land while the importance of nearness to paved roads and towns declined in importance in recent years. Greater capital outlay requirements for purchasing an agricultural tract have resulted in a reduction in the number of potential buyers in the market thereby increasing the importance of tract size. Improved county roads have resulted in the decreasing importance of proximity to paved roads as a determinant of farmland values. Proximity to the nearest town was found to have declined while proximity to the nearest principal market was found to have increased in importance as a determinant of agricultural land values. This was because improved county roads make distant market and supply centers more readily accessible. Finally, the study showed the level of affluence or development of the area to have a positive influence on farmland values. Net county property value per square mile was used to quantify this factor in the study.

Agricultural land market studies in other areas of the country have shown other factors to influence land values. In a cross sectional study, Mundy (26) found that Tennessee land values were influenced by several nonagricultural related variables. An ad valorem property tax variable was found to have a negative influence on the land market while variables measuring economic location and urban influence had positive influences in the market. Variables included in the study to measure economic location and urban influence were the rate of change in population through time, population density per square mile, regional location of the county, and classification of the county by the largest city or town.

Wise and Walker (27) have studied the rural land market in Southwest Georgia. Their analysis included not only physical and locational factors of each farm sale but conditions related to each agricultural land sale. Conditions of sale variables are defined as date of sale, size of tract sold, inadequate capital as a reason for sale, and investment as a reason for purchase. Their findings indicate that other than the date of sale and size of tract, the reason for purchase was the most important condition of sale variable. Tracts purchased as homesites or as investments are generally higher in per acre value than tracts purchased for agricultural reasons.

The Georgia study also found that when inadequate capital was given as a reason for sale, the average price per acre decreased. Moreover, peanut allotments and permanent improvements had a positive influence on per acre farmland values.

Federal Land Bank data were used by Vollink (28) to study North Carolina bare land values during the period 1975 to 1976. In an attempt to obtain sales data under homogeneous agricultural conditions, North Carolina was partitioned into four land market regions. Results of the study indicated that farm sales with commercial or residential influences had higher estimated average per acre sale prices in all four regions than farm sales without nonfarm influences. Similarly, farm sales which were purchased for investment had greater average per acre sales prices than farm sales purchased for expanding existing farming operations in all four regions of South Carolina.

Closely related to the role of nonagricultural investment in agricultural land markets is the question of who is buying and who owns today's agricultural land. Much of the research indicates that farmers are the most active participants in farmland markets. After analyzing Federal Land Bank data for the 1975 calendar year, Duncan (29) concluded that probably the toughest competitor that a family farmer will face in the agricultural land market is another farmer. Moreover, his data suggested that farmers presently purchasing farmland were larger, more aggressive, and enjoyed a substantially higher than average personal income from both farm and non-farm sources than in previous times.

Similar results were found in the Wyoming and Nebraska farm real estate markets (30, 2). A survey of the Nebraska market revealed that active farmers were the major buyer group most frequently buying land for expansion of existing enterprises while estate settlement and retirement were major reasons for selling land. The Wyoming study indicated agricultural land is bought by buyers interested in land appreciation, mineral development, rural homesites, and other types of nonagricultural development. However, the study concluded the most important group of buyers in the real estate market were farmers and ranchers seeking either to establish farming or ranching operations or expand existing ones.

Factors Which Influence the Agricultural Land Market

The previous sections indicate that many factors influence the agricultural land market. The discussion indicates that not only the physical factors such as soil quality, location, and economic development influence farmland values but also the nonphysical factors (conditions related to land purchase) such as primary reason for land purchase and other characteristics of the land buyer play an active role in today's farmland markets. Physical and nonphysical factors which are hypothesized to influence the agricultural land market in later analyses are presented and discussed in the following sections.

Physical Factors

In this section, the physical factors or variables used in analyzing the Western Oklahoma land market are defined. For each physical independent variable, the economic reasoning for including the variable in the analysis, the units of measurement, and the general method for estimating the factor are presented and discussed. These factors are used in subsequent sections as independent variables in models for explaining per acre variation in agricultural land values. For a complete explanation of data sources and data computation procedures, see Appendix A.

Price per Acre. Price per acre is the dependent variable to be explained in the analysis. This variable does not include the per acre value of improvements. Price per acre is computed as the total selling price of the tract minus the total value of improvements divided by the total number of acres in the tract.[5] The total selling price of each

[5]The value of improvements is estimated from assessed improvement values from county assessor offices and county assessment ratios obtained from the Oklahoma Tax Commission. For the complete estimation procedure, see Appendix A.

tract was obtained from County Court House deed records, Federal Land Bank offices, or computed from revenue stamps attached to the conveyance instrument. A study by Parcher (31) has shown that in Oklahoma revenue stamps usually provide reliable estimates of the tract selling price.

Date of Sale. This variable is included in the analysis to reflect the recent general upward trend in land prices and as a proxy variable for the general influences of inflation, net rent increases, and advancing levels of technology. The expected relation between this variable and land values is expected to be positive. The time variable is measured according to the month of the sale and its value ranges from 1 to 78. For instance, a sale occurring in the first month of the study time period (January, 1972) would have a value 1 whereas a sale occurring in the last month of the study time period (June 1978) would have a value of 78.

Size of Tract. Tract size is generally expected to have a negative influence on per acre farmland values. This is because of the positive relation of tract size and capital outlays needed for land purchases. Large capital outlays tend to decrease the number of potential land buyers and hence competition in the agricultural land market. Size is measured as the total number of acres in the tract.

Proportion of Mineral Rights Conveyed. As indicated in the previous chapter, several counties in the study area enjoy substantial incomes from the production of minerals. For these counties, the per acre selling price is likely to be influenced by whether mineral rights are conveyed in the sale. Mineral rights are measured in percentage terms and land values are expected to vary directly with the amount of mineral rights transferred.

Peanut Allotment Acreage. This variable is expected to have a positive influence on land values. Government programs have been used to raise farm prices and incomes. It has been observed that monetary benefits of these programs have been capitalized into land values over time (32).

Road Accessibility Variables. Two variables are included in the analysis to measure the degree of accessibility to all-weather routes of transportation for marketing needs. These two variables are type of road adjacent to the tract and distance to the nearest paved road. Most land buyers would be expected to favor a paved road adjacent to their tract or alternatively be located near all weather routes of transportation. Thus, improved roads such as gravel roads and paved roads are expected to have a positive influence on land values whereas increasing distances from paved roads are expected to have a negative influence on agricultural land values.

Tract Quality. As discussed earlier, farmland has value because of the value of goods and services it produces or is expected to produce. Several tract quality variables are included in the analysis to measure the income producing potential for agricultural land. These variables are: (1) land production type percentages, (2) soil capability class percentages, and (3) tract productivity indexes.

Land production type percentage variables are land type acreages expressed as a percentage of the total number of acres in the tract. The land types included in the analysis are: (1) irrigated cropland, (2) dry cropland, (3) improved pasture, (4) native pasture, and (5) wooded land. In most cases, cropland is thought to produce higher returns (rents) than other land types. Thus, the percentage of cropland, (both dryland and irrigated cropland) is expected to vary directly with per acre land values. No specific relation is hypothesized to exist between the per acre value of farmland and the percentage of the tract in pastureland or woodland.

The second set of soil quality variables included in the analysis are the percentage of the tract in soil classes I and II and the percentage of the tract in soil classes III and IV.[6] Cropland in the study area for the most part consist of soils in these four classes. The percentage of the tract in soil classes I and II is expected to have a positive influence on per acre farmland values while no relationship is hypothesized for the percentage of the tract in soil classes III and IV variable.

The last set of variables included in the analysis to measure tract productivity and hence income producing capability are tract productivity indexes. These indexes are computed using soil rating information prepared by the soil conservation service personnel and soil type acreages estimated from county soil survey maps.[7] These variables are expected to be more accurate measures of tract productivity than the variables discussed above. This is because many factors including soil texture,

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[6]Soil capability classes are defined by the Soil Conservation Service. They are defined according to their suitability for most kinds of farming. Class I soils have few limitations that restrict their useage while Class IV soils have severe limitations that reduce the choice of plants or require careful management.

[7]Detailed soil survey maps for respective study of counties are given in (11) through (16).

soil wetness, slope, erosion, climate, topography, and general soil productivity are incorporated in the soil ratings by the soil conservationists.

Three tract productivity indexes are computed for each sale tract: (1) county tract productivity index, (2) area tract productivity index, and (3) study area tract productivity index. The indexes differ in that the index for a particular area is computed in terms of the most productive soil in the area. For instance, the most highly rated soil in the study area is located in Garfield County and all other soils in the study area are rated according to this soil. A county tract productivity index for a county other than Garfield County differs in that the index is computed from soil ratings in terms of the most highly rated soil for the respective county. The choice of the index depends upon the type of analysis being performed. If land values are being analyzed by county, the county index is used in the analysis. Similarly, if farmland are being analyzed in one of the defined areas then the respective area productivity index is used. For a complete explanation of tract productivity index computational procedures, see Appendix A.

Tract Location. Relevant theory suggests lower marketing costs associated with agricultural land that is favorably located to market centers. These cost advantages in most cases are capitalized into higher agricultural land prices. Three variables are used in this study to measure the relationship between agricultural land prices and location: (1) distance to nearest town, (2) distance to nearest principal market, and (3) distance to nearest city. These variables are measured in miles.

The principal market is defined as the county seat or a town with a population of at least 5,000. A city is defined in this analysis as having a population of at least 250,000. The principal market should provide the majority of the marketing needs necessary for the operation of the farm business whereas the nearest town should meet most of the immediate marketing needs of the family farm. The nearest city is expected to provide major health and consumption needs and many other needs of the family farm not provided by smaller towns in the area.

The distance variables may also serve to measure nonagricultural activity in an area. This is because the demand for agricultural land is likely to be stronger near large communities or communities experiencing economic growth.

Economic Development. Two variables are included in the analysis to measure the influence of economic development on per acre agricultural land values. These variables are population of nearest town and population of nearest principal market. As indicated in earlier sections these variables are expected to have a positive influence on per acre land values.

Combined Location and Economic Development. Three variables are included in the analysis to measure the combined effect of location and economic development on agricultural land values. The variables are: (1) the ratio of population of nearest town to the distance between the tract and the nearest town, (2) the ratio of population of nearest principal market to the distance between the tract and the nearest principal market, and (3) tract market potential.

The first two variables (ratios) represent combined economic development and location variables because the numerator consists of an economic development variable (population) while the denominator includes a locational variable (distance). Both of these variables are expected to be positively correlated with land values. This is because of the inverse relationship between this variable and distance (the denominator). For these respective variables as distance decreases, both the variable and the expected influence of economic development on per acre land values associated with a town are expected to increase.

Market potential is a concept frequently discussed in the geography literature (33). Potential at a point may be thought of as a measure of the proximity of a point in a geographical area to all other places in the area, or as a measure of aggregate accessibility of that point to all points in the area. Potential at a point is simply an aggregate measure of the influence of all places in a defined area on that place.

Market potential is defined as a measure of the interaction between producers and markets. This concept is illustrated in Figure 6. In the figure, suppose that the circles $P_1 \ldots P_j$ represent towns in an area and a tract of land is situated at T_i. As discussed earlier, one measure of the influence of location on per acre land values is distance to nearest town or distance to nearest principal market. Assume in this analysis that P_1 represents the nearest town to T_i while P_2 represents the nearest principal market to T_i. As can be seen in the figure, no consideration is given to economic services that may be provided by towns P_3 or P_j. A more accurate measure of the tract location relative to markets and hence economic services provided would be a variable which would measure the influence of not only the nearest towns within an area but the influence of all towns within an area. Again assuming

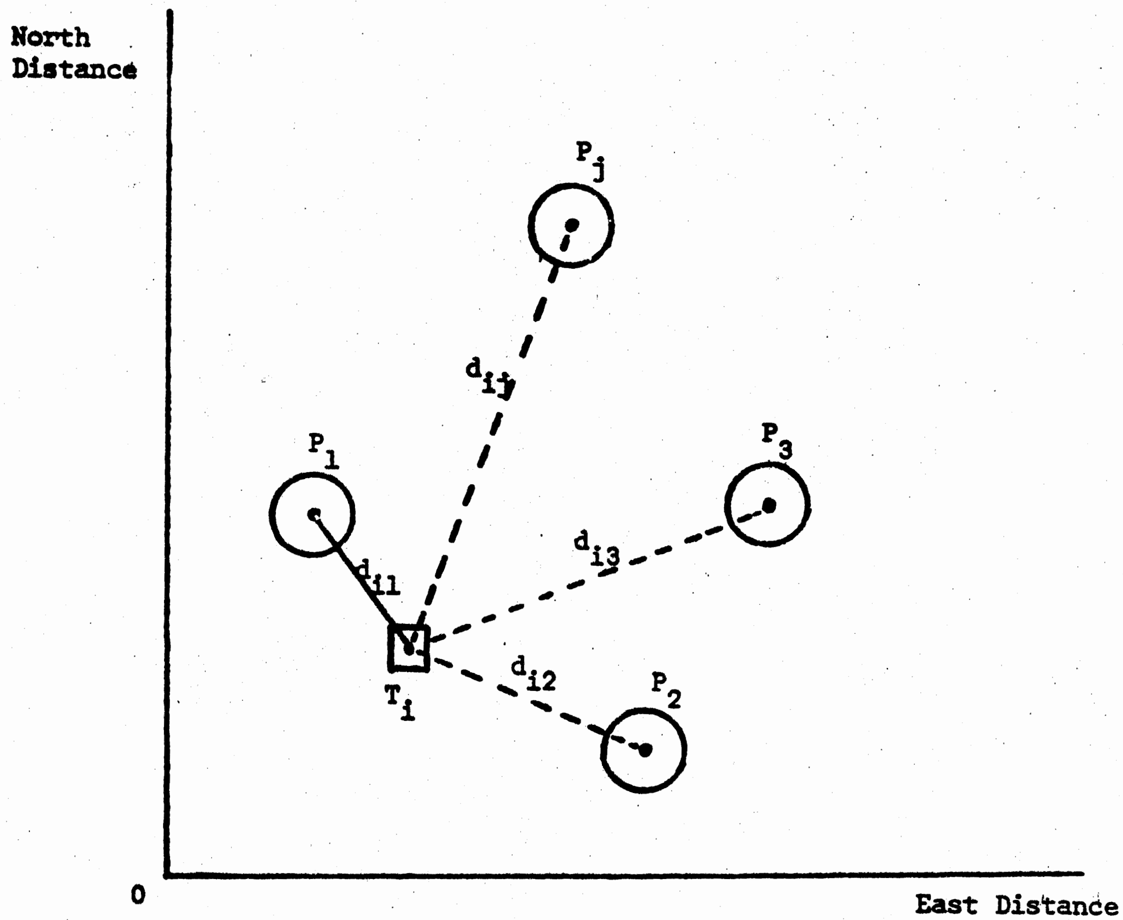

Figure 6. Location of a Tract of Agricultural Land Relative to Towns in an Area

that population is a measure of economic activities or services rendered, then market potential for any T_i can be estimated by the following equation.

$$MP_i = \frac{P_1}{d_{i1}} + \frac{P_2}{d_{i2}} + \ldots \frac{P_j}{d_{ij}}$$

or

$$MP_i = \sum_{j=1}^{n} \frac{P_j}{d_{ij}}$$

where

MP_i = the total market potential for tract i,

P_j = population of the jth town in an area, and

d_{ij} = the distance between tract i and town j.

The market potential is expected not only to measure the location of a tract relative to markets but also the nonagricultural influences on land value.[8] This implies that the market potential variable measures a two way interaction between the tract and market centers. A direct competition exists between agricultural and nonagricultural land located near market centers. The market potential variable is expected to measure the interaction and hence the influence between a market center and a tract of land.

Nonphysical Variables

A complete analysis of the spatial as well as other agricultural land market activity should include an analysis of not only the physical factors which influence land values but an analysis of the nonphysical

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[8]Nonagricultural and economic development land market determinants in the analysis are the same and used interchangeably.

land market determinants. Nonphysical factors in this analysis are defined to include those conditions relating to each tract purchase. These variables generally describe the psychology of the agricultural land market. These factors make a tract more attractive to a particular land buyer and generally influence the willingness and ability of the buyer to purchase the tract. More specifically, it is these variables which measure the psychology of the agricultural land market and describe the conditions which influence the demand for agricultural land in some defined area. The nonphysical factors used in later empirical analyses are described and discussed below.[9]

Occupational Status. Three types of occupational status are considered in the study: (1) full time farmer, (2) full time off farm employment, and (3) part time farmer. The effect of occupational status on per acre land values is not hypothesized for the analysis. This is because the influence is generally not expected to be the same between areas. For example, full time farmers would be expected to have a positive influence on per acre land values in a predominantly agricultural area. Similarly, land buyers employed full time off the farm and part time farmers would be expected to have positve influences on land values in an area where there is substantial nonagricultural activity such as residential and industrial development. Off farm employment opportunities would be expected to provide income for supporting farming activities as well as investment in agricultural land.

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[9] Nonphysical factors discussed in this section form a partial list of those collected for the study. Other nonphysical factors not discussed here are presented in Appendix B.

Type of Ownership. Four types of ownership are included in the analysis: (1) family farm, (2) partnership, (3) family corporation, and (4) corporate farm. No specific hypothesis is given regarding the effect of this variable on per acre price, however, the financial resources available would be expected to influence the price of land. Available financing might possible increase with increasing numbers of people who jointly buy property hence a corporation or partnership might be able to pay more for land than an individual.

Farm Enlargement and Other Conditions Associated with Land Transfer. Several variables are included in the analysis to measure the impact of farm enlargement and other related reasons for land purchase on land values. These variables are: (1) primary reason for land purchase, (2) acres of land owned prior to purchase, (3) did land buyer rent subject property prior to purchase, (4) did land purchase require additional machinery investment, and (5) seller's reason for selling land.

Six primary reasons for purchase are included in the analysis: (1) establish own farm, (2) expand farming operations, (3) investment, (4) nonagricultural development, (5) recreation or second homeside development, and (6) other. These reasons for purchase would be expected to influence agricultural land values, however no specific effect on land values is hypothesized in the analysis. These influences would generally be expected to vary with characteristics of different area economies. For instance in a predominantly agricultural area, expanding farming operations may have a positive influence on land values whereas this may not be the case in other areas where there is a higher degree of residential and urban development.

The number of acres of land owned prior to purchase of additional land is expected to generally have a positive influence on land values. This is because ownership of land provide advantages for acquiring additional land. Returns from land already owned may be used to pay for newly purchased land. In addition, already owned land may be used to secure mortgages for new land purchases. Land ownership acreages prior to purchase included in the analysis are: (1) 0-160 acres, (2) 161-320 acres, (3) 321-480 acres, (4) 481-640 acres, (5) 641-1000 acres, (6) 1001-1500 acres, and (7) more than 1500 acres.

A question concerning whether the land purchase required additional investment in machinery is included in the analysis to provide additional insights into the impacts of farm enlargement pressures and general expanding land ownership patterns on land values for both farmers and nonfarmers. Small investments in machinery would be expected to be positively correlated with agricultural land values. This is because planned growth by farmers and lumpiness of machinery investments. Farmers with excess machinery capacity are able to budget the price they are willing to pay for additional land at a higher rate than those who do not have an existing farm operation to absorb the cost of machinery that would be purchased. In addition, highly valued land bought for nonagricultural related reasons would not likely require machinery investments.

Another condition of sale variable that is included in the analysis is whether or not the land buyer rented the subject property prior to purchase. A negative relationship between this variable and land values might indicate that leaseholders have advantages in negotiating attractive selling prices while a positive relationship with land values could possible result from farm enlargement or nonagricultural development pressures.

The final condition of sale variable is the seller's reason for selling land. Possible reasons for selling land include: (1) estate settlement, (2) off farm employment, (3) financial difficulties, (4) retirement, (5) unknown, and (6) other. With the exception of estate settlement and financial difficulties, no hypotheses are given concerning the influence of these reasons on land values. Estate settlement and financial difficulties might be expected to lead to lower land selling prices. Financial difficulties might lead to lower selling price because of time restrictions that do not permit sufficient time to find a buyer willing to pay a fair market price. Likewise a lower market selling price may be realized in the case of estate settlement because heirs to the land are not interested in managing land and often times have insufficient knowledge of agricultural land market levels.

Attitudes. Several variables are included in the analysis to measure attitudes toward owning and managing agricultural land. The variables are: (1) ownership of nonagricultural investments such as stocks or bonds (yes or no), (2) preference for investment (stocks, bonds, or agricultural land), (3) satisfaction with land purchase (yes or no), (4) plans to purchase additional land (yes or no), and (5) land buyer's preference for future transfer of land (transfer to relative, sell on open market, or other). These variables are primarily included in the analysis for purposes of isolating spatial differences in attitudes that might exist in agricultural land markets. These variables might also provide insights for future land market activity in the study area. For instance, a large number of land buyers indicating plans to purchase land in the future gives some evidence for expected strong future agricultural land market activity.

Personal Characteristics. Personal characteristics included in the analysis are education, age, and annual taxable income of land buyers. Both greater levels of education and income would be expected to be positively correlated with land values. Similarly, older age groups would be expected to have a positive influence on land values. These land buyers generally would be expected to be more financially able to actively compete in agricultural land markets.

Summary

Both relevant theory and previous agricultural land market research were used to select important factors to be used in explaining inter-tract land price variations in later analyses. Soil quality, location, and economic development determinants were shown to have important impacts on agricultural land values. A review of recent agricultural land market research indicated that in addition to these factors other factors such as size of tract, percent of mineral rights conveyed, and allotment acreages were found to have impacts on agricultural land values. Research also indicated that nonphysical factors such as important reasons for selling and purchasing agricultural land had important impacts on agricultural land values. Many of these physical and nonphysical factors were hypothesized to influence agricultural land values in the study.

CHAPTER III

AN ANALYSIS OF THE WESTERN OKLAHOMA AGRICULTURAL LAND MARKET

Agricultural land market activity as well as the factors which are hypothesized to influence agricultural land values in the six county study area are presented and discussed in this chapter. The analysis is presented in three sections. Average per acre agricultural land values and other characteristics are presented and discussed in the first section while an analysis of characteristics of Western Oklahoma agricultural land buyers is presented in the following section. In the final section, the relative influences of the important factors in the agricultural land market are estimated. These factors are quantified in an agricultural land market model estimated for the entire six county study area.

Western Oklahoma Land Market Activity

The sample for the study consists of 1310 bona fide agricultural land market sales which occurred during the period January 1972 through June of 1978 for the six county study area. The sample size and other related characteristics by county are presented in Table II. The sample size ranges from a high of 303 observations in Caddo County to a low of 127 observations in Jackson County while the total number of acres in the sample ranges from a high of 40,645 acres in Caddo County to a low

TABLE II

SAMPLE SIZE AND OTHER RELATED CHARACTERISTICS BY COUNTY, OKLAHOMA

County	Sample Number	Total Sample Acres	Total County Acres	Sample Percent of Total County Acres
Alfalfa	254	35,323	555,520	6.36
Garfield	247	34,972	674,560	5.18
Blaine	181	32,052	586,880	5.46
Caddo	303	40,645	814,080	4.99
Jackson	127	20,373	518,400	3.93
Tillman	198	31,725	576,640	5.50
Total	1310	195,090	3,726,080	5.24

of 20,373 total acres in Jackson County. The total sample acreage expressed as a percentage of the total county acreage represents just over six percent of the total Alfalfa County area for the high while the corresponding low is almost four percent for Jackson County. The Jackson County sample is for the most part restricted to those agricultural land sales available from Federal Land Bank records. However, this sample is felt to accurately reflect the agricultural land market activity for Jackson County.

Average land market values and other characteristics of agricultural land sales are presented in Table III and shown in Figure 7. These results are discussed in the following sections.

All Land Sales

The results in Table III and Figure 7 indicate an upward trend in the Western Oklahoma agricultural land market. During the six and one-half year period, the average value paid for agricultural land more than doubled. However, these results indicate that most of this price increase occurred during the early 1970's. Average per acre land values are shown to increase from $318 in 1972 to $566 in 1975. This represents a 78 percent increase. A large part of this price increase is probably associated with relatively higher farm incomes. For instance, the highest average price of wheat in the study period occurred during 1974. In addition to increasing net returns, these favorable prices also are expected to increase the level of optimism and hence bidding in the agricultural land markets.

Western Oklahoma land market activity between 1976 and June 1978 is characterized by more modest price increases. During this period,

TABLE III

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF AGRICULTURAL LAND SALES
BY THE SIX COUNTY STUDY AREA, OKLAHOMA

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
All Land Sales							
Average Price, $/Acre	318	356	477	566	591	629	681
Change from Previous Year		12	34	19	4	6	8
Standard Deviation, $/Acre	154	204	260	312	287	310	301
Average Size, Acres	148	154	154	146	141	150	149
Mineral Rights, % Conveyed	63	57	60	58	55	51	61
Cropland, % of Tract	65	59	63	59	60	62	66
Tract Productivity Index	59	56	56	57	55	56	60
Number of Observations	175	200	210	213	204	212	96
Irrigated Cropland[b]							
Average Price, $/Acre		697	628	684	668	870	1111
Change from Previous Year			-10	9	-2	30	28
Standard Deviation, $/Acre		291	372	146	35	153	268
Average Size, Acres		110	82	118	74	99	111
Tract Productivity Index		67	55	66	62	65	67
Number of Observations	0	2	3	7	2	7	5
Dry Cropland[c]							
Average Price, $/Acre	339	488	655	825	779	888	826
Change from Previous Year		22	34	26	-6	14	-7
Standard Deviation, $/Acre	125	239	311	375	360	297	281
Average Size, Acres	136	121	135	127	128	133	126
Tract Productivity Index	69	70	67	71	66	70	71
Number of Observations	56	53	67	60	57	51	31

TABLE III (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
Pastureland[d]							
Average Price, $/Acre	179	183	294	361	415	371	449
Change from Previous Year		2	61	23	15	-11	21
Standard Deviation, $/Acre	107	84	107	131	215	188	229
Average Size, Acres	118	151	128	183	152	145	130
Tract Productivity Index	40	41	39	43	40	37	43
Number of Observations	19	27	28	35	28	29	11

[a]Includes agricultural land sales which occurred during the first six months of 1978.

[b]Includes those tracts in the sample which are at least 90 percent irrigated cropland.

[c]Includes those tracts in the sample which are at least 90 percent dry cropland.

[d]Includes those tracts in the sample which are at least 90 percent native pasture and improved pasture.

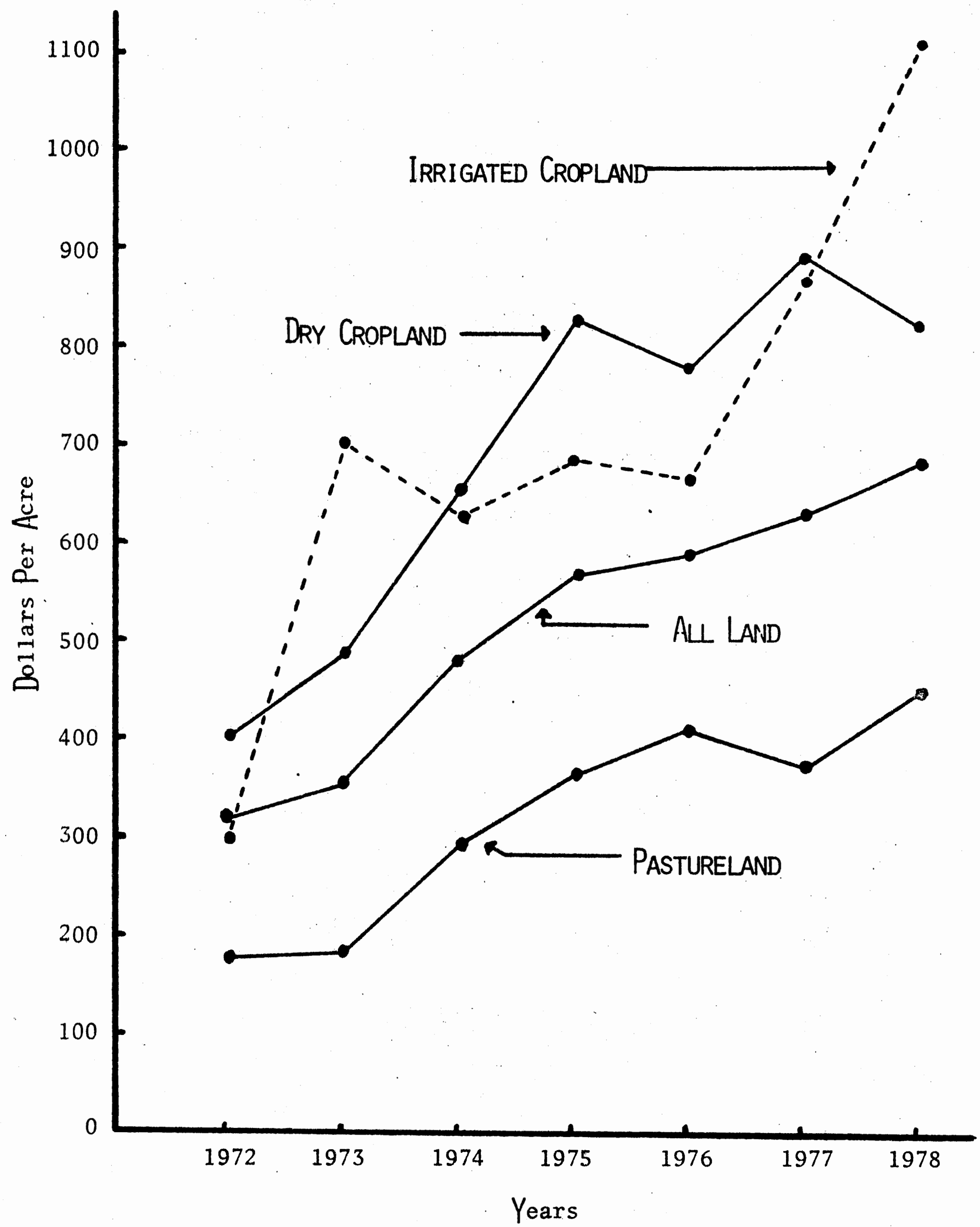

Figure 7. Average Yearly Prices of Agricultural Land Sales by All Land Sales and Type of Agricultural Land

the percentage price increase ranges from four percent in 1976 to eight percent in 1978. However, part of the average per acre price increases between these years is because of differences in average tract productivity of land sold between years. For instance, average per acre land prices are shown to be eight percent greater during the first six months of 1978, while the average tract productivity of land sold in 1978 is about seven percent greater than average tract productivity for land sold in the previous year. Similarly, the average percentage of cropland for land sold in 1978 is six percent greater than the percentage in 1977. If an adjustment were made for increases in tract quality between these years, the results would most likely show smaller or even no price increases for agricultural land during this period. Uncertainty associated with lower small grain prices, increasing farm input costs, and in some cases unfavorable weather conditions are some of the reasons for smaller average per acre price increases in more recent years.

The results also indicate a greater variation in land prices. In 1972, approximately 68 percent of the reported land sales are expected to fall in the price interval of $164 to $472 (the mean plus and minus the standard deviation) while in 1978 the corresponding interval is $380 to $982. Moreover, the price variability as measured by the standard deviation is almost 103 percent greater in 1975 than in 1972 while variability is four percent less in 1978 than in 1975. The earlier period indicates both a dollar and a percentage increase in land price variability. This might be attributed to many reasons including imperfections in the upward adjusting land market or a wider quality range of agricultural land sales.

Average size of tract, percent of mineral rights conveyed, and tract productivity show no discernible trends. The average size of tract is fairly stable at nearly a quarter section of land. The average percent of mineral rights varies from slightly more than 50 percent to 63 percent. This probably results because the study area includes not only counties where potential mineral production is extremely high but also counties where potential mineral production is low.

Cropland and Pastureland Sales

Agricultural land prices by land type are given in Table III and shown in Figure 7.[1] The prices of agricultural land by specific land type categories in recent years exhibit different trends than all land sales discussed previously. Irrigated cropland sales show large price increases in 1977 and 1978 while dry cropland sales show price decreases in 1976 and 1978.

Irrigated cropland sales are confined to Caddo, Jackson, and Tillman Counties. With the exception of 1974 and 1976, irrigated cropland show large price increases. The results indicate that price decreases in years 1974 and 1976 are due to quality differences. In 1974, average tract productivity is almost 18 percent less than average tract productivity of land sold in 1973. Generally, smaller average tract sizes of irrigated cropland probably reflect the scarcity and availability of adequate irrigation water sources in the study area.

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[1]Irrigated cropland is defined to include those tracts in the sample where at least 90 percent of the tract is irrigated cropland. A similar rule is used to classify dry cropland and pastureland categories.

Dry cropland prices are shown to increase by 106 percent between 1972 and 1975. However, later years show a price increase and even price declines in 1976 and 1978. Average productivity for cropland is one percent greater in 1978 than in the previous year and yet cropland values are seven percent less in 1978. Low small grain prices coupled with increasing production costs are two of the possible factors which might be associated with depressed cropland prices. In general, trends in cropland values reflect the expected positive relation between per acre land prices and income earning capacity. During the 1972-1975 period when small grain prices were relatively higher than earlier periods, cropland prices increased rapidly while more recent lower small grain prices are reflected in cropland markets with modest price increases and even price declines.

As indicated by the results in Table III, pastureland values range from $179 per acre to almost $450 per acre in 1978. This represents a 151 percent increase in pastureland values for the six and one-half year period. Moreover during the period 1972 to 1975, the average per acre pastureland values are shown to increase by 102 percent while the increase for 1975 through June of 1978 is 24 percent. With the exception of 1977 when both price and tract productivity are lower than the previous year, the pastureland market shows greater stability and strength than the dry cropland market.

Characteristics of Western Oklahoma Agricultural Land Market Buyers

A Western Oklahoma land market questionnaire was sent to agricultural land buyers requesting information concerning their land purchase.

Of the 1197 land market questionnaires sent, 519 land buyers responded for a response rate of 43 percent. County response rates ranged from a low of 33 percent in Jackson County to a high of 50 percent in Alfalfa County. For a complete explanation of the procedures used to obtain questionnaire data as well as response rates by county, see Appendix B.

Selected characteristics of agricultural land buyers are presented in Table IV. These results generally indicate that most of the land in the study area was bought by farmers and part time farmers. Nearly 83 percent of the respondents listed their type of farming operation as a family farm while at the same time just over 83 percent of the respondents listed their occupation as full time and part time farmers. Similarly, the results indicate that almost 86 percent of the respondents bought land for establishing their own farm or expanding their existing one.

The response distributions associated with the primary reason for purchase, acres owned prior to purchase, and the purchase of additional machinery all indicate the expanding farmer is the primary buyer group in the Western Oklahoma land market. The distribution of acres owned prior to purchase of additional land indicates the majority of land buyers were not large land owners. Over 74 percent of the land buyers owned 480 acres of land or less prior to their purchase. Similarly, the distribution associated with the purchase of additional machinery indicates that farmers are anticipating future growth in size through their previous machinery purchases. A larger number of acres enables them to spread their machinery costs over more acres of land hence decreasing their per acre unit production costs.

TABLE IV

CHARACTERISTICS OF AGRICULTURAL LAND BUYERS BY STUDY AREA, OKLAHOMA, 1978

Questionnaire Response Distributions			
Question	Percent	Question	Percent
Occupational Status		Acres Owned Prior to Purchase	
Full Time Farmer	58.0	0-160 Acres	45.3
Full Time Off Farm Employment	14.3	161-320 Acres	17.0
Part Time Farmer	25.4	321-480 Acres	11.9
No Response	2.3	481-640 Acres	7.1
		641-1000 Acres	9.2
Type of Farming Operation		1001-1500 Acres	3.5
		More Than 1500 Acres	5.0
Family Farm	82.6	No Response	1.0
Partnership	11.4		
Family Corporation	3.1	Did Respondent Rent Property Prior to Purchase	
Corporate Farm	0.4	Yes	21.4
No Response	2.5	No	78.6
		No Response	0.0
Primary Reason for Land Purchase		Did Land Purchase Require Purchase Additional Machinery	
Establish Own Farm	25.4		
Expand Farming Operations	60.3		
Investment	9.8	Yes	17.7
Non-Agricultural Development	0.6	No	82.1
Recreation or Second Homesite	1.2	No Response	0.2
Other	2.7	Respondent's Satisfaction with Land Purchase	
No Response	0.0		
		Yes	94.4
		No	5.2
		No Response	0.4

TABLE IV (Continued)

Questionnaire Response Distributions			
Question	Percent	Question	Percent
Seller's Reason for Selling Land		Respondent's Plans to Purchase Additional Land	
Estate Settlement	36.8		
Off Farm Employment	3.9	Yes	66.9
Financial Difficulties	10.8	No	23.9
Retirement	24.1	Undecided	9.1
Unknown	16.6	No Response	0.2
Other	7.5		
No Response	0.4	Education	
		Less than High School	7.1
Ownership of Non-Farm Investments		High School	32.0
Yes	13.9	Some College	23.9
No	84.8	College Graduate	36.4
No Response	1.3	No Response	0.4
Current Age		Annual Taxable Income	
20-30	12.5	Less Than $5,000	6.0
31-40	21.0	$5,000-10,000	12.9
41-50	28.3	$10,001-20,000	22.7
51-60	25.0	$20,001-30,000	18.5
61-70	8.9	$30,001-40,000	10.2
Over 70	3.1	Over $40,000	22.5
No Response	1.2	No Response	7.1

Several response distributions in Table IV indicate reasons for the competitiveness in the agricultural land market in recent years as well as the possible strengths for future years. The results indicate that 94 percent of the respondents indicated their satisfaction with the land purchase while over two-thirds indicated plans to purchase additional land in the future. In addition, the results indicate the majority of agricultural land buyers to be in the middle age category, well educated and in the upper income levels.

The characteristics of agricultural land buyers are further described in Table V. Questionnaire percentage response distributions of land buyers are presented by occupational status in this table.

The response distributions among occupations are most similar for the type of farming operation and plans to purchase additional agricultural land. In each occupational state, the family farm was the primary type of farming operation.

Response distributions appear to differ among occupations for the other characteristics. The response distributions for nonfarmers and part time farmers appear to be more evenly distributed in primary reason for purchase than for full time farmers. Establishing a farm and investment, as well as expanding farming operations are important reasons for purchase among the non-full time farmer occupations. The results also indicate that full time farmers owned more land, purchased less machinery with land acquisitions, had fewer nonfarm investments, and were less educated than nonfarmers and part time farmers. Similarly, nonfarmers purchasing land tend to be slightly more heavily distributed towards the upper age and income levels.

TABLE V

SELECTED CHARACTERISTICS OF AGRICULTURAL LAND BUYERS BY OCCUPATIONAL STATUS, OKLAHOMA, 1978

Selected Characteristic	Occupational Status: Full Time Farmer Percent	Full Time Off Farm Employment Percent	Part Time Farmer Percent
Type of Farming Operation			
Family Farm	84.4	79.7	81.1
Partnership	11.3	5.4	14.4
Family Corporation	3.0	2.7	3.8
Corporate Farm	0.3	0.0	0.8
No Response	1.0	12.2	0.0
Primary Reason for Land Purchase			
Establish Own Farm	22.9	24.3	31.8
Expand Farming Operations	73.8	32.4	47.7
Investment	1.3	31.1	14.4
Nonagricultural Development	0.3	1.4	0.8
Recreation or Second Homesite	0.0	4.1	2.3
Other	1.7	6.8	3.0
Acres of Land Owned Prior to Purchase			
0-160	38.9	67.6	49.2
161-320	17.3	6.8	22.7
321-480	15.0	9.5	5.3
481-640	8.0	5.4	6.8
641-1000	10.3	5.4	7.6
1001-1500	3.7	0.0	4.6
More Than 1500	5.7	4.1	3.8
No Response	1.3	1.4	0.0

TABLE V (Continued)

Selected Characteristic	Occupational Status: Full Time Farmer Percent	Full Time Off Farm Employment Percent	Part Time Farmer Percent
Did Land Purchase Require Purchase of Additional Machinery			
Yes	12.3	25.7	26.5
No	87.4	74.3	73.5
No Response	0.3	0.0	0.0
Ownership of Non-Farm Investments			
Yes	8.0	25.7	19.7
No	90.7	74.3	78.8
No Response	1.3	0.0	1.5
Plans to Purchase Additional Land			
Yes	68.4	63.5	69.7
No	21.6	27.0	24.2
Undecided	10.0	8.1	6.1
No Response	0.0	1.4	0.0
Education			
Less Than High School	7.0	1.4	7.6
High School	38.9	27.0	19.7
Some College	27.2	13.5	22.0
College Graduate	26.6	58.1	49.2
No Response	0.3	0.0	1.5

TABLE V (Continued)

Selected Characteristic	Occupational Status: Full Time Farmer Percent	Full Time Off Farm Employment Percent	Part Time Farmer Percent
Current Age			
20-30	14.6	8.1	10.6
31-40	20.6	17.6	25.0
41-50	28.9	37.8	24.2
51-60	26.3	24.3	23.5
61-70	7.0	5.4	12.9
Over 70	1.7	5.4	2.3
No Response	1.0	1.4	1.5
Annual Taxable Income			
Less Than $5,000	7.3	1.4	5.3
$5,000-10,000	15.6	4.1	11.4
$10,001-20,000	22.6	27.0	21.2
$20,001-30,000	15.6	20.3	25.0
$30,001-40,000	9.6	9.5	12.9
Over $40,000	20.6	29.7	22.7
No Response	8.6	8.1	1.5

An Empirical Model of the Western Oklahoma Agricultural Land Market

In this section, the variables which were defined in Chapter II are used to model the Western Oklahoma agricultural land market. The following sections present and discuss the variables which are included in the model and procedures for estimating the model while the final section presents the empirical land value models estimated for the six-county area.

Designation of the Variables

The per acre value of agricultural land (dependent variable) is the variable to be explained in the following analysis. The factors which were hypothesized to influence land values in Chapter II are used as independent or explanatory variables in the analysis. The variables which are used in the analysis are given below.[2]

PRA = Price per acre (dollars)

WCD = West Central Oklahoma binary variable (1 if observation is in West Central Oklahoma, 0 otherwise)

SWD = Southwest Oklahoma binary variable (1 if observation is in Southwest Oklahoma, 0 otherwise)

TI = Date of sale (months)

SIZ = Size of tract (acres)

RPDNT = Ratio of population of nearest town to distance to the nearest town

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[2]These variables are discussed and explained in Chapter II and the procedures for measuring these variables are discussed in Appendixes A and B.

DPR = Distance to paved road (miles)

MP2 = Market potential variable (distance in denominator raised to second power)

PA = Peanut allotment (acres)

MR = Mineral rights conveyed (percent)

PI = Study area tract productivity index

PC = Cropland (percent)

PIC = Irrigated cropland (percent)

FTOFED = Full time off farm employment binary variable (1 if occupational status is full time off farm employment, 0 otherwise)

PTFD = Part time farmer binary variable (1 if occupational status is part time farmer, 0 otherwise)

ESTFOD = Establish farming operation binary variable (1 if primary reason of purchase is to establish farming operation, 0 otherwise)

NAD = Nonagricultural binary variable (1 if primary reason for purchase is investment, nonagricultural development, recreation or second homesite or other, 0 otherwise)

BRPD = Buyer rented property binary variable (1 if buyer rented property prior to its purchase, 0 otherwise)

INCD1 = Annual taxable income binary variable (1 if income equals $10,001 to $30,000, 0 otherwise)

INCD2 = Annual taxable income binary variable (1 if income equals $30,001 or greater, 0 otherwise)

Both the locational (WCD and SWD) and land buyer characteristic binary variables enter the analysis through shifts in the land value model intercepts. For example in testing the influence of occupational status (full time farmer, full time off farm employment, or part time farmer) on per acre land values, two coefficients are estimated to represent this influence. The third occupational status estimate (full time farmer in the analysis) is included in the model intercept. In the analysis, an estimated occupational status coefficient represents the per acre difference in value paid for land between respective occupational statuses not included in the regression model intercept and the occupational status that is included in the model intercept.

Estimation Procedure

Multiple regression analysis is used to estimate the land value models in the analysis. The model is estimated in two related steps. The first step includes a preliminary analysis of the variables and the relationships existing among the variables. This includes a correlation and a stepwise multiple regression analysis of the independent variables included in the study. The correlation procedure estimates simple correlation coefficients between pairs of numerical values in the analysis. This facilitates the identification of the relationship between the dependent variable and each independent variable as well as the correlations between the explanatory variables. The stepwise procedure produces multiple regression equations using variables which explain the most variation in the dependent variable. The procedure gives an indication of the variation explained by certain variables as well as the effects of adding new variables to an existing model.

The final step of the estimation procedure includes specifying and estimating trial multiple regression models. This is necessary because in several instances more than one variable is included in the study to measure the same economic relation. The trial regression models help establish which variables most accurately explain the variation in per acre land values. Three criteria are used for selecting the best model: (1) the economic reasoning for including a variable in the model, (2) the amount of variation explained by including an explanatory variable in the model, and (3) the statistical significance of the equation and explanatory variables included in the model.

In the next section, a model of the Western Oklahoma agricultural land market is estimated using primary sample data (1310 observations). At this point the Chow test (18) is employed to test if this model does relate to a stable structure. More specifically the test is designed to test whether the regression coefficients estimated by assigning subsets of a given set of observations to two or more different structures do in fact below to the same structure. Different structures refer to estimated equations containing the same explanatory variables whose coefficients differ significantly.

The primary sample is segmented into those observations where nonphysical data are available (hereafter referred to as the reduced sample), and those observations for which nonphysical data are not available (hereafter referred to as the nonrespondent sample). Regression equations were estimated for these two subsamples and the resulting estimated F value from the Chow test did not exceed the tabled F value at the 99 percent confidence level. This means that the difference between the estimated regression coefficients from the two models is not statistically significant and the two structures are inferred to be the same. These results indicate that it it appropriate to use the existing model estimated from primary data to test the influence of the nonphysical variables on per acre price in the reduced sample. In addition, these results at least implicitly add to the validity of the reduced sample in that the structures between subsamples are not inferred to be different.

Empirical Land Value Models

The estimated multiple regression land value models of the six county area are presented in Table VI. Model 1 is estimated using the primary sample. The coefficient of determination (R^2) for Model 1 indicates that 65 percent of the variation in the per acre value of land is explained by the explanatory variables included in the model. An additional three percent of the variation in per acre price is explained by Model 2 when buyer characteristics are incorporated into the model. The standard deviation for Model 2 indicates the true mean value of PRA (price per acre) will be expected to fall within the range of the predicted PRA $\pm$ \$183 approximately 68 percent of the time upon repeated sampling.

With the exception of the percentage of mineral rights conveyed (MR), all of the variables in Model 1 are significant at the 0.10 probability level.[3] This implies the values of these coefficients to be statistically different from zero at least 90 percent of the time upon repeated sampling. For reasons mentioned earlier and a small number of observations for which mineral rights are transferred are two of many reasons for a lower t-value for the percentage of mineral rights conveyed.

[3] A t-value of 1.645 indicates that a variable coefficient is statistically significant at the 0.10 probability level.

TABLE VI

AGRICULTURAL LAND VALUE MODEL COEFFICIENTS ESTIMATED FROM THE PRIMARY SAMPLE AND REDUCED SAMPLE, OKLAHOMA[a]

Variables[b]	Primary Sample Model 1	Reduced Sample Model 2
Dependent Variable	PRA	PRA
Constant	347.95	424.63
WCD	-119.86 (9.12)	-143.62 (6.19)
SWD	-201.97 (14.38)	-211.76 (7.91)
TI	12.32 (14.99)	11.67 (7.41)
TI^2	-0.077 (7.92)	-0.064 (3.38)
SIZ^2	0.00035 (3.29)	0.0003 (1.98)
$SIZ^{.5}$	-11.11 (4.74)	-12.77 (3.13)
RPDNT	0.00277 (2.18)	0.004 (1.45)
DPR	-2.27 (1.85)	-4.32 (1.73)
MP2	0.044 (3.19)	0.055 (1.75)
PA	2.59 (1.68)	1.91 (0.62)
$MR^{.5}$	2.01 (1.42)	1.41 (0.56)
PI	-9.58 (5.24)	-10.24 (3.11)
PI^2	0.128 (8.31)	0.125 (4.56)

TABLE VI (Continued)

Variables[b]	Primary Sample Model 1	Reduced Sample Model 2
PC^2	0.022 (12.01)	0.026 (8.08)
PIC^2	0.011 (3.16)	0.014 (2.30)
FTOFED		-50.72 (1.79)
PTFD		-26.86 (1.26)
ESTFOD		-38.26 (1.83)
NAD		-22.70 (0.78)
BRPD		-43.31 (2.02)
INCD1		18.00 (0.76)
INCD2		36.48 (1.47)
Standard Deviation	174.08	182.996
Number of Observations	1310	470
R^2	65	68

[a]The number in parentheses are t-values for the regression coefficients.

[b]PRA = price per acre, WCD = West Central area intercept binary variable, SWD = Southwest area intercept binary variable, TI = date of sale, SIZ = size of tract, RPDNT = ratio of population of nearest town to distance to the nearest town, DPR = distance to paved road, MP2 = market potential variable, PA = peanut allotment acres, MR = percentage of mineral rights conveyed, PI = study area tract productivity index, PC = cropland percentage, PIC = irrigated cropland percentage, FTOFED = full time off farm employment intercept binary variable, PTFD = part time farmer intercept binary variable, ESTFOD = establish farming operation intercept binary variable, NAD = nonagricultural intercept binary variable, BRPD = land buyer rented property prior to purchase intercept binary variable, INCD1 = annual taxable income \$10,000-\$30,000, and INCD2 = annual taxable income \$30,001 and greater.

The t-values for the number of acres of peanut allotment acres transferred and again the percentage of mineral rights conveyed show lower t-values than the remaining physical variables in Model 2. Overall, the t-values would be expected to improve with a larger sample size.

Physical Variable Interpretation. The results in Table VI indicate that location has an important influence on the per acre value of land. Model 2 indicates that land in West Central Oklahoma is valued for $120 less than similar land in North Central Oklahoma. Similarly land in Southwest Oklahoma may be expected to be valued $202 less than land in North Central Oklahoma.

Size of tract (SIZ) and distance to paved road (DPR) have a negative influence on the per acre value of agricultural land. Distance to paved road depicts a linear or constant relationship with per acre land value while a curvilinear relation is found to exist between tract size and per acre value. Although the distance to paved road shows a constant negative influence on per acre values, reasoning would indicate after a certain distance is reached, additional increases would have smaller and eventually only a negligible effect on per acre value. The curvilinear relation between per acre value and tract size is interpreted to mean that each additional one acre increase in size has a smaller and smaller negative effect on price as the total size of the tract increases. As the size of tract increases from 40 to 41 acres, the per acre price is expected to decrease $0.82 while a one acre increase in size from 80 to 81 acres is expected to result in only $0.56 per acre decrease assuming all other factors remain constant.

The results in Table VI indicate that time (TI), location and economic development (RPDNT, MP2), percentage of mineral rights conveyed (MR) peanut allotment acres transferred (PA), and tract soil quality variables (PI, PC, PIC) are found to be positively correlated with per acre agricultural land prices. Among these variables time and soil quality variables explain the greatest amount of the variation in per acre values. Time and the productivity index indicate a curvilinear relation with per acre values while the remaining variables depict a linear or constant relation. For instance assume that time increases from January 1975 to January 1978 and all other factors remain constant. The difference in per acre price between the same land sold in January 1975 and January 1976, January 1976 and January 1977, and January 1977 and January 1978 is $74.86, $54.12, and $33.38, respectively. Thus, the impact of time on per acre land price increases is less as this variable increases.

Nonphysical Variable Interpretation. The nonphysical variables enter Model 2 through shifts in the intercept of the model. The results in Table VI indicate that full time farmers have a stronger influence in agricultural land market than part time farmers (PTFD) and nonfarmers (FTOFED). The coefficient associated with full time off farm employment indicates these buyers pay almost $51 per acre less than full time farmers. At the same time part time farmers purchased land for $27 less than full time farmers.

Expanding farm operations and nonagricultural related reasons for purchase (NAD) appear to influence the agricultural land market more than buyers who buy land to establish a farm (ESTFOD).[4] The small t-value for nonagricultural related land purchases indicates this influence is not statistically different from the influence of land buyers expanding their existing operations. However, Model 2 indicates that land buyers seeking to establish a farm generally paid $38 less than the two other types of land buyers.

The analysis indicates that buyers who rented the tract prior to purchasing it generally paid $43 less than those who did not rent the property prior to purchase. This may be interpreted to mean that buyers who rented the property prior to purchase possible were better acquainted with the sellers and have a longer time to negotiate a more attractive selling price. It could also be that land sellers have a preference for selling land to existing managers.

As might be expected, the analysis indicates that income has a positive influence on per acre land values. The results indicate that land buyers with incomes exceeding $30,000 generally paid $36 more per acre for land than land buyers with lower income levels.

Implication of the Analysis

The analyses indicate many physical and nonphysical factors have important influences on per acre agricultural land values. In addition, different land value model intercepts between areas indicate the structures of agricultural land markets may differ by area. These structures are investigated in the next chapter through a spatial analysis of area agricultural land market activity.

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[4]Nonagricultural related reasons include investment, nonagricultural development, recreation or second homesite development, and an other category as the primary reason for purchasing the tract.

CHAPTER IV

A SPATIAL ANALYSIS OF THE AGRICULTURAL LAND MARKET

The primary objective of this chapter is to analyze the spatial aspects of the Western Oklahoma agricultural land market. Mean agricultural land values and characteristics of land buyers are presented and discussed in the first two sections of the analysis. These data suggest that land values and other characteristics differ among the north central, west central, and southwest areas in the study. Factors which cause inter-tract variations in per acre prices in agricultural land market activity are estimated in area land value models in the final section. The relative influences of the important factors in each area agricultural land market are used to explain spatial variations in per acre land values.

Average Land Values by Area

Average agricultural land market values and other related characteristics by selected areas are presented and discussed in this section. In the study, the north central area is represented by Alfalfa and Garfield Counties while west central and southwest areas are represented by Blaine and Caddo, and Jackson and Tillman Counties, respectively. The number of bona fide sales from which this analysis is based are: (1) 501 for the north central area; (2) 484 for the west central area;

and (3) 325 for the southwest area. Average land values for all land sales, cropland, and pastureland are presented and discussed in the two following sections.

All Land Sales

Average land values for each area are presented in Table VII and illustrated in Figure 8. These results generally show large differences in the average per acre price of land among areas. In 1978, average land values in North Central Oklahoma are 78 percent greater than those in West Central Oklahoma and almost 47 percent more than the southwest area. However, the results indicate that at least part of the price differences occur because of variations in average tract productivity and the average percentage of cropland per tract between areas. Average productivity of tracts sold in the north central area is clearly greater than tract productivity in the other areas. Average tract productivity in the north central area ranges from a low of 58 in 1973 to a high of 69 in 1978 while this same variable in the southwest ranges from 52 in 1975 to 58 in 1978. The corresponding range for the west central area is 50 in 1976 to 54 in 1973.

The average percentage of cropland per tract appears to be greatest in the southwest area. In only two years is the average percentage greater in the north central area than in the southwest area. At the same time, the average percentage of the tract in cropland in the west central area is quite low when compared to the other areas. The results generally indicate this percentage to be near 40 percent for most years.

The standard deviation of per acre price appears to be greater in the north central area than in other areas in most cases. This

TABLE VII

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF AGRICULTURAL LAND SALES BY AREA, OKLAHOMA

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
North Central Area							
Average Price $/Acre	379	434	587	773	755	878	900
Change from Previous Year, %		15	35	32	-2	16	3
Standard Deviation, $/Acre	146	192	306	367	349	321	263
Average Size, Acres	140	142	154	129	138	141	134
Mineral Rights, % Conveyed	68	65	66	69	64	65	80
Cropland, % of Tract	74	70	68	67	66	75	76
Tract Productivity Index	65	58	59	66	63	66	69
Number of Observations	93	87	85	83	62	58	33
West Central Area							
Average Price, $/Acre	244	306	396	440	502	522	507
Change from Previous Year, %		25	29	11	14	4	-3
Standard Deviation, $/Acre	142	212	209	190	249	251	194
Average Size, Acres	145	168	145	161	140	142	150
Mineral Rights, % Conveyed	51	40	36	25	35	29	22
Cropland, % of Tract	45	44	38	36	41	42	38
Tract Productivity Index	32	54	52	52	50	51	52
Number of Observations	64	84	75	70	82	81	28
Southwest Area							
Average Price, $/Acre	264	266	413	427	544	551	613
Change from Previous Year, %		1	55	3	27	1	11
Standard Deviation $/Acre	85	116	159	151	175	247	286
Average Size, Acres	203	148	168	152	146	167	163

TABLE VII (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
Southwest Area (continued)							
Mineral Rights, % Conveyed	87	79	84	82	72	63	76
Cropland, % of Tract	85	68	78	76	78	74	80
Tract Productivity Index	54	57	54	52	54	55	58
Number of Observations	18	29	50	60	60	73	35

[a]Includes agricultural land sales which occurred during the first six months of 1978.

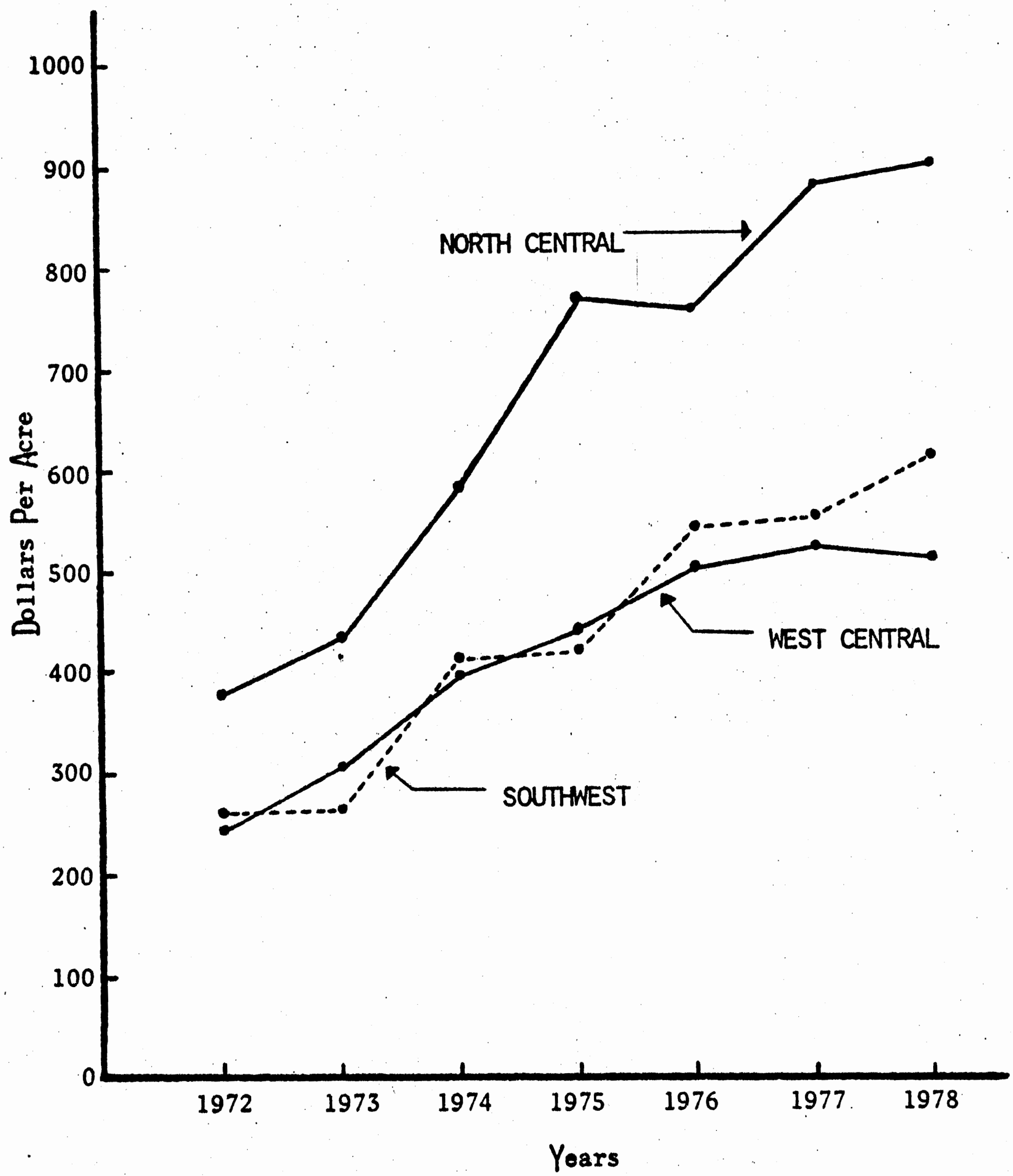

Figure 8. Average Yearly Prices of Agricultural Land Sales by Area, Oklahoma

indicates a possible greater quality range of land in north central areas and hence greater variation in prices.

For most years, the average tract size is smaller for the north central area. The analysis also indicates the percentage of mineral rights conveyed tends to be smaller for the west central area. This is because, as indicated in Table I, minerals lead to substantial incomes in west central counties. This income and potential future income is expected to cause sellers to convey smaller percentages of mineral rights to agricultural land buyers in these counties.

The results in Table VII and Figure 8 indicate large average price increases in early years of the study while more recent years show modest price increases and even a price decline for the west central area in 1978. Moreover, average land values in 1978 would probably show smaller or even possible no price increases if an adjustment were made for tract productivity and average cropland percentages between years. Average land prices in the north central area for 1978 are about three percent higher than the previous year. However in the north central area, average tract productivity is five percent greater for tracts sold in 1978 than tracts sold in 1977 while the average percent of cropland in land transfers is one percent more in 1978 than in 1977. In west central areas, average per acre prices are three percent less in 1978 than in the previous year while average tract productivity is two percent more for land transfers in 1978 than in 1977. A lower price for land in this area of 1978 is probably associated with less cropland in tracts for this year than in the previous year. In the southwest area average per acre land values are 11 percent greater for tracts sold in 1978 than in 1977. However, part of this positive price differential may be due to soil productivity and cropland acreage differences between these years.

Cropland and Pastureland Sales

Average yearly prices and other related characteristics of cropland sales are presented in Table VIII. Cropland sales are again defined to be those sales in which at least 90 percent of the tract is cropland. The results show that cropland values are much higher in the north central area even though a sizable portion of the cropland in the other areas is irrigated. As indicated in the all land sales discussed previously, part of the price difference between areas may be attributed to productivity differences. For example, in 1977, the average per acre land price in the north central area is almost 18 percent more than in the west central area and 46 percent more than in the southwest area. At the same time, average tract productivity is 16 percent and 22 percent less in west central and southwest areas, respectively. However, part of the quality difference is offset by the fact that 13 percent of the land in the west central area and 33 percent of the land in the southwest area is irrigated cropland. Trends in cropland market appear to be similar to trends of the all land sales.

The average per acre value of pastureland sales are presented in Table IX. Tracts consisting of at least 90 percent pastureland are included in this land type category. Again, the results indicate land prices to be greatest in the north central area. However, less reliance can be placed on these results because of a small number of observations for the north central and southwest areas. Both of these areas are

TABLE VIII

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS
OF CROPLAND SALES BY AREA, OKLAHOMA[a]

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
North Central Area							
Average Price, $/Acre	431	535	814	1069	1007	1031	1026
Standard Deviation, $/Acre	98	188	353	311	449	279	210
Cropland, % of Tract	97	98	97	98	98	98	98
Tract Productivity Index	71	67	72	80	76	77	80
Number of Observations	31	29	30	34	19	26	16
West Central Area							
Average Price, $/Acre	372	525	638	789	750	874	673
Standard Deviation, $/Acre	160	312	239	62	295	202	288
Cropland, % of Tract	99	99	99	99	98	98	99
Irrigated Cropland, % of Tract	6	9	11	50	0	13	49
Tract Productivity Index	72	72	70	62	64	62	52
Number of Observations	18	18	16	4	15	8	2
Southwest Area							
Average Price, $/Acre	319	322	479	510	614	707	749
Standard Deviation, $/Acre	84	138	155	132	177	237	301
Cropland, % of Tract	99	99	97	96	97	97	97
Irrigated Cropland, % of Tract	0	10	14	17	8	33	26
Tract Productivity Index	56	70	59	60	59	63	63
Number of Observations	8	10	29	29	25	30	20

[a]The analysis includes those tracts which are at least 90 percent cropland.

[b]Includes agricultural land sales which occurred during the first six months of 1978.

TABLE IX

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF PASTURELAND SALES BY AREA, OKLAHOMA[a]

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
North Central Area							
Average Price, $/Acre	297	205	270	391	591	732	
Standard Deviation, $/Acre		25	121	104	347	308	
Tract Productivity Index	43	31	37	45	46	33	
Number of Observations	1	7	7	12	5	3	0
West Central Area							
Average Price, $/Acre	172	182	307	362	376	354	389
Standard Deviation, $/Acre	106	99	94	138	166	111	119
Tract Productivity Index	40	43	42	43	39	39	44
Number of Observations	18	17	17	21	22	21	9
Southwest Area							
Average Price, $/Acre		142	284	173	400	224	381
Standard Deviation, $/Acre		80	156	3		106	
Tract Productivity Index		51	29	29	26	30	50
Number of Observations	0	3	4	2	1	5	1

[a]The analysis includes those tracts which are at least 90 percent pastureland.

[b]Includes agricultural land sales which occurred during the first six months of 1978.

primarily cropland areas and few observations qualified as pastureland sales.

Characteristics of Agricultural Land Buyers by Area

Characteristics of agricultural land buyers by area are presented in Table X. The analysis indicates that full time farmers are the primary buyer group in each of the areas of study. Part time farmers appear to be relatively more important buyer groups in the west central and southwest areas than in the north central area. Land buyers employed full time off the farm are relatively more frequent in the north and west central areas. The family farm by far appears to be the major type of farming operation in each area.

Although expanding farming operations is the most frequent reason for purchase in each of the areas, establishing a farm appears to be relatively more important in the southwest area than the other two areas. More than one third of the respondents listed this reason as the primary reason for purchase in the southwest area. This result is also reflected in the percentage distribution of acres owned prior to purchase of additional land. For the southwest area, this distribution is more tightly skewed to the left generally indicating a relatively larger number of smaller farmers establishing farming operations.

The seller's reason for selling land is characterized by a bimodal distribution. Estate settlement and retirement are the most frequent reasons given for selling land. It is also interesting to note that financial difficulties as a reason for selling land occurs most frequently in the north central area where land values are at the

TABLE X

CHARACTERISTICS OF AGRICULTURAL LAND BUYERS BY AREA, OKLAHOMA

	Questionnaire Response Percent Distributions by Area		
	North Central	West Central	Southwest
Occupational Status			
Full Time Farmer	63.7	48.4	63.4
Full Time Off Farm Employment	13.5	17.7	9.8
Part Time Farmer	21.4	30.7	24.1
No Response	1.4	3.1	2.7
Type of Farming Operation			
Family Farm	80.9	82.3	86.6
Partnership	11.2	12.0	10.7
Family Corporation	3.7	2.6	2.7
Corporate Farm	0.5	0.5	0.0
No Response	3.7	2.6	0.0
Primary Reason for Land Purchase			
Establish Own Farm	21.4	24.0	35.7
Expand Farming Operations	63.7	61.5	51.8
Investment	9.8	10.4	8.9
Nonagricultural Development	0.0	0.5	1.8
Recreation or Second Homesite	2.3	0.0	0.9
Other	2.8	3.6	0.9
Acres Owned Prior to Purchase			
0-160 Acres	42.8	45.8	49.1
161-320 Acres	14.4	19.8	17.0
321-480 Acres	14.0	10.9	9.8
481-640 Acres	8.8	4.2	8.9
641-1000 Acres	10.7	7.8	8.9

TABLE X (Continued)

	Questionnaire Response Percent Distributions by Area		
	North Central	West Central	Southwest
Acres Owned Prior to Purchase (continued)			
1001-1500 Acres	4.2	3.1	2.7
More Than 1500 Acres	4.2	6.8	3.6
No Response	0.9	1.6	0.0
Seller's Reason for Selling Land			
Estate Settlement	41.4	31.8	36.6
Off Farm Employment	3.3	4.7	3.6
Financial Difficulties	12.6	10.4	8.0
Retirement	20.5	24.5	30.4
Unknown	13.0	22.9	12.5
Ownership of Non-Farm Investments			
Yes	15.3	15.6	8.0
No	83.7	82.8	90.2
No Response	0.9	1.6	1.8
How Would Respondent Invest a Gift of $50,000?			
Stocks	3.7	3.1	4.5
Bonds	8.8	4.2	6.3
Agricultural Land	84.7	90.6	86.6
No Response	2.8	2.1	2.7
Respondent's Satisfaction with Land Purchase			
Yes	93.0	96.4	93.8
No	7.0	2.6	6.2
No Response	0.0	1.0	0.0

TABLE X (Continued)

	Questionnaire Response Percent Distributions by Area		
	North Central	West Central	Southwest
Respondent's Plans to Purchase Additional Land			
Yes	61.4	67.7	75.9
No	27.4	21.9	20.5
Undecided	11.2	9.9	3.6
No Response	0.0	0.5	0.0
Upon Termination of Land Ownership, Respondent's Choice of Land Transfer			
Transfer Land to Relative	74.0	72.9	73.2
Sell Land on Open Market	22.8	21.9	25.0
Other	1.9	2.6	0.0
No Response	1.4	2.6	1.8
Likelihood of Respondent's Relative to Maintain Ownership of Land[a]			
Yes	97.5	96.4	84.1
No	2.5	3.6	15.9
Education			
Less Than High School	5.1	8.9	8.0
High School	32.1	38.0	21.4
Some College	25.6	15.6	34.8
College Graduate	37.2	36.5	34.8
No Response	0.0	1.0	0.9

TABLE X (Continued)

	Questionnaire Response Percent Distributions by Area		
	North Central	West Central	Southwest
Current Age			
20-30	12.1	9.9	17.9
31-40	16.7	25.5	21.4
41-50	29.3	27.1	28.6
51-60	28.8	21.9	23.2
61-70	9.3	8.9	8.0
Over 70	2.3	5.2	0.9
No Response	1.4	1.6	0.0
Annual Taxable Income			
Less Than $5,000	6.0	6.3	5.4
$5,000-10,000	15.3	12.5	8.9
$10,001-20,000	20.0	21.4	30.4
$20,001-30,000	15.3	19.8	22.3
$30,001-40,000	11.6	9.4	8.9
Over $40,000	22.3	23.4	21.4
No Response	9.3	7.3	2.7

[a]Expressed as a percentage of those respondents that would transfer their land to a relative.

highest levels. This could be interpreted to mean that land buyer cash flow and repayment problems are directly associated with higher land value areas.

The results do not indicate a large difference in attitudes toward owning and managing land between areas. The large majority of land buyers in all areas indicate small ownership of off farm investments, a preference for investing in agricultural land as opposed to stocks and bonds, were satisfied with their land purchase and plan to purchase additional land in the future. However, fewer respondents indicated plans to purchase additional farmland in the future for the north central area indicating a larger degree of uncertainty in this area. This uncertainty is probably associated with low small grain prices and already relatively high farmland prices. A smaller degree of uncertainty in west central and southwest areas may possible reflect a generally higher level of crop enterprise diversification than in the north central area.

Among the personal characteristics of land buyers, the analysis indicates them to be generally well educated. Over one half of the respondents in each area either have some college or are college graduates. The age distribution for the north central area tends to be distributed slightly towards the older age groups when compared to other areas. A relatively large number of land buyers in the first two levels of the southwest area age distribution is consistent with the previously discussed result of a large number land buyers purchasing land to establish a farm in this area. The distributions of annual taxable income by area tend to be very similar with only slight differences. The results indicate the north central area annual taxable income to be more evenly distributed over income levels while these same distributions for west central and southwest areas tend to be slightly more distributed toward the middle income levels ($10,001-$30,000).

Empirical Estimates of Spatial Land Market Determinants

Agricultural land market variables which were discussed and explained in Chapter II are used to estimate area agricultural land market models. Procedures for estimating these models and the empirical results are presented and discussed in the following sections.

Estimation Procedures

The primary objective of this analysis is to estimate the spatial variation in the Western Oklahoma agricultural land market. Several variables have been included in the study to measure soil quality, location, and economic development land market determinants. A large number of variables coupled with other land market characteristics make it difficult to determine and measure the structural differences which exist among area markets. For example, preliminary analyses indicate that among the soil quality variables, tract productivity and the percentage of native pasture explain a large percent of the variation in per acre land values in one area while tract productivity and the percentage of cropland in the tract best explain this variation in another area. Similarly, different variables are found to best explain the impacts of location and economic development between area agricultural land markets. These results suggest the need for a procedure to standardize land market determinants so that meaninful comparisons could be made between area agricultural land markets.

One possible solution to this problem and the solution used in this analysis is to estimate a single index for each of the important land market determinants (tract quality, location, and economic development). Standardized indexes would facilitate the direct comparison of determinants among the three agricultural land market areas. More specifically estimated multiple regression models using these indexes would facilitate the comparison and interpretation of tract quality, locational, and economic development determinants among areas.

There are at least two other advantages associated with using estimated indexes in area land value models. In the first instance, the standardization of the determinants resulting from index estimation facilitates testing of structural differences between market areas. This advantage will be made more clear in a later section when area agricultural land markets are tested for structural differences. In the second instance, the computation of indexes is expected to decrease the degree of multicollinearity in the land value data and hence increase the precision of land value models. This is because land value models estimated without such indexes typically include more than one explanatory variable in the model to measure tract productivity and in some instances more than one explanatory variable in the model to measure locational and economic development factors. These variables are often highly correlated hence increasing the degree of multicollinearity in model estimation.

Principal component analysis is chosen as the appropriate method for estimating the indexes discussed above. The method provides a technique by which a set of observed variables can be expressed as a linear combination of a smaller set of principal components which are linearly independent.[1] In general, principal components are characteristic vectors of the covariance matrix of the observed variables. The number of estimated principal components equals the number of observed variables. The first principal components normally explain the greatest variation in the sample observations, while the variation explained by remaining components is negligible. Principal component analysis replaces the set of observations on the original variables by a linear combination of a given number of principal components. The ith principal component using K observed variables (X_i) is defined as

$$P_i = \sum_{i=1}^{K} f_i X \qquad i = 1, 2, \ldots, K$$

subject to the condition that

$$\sum_{i=1}^{K} {f_i}^2 = 1$$

A vector of factor weights is represented by f_i. The first principal component P_1 is then defined as that P for which the amount of variation explained in the observed sample observations is a maximum.

Principal component analysis is used in the analysis to collapse the variation of several related variables into a single index. Tract productivity (PI), cropland percentages (PC), and pastureland percentages (PP) are included in the principal component analysis to estimate an index for tract quality or productivity. Similarly, the ratio of population to distance to nearest town (RPDNT), the ratio of population

[1]For a complete explanation and discussion of principal component estimation procedures, see (18).

to distance to nearest principal market (RPDNPM) and market potential (MP2) are included in the principal component analysis to estimate an index for locational and economic development determinants.[2] In following sections, these two estimated indexes are used as explanatory variables in multiple regression land value models.

Estimated principal component results using the principal axis method (19) are presented in Table XI. Principal components in the analysis are estimated using standardized variables. Means and standard deviations for standardizing the observed variables used in index computation are presented in Table XI. The estimated factor weights are weights by which each of the observed variables must be multiplied to obtain respective indexes.

The analysis indicates the first principal component used to estimate the tract quality index explains more than 80 percent of the variation in the original included tract quality variables (PI, PC, and PP). Similarly, almost 80 percent of the variation of the original location and economic development variables (RPDNT, RPDNPM, and MP2) is explained by the first principal component. The degree of correlation between each of the original variables and the first principal component are given in Table XI. The correlation vectors indicate a high degree of correlation between the included original variables and first principal component. For instance the correlation between the first principal component for tract quality and the study area tract productivity variable is estimated to be 0.80. Moreover, positive

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[2] A single index is estimated to measure the influence of location and economic development on per acre land values. These variables are very closely related making it difficult to separate their influences on per acre land values.

TABLE XI

PRINCIPAL COMPONENT ANALYSIS OF TRACT QUALITY, LOCATION, AND ECONOMIC DEVELOPMENT LAND MARKET DETERMINANTS

Variable[a]	Mean	Standard Deviation	Factor Weights for the First Principal Component	Correlation
Tract Quality				
PI	56.77	16.53	0.51398	0.80354
PC	61.61	35.55	0.61403	0.95996
PP	34.29	34.08	-0.59899	-0.93644
Variation Explained, %			81.5	
Location and Economic Development				
RPDNT	1168.03	4763.64	0.61361	0.94695
RPDNPM	2188.81	4921.64	0.61148	0.94366
MP2	327.00	436.87	0.49959	0.77098
Variation Explained, %			79.4	

[a]PI = study area tract productivity, PC = cropland percentage, PP = pastureland percentage, RPDNT = ratio of population of nearest town to distance to nearest town from tract, RPDNPM = ratio of population of nearest principal market to distance to nearest principal market from tract, MP2 = market potential with distance in the denominator raised to the second power.

correlations are shown between the first principal component and both the study area tract productivity index and the percentage of cropland while a negative relation is shown between the first principal component and the percentage of pastureland. This indicates that both tract soil productivity and cropland acreages have a positive influence on the tract quality index estimated from principal components while the percentage of pastureland has a negative influence on the estimated tract quality index.

Variable Identification

The per acre value of agricultural land is the variable to be explained in the following sections. Estimated indexes using principal component analysis as well as the variables described in Chapter II are used as explanatory variables in the analysis. These variables are defined below.

PRA = Price per acre (dollars)

TI = Date of sale (months)

QFACT = Tract quality index (estimated by using principal components)

QFACT1 = Tract quality index slope binary variable (1 x QFACT for observations with a date of sale between March 1974 and May 1976, 0 otherwise)

QFACT2 = Tract quality index slope binary variable (1 x QFACT for observations with a date of sale after May 1976, 0 otherwise)

LFACT = Locational and economic development index (estimated by using principal components)

LFACTD = Locational and economic development index slope binary variable (1 x LFACT for Tillman County observations, 0 otherwise)

SIZ = Size of tract (acres)

DPR = Distance to paved road (miles)

MR = Mineral rights conveyed (percent)

PA = Peanut allotment (acres)

PIC = Irrigated cropland (percent)

FTOFED = Full time off farm employment binary variable (1 if occupational status is full time off farm employment , 0 otherwise)

PTFD = Part time farmer binary variable (1 if occupational status is part time farmer, 0 otherwise)

ESTFOD = Establish farming operation binary variable (1 if primary reason of purchase is establish farming operation, 0 otherwise)

NAD = Nonagricultural binary variable (1 if primary reason for purchase is investment, nonagricultural development, recreation, second homesite or other, 0 otherwise)

ACD1 = Acres owned prior to purchase binary variable (1 if acres owned is between 161 and 480, 0 otherwise)

ACD2 = Acres owned prior to purchase binary variable (1 if acres owned is between 481 and 1,000, 0 otherwise)

ACD3 = Acres owned prior to purchase binary variable (1 if acres owned is greater than 1,001, 0 otherwise)

INCD1 = Annual taxable income binary variable (1 if income equals $10,001 to $30,000, 0 otherwise)

INCD2 = Annual taxable income binary variable (1 if income is greater than $30,000, 0 otherwise)

As discussed in the previous section, the tract quality index (QFACT) and the locational and economic development index variables are estimated using principal component analysis. Tract quality index slope binary variables (QFACT1, QFACT2) result when the study time period is divided into three equal periods. Similarly, the locational and economic development index slope binary variable results when the southwest area is divided by counties. The reasons for including these variables in the analysis will be discussed in later sections. The nonphysical variables (FTOFED, PTFD, ESTFOD, NAD, ACD1, ACD2, ACD3, INCD1, and INCD2) enter the analysis through shifts in the intercept of a multiple regression model. The coefficients estimated for these variables are interpreted as the change that can be expected from the related variable being included in the intercept term of the model.

Empirical Test for Area Market Structural Differences

Estimated models of the Western Oklahoma agricultural land market are presented in Table XII. Model 1 in this table differs from models estimated in the previous chapter in that a tract quality index (QFACT) and an index of locational and economic development (LFACT) are included in the model in place of original tract quality, locational, and economic development variables. As explained in the previous section, principal components are used to compute these indexes. Moreover, in each case the variation of three related original independent variables are incorporated into each index. This standardization facilitates testing for structural differences between area agricultural land markets.

The estimated land value model for the six county area is Model 1 in Table XII. In Model 1, the area coefficients of the variables are restricted to be the same while in Model 2 binary variables allow the

TABLE XII

AGRICULTURAL LAND VALUE MODELS USED TO TEST FOR STRUCTURAL STABILITY, OKLAHOMA[a]

Variable[b]	Restricted Model (Model 1)	Unrestricted Model (Model 2) North Central Coefficient	West Central Binary Coefficient	Southwest Binary Coefficient
Intercept	322.258	358.320	-50.662	-139.213
TI	5.402	8.059	-3.279	-3.000
	(20.68)	(21.39)	(6.08)	(4.67)
QFACT	99.277	114.265	-34.430	-35.237
	(24.96)	(18.69)	(4.22)	(3.06)
LFACT	17.369	11.763	72.747	4.126
	(4.55)	(2.75)	(3.72)	(0.55)
SIZ	-0.275	-0.398	0.316	0.134
	(4.34)	(3.00)	(2.05)	(0.76)
DPR^2	1.503	-13.223	5.646	3.980
	(1.05)	(2.01)	(1.59)	(1.17)
MR	0.120	0.027	0.324	0.270
	(0.79)	(0.90)	(1.00)	(0.62)
PA	1.965	3.254	--	--
	(1.11)	(2.02)	--	--

TABLE XII (Continued)

Variable[b]	Restricted Model (Model 1)	Unrestricted Model (Model 2) North Central Coefficient	West Central Binary Coefficient	Southwest Binary Coefficient
R^2	49	60	--	--

[a]The number in parentheses are t-values for the regression coefficients.

[b]TI = date of sale, QFACT = tract quality index estimated by using principal components, LFACT = locational and economic development index estimated by using principal components, SIZ = size of tract, DPR = distance to paved road, MR = percent of mineral rights conveyed, PA = number of acres of peanut allotment acres transferred in sale.

intercepts and slopes of the variables to vary by area. In the analysis, both relatively large binary slope and intercept coefficients for the west central and southwest areas in the unrestricted model indicate structural differences between land market areas. Moreover for both the west central and southwest areas, the t-values for the binary slope coefficients of time and tract quality are highly significant indicating a different land market structure among areas. For example in Model 2, for the north central area, the coefficient for time is 8.059 for each increment in time while this corresponding value for the west central area is 4.78 (8.059 - 3.279). This indicates higher land inflation rates in the north central area.

Other variables in Model 2 may be interpreted in the same manner. The influence of tract quality has the greatest influence in the north central area while the effect of location and economic development is greatest in the west central area. The influence of size and distance to nearest paved road have the largest negative influence in the north central area. Both the percentage of mineral rights conveyed and the number of peanut allotment acres conveyed show a positive influence on per acre price, although not highly statistically significant. The impact of mineral rights appears to be greatest in the west central area. In addition, number of peanut allotment acres transferred is relative only for the west central area.

The results generally indicate Model 2 to be the better land value model. Model 2 explains 60 percent of the variation in per acre land values while Model 1 explains only 49 percent of the variation. In addition, the positive sign for distance to paved road in Model 1 is inconsistent with economic logic whereas it is negative as expected in

Model 2.

In general these results indicate a different structure to exist between area agricultural land markets. Land value models for each area are estimated and discussed in remaining sections of this chapter.

Analysis of the Physical Area Land Market Determinants

Estimated area land value models are presented in Table XIII. The results generally indicate the influence of land market determinants to vary by region. In addition, area quality influences are found to change throughout the study period. In the models, QFACT represents the estimated tract quality coefficient for the first third of the study period while QFACT1 and QFACT2 represent changes in the influence of the quality factor (QFACT) on per acre values in later periods.[3] For example in the north central area, the tract quality variable coefficient for the second period (March 1974-May 1976) is estimated to be 158.308 (66.351 + 91.957) while this same value in the third period (after May 1976) is estimated to be 115.282 (66.351 + 48.931). These tract quality variables show interesting trends. In both the west central and southwest areas, the influence of tract quality on per acre values continues to increase with time. However, for the north central area, tract quality determinants are largest in the 1974 to 1976 period and then decline for the last period. It is interesting to note that for each area, due to the high degree of correlation between tract quality

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[3]For each area model, QFACT1 and QFACT2 represent binary slope tract quality variables for respective time periods.

TABLE XIII

ESTIMATED AREA LAND VALUE MODELS USING PHYSICAL DATA, OKLAHOMA[a]

North Central (Model 3)		West Central (Model 4)		Southwest (Model 5)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Intercept	595.498	Intercept	410.496	Intercept	426.021
TI	14.882 (8.81)	TI	9.968 (9.05)	TI	7.221 (3.96)
TI^2	-0.095 (4.43)	TI^2	-0.055 (4.23)	TI^2	-0.033 (1.61)
QFACT	66.351 (5.71)	QFACT	55.240 (7.87)	QFACT	24.597 (1.75)
QFACT1	91.957 (6.08)	QFACT1	28.713 (2.99)	QFACT1	32.899 (1.93)
QFACT2	48.931 (2.94)	QFACT2	48.683 (5.00)	QFACT2	72.876 (4.45)
LFACT	17.586 (3.68)	LFACT	79.389 (5.13)	LFACT	9.027 (1.82)
SIZ	1.766 (2.66)	SIZ	0.741 (3.36)	SIZ	1.139 (2.89)
$SIZ^{.5}$	-52.803 (3.19)	$SIZ^{.5}$	-27.233 (3.90)	$SIZ^{.5}$	-38.893 (3.48)

TABLE XIII (Continued)

North Central (Model 3)		West Central (Model 4)		Southwest (Model 5)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
DPR	-15.485 (1.94)	$PIC^{.5}$	9.820 (1.97)	PIC^2	0.018 (5.19)
		PA^2	0.070 (2.15)	$MR^{.5}$	3.921 (1.06)
		MR^2	0.004 (2.01)		
Number of Observations	501		484		325
Standard Deviation	212.00		151.72		144.01
R^2	61		59		59

[a]The numbers in parentheses are t-values for the regression coefficients.

[b]TI = date of sale, QFACT = tract quality index estimated by using principal components, QFACT1 = tract quality index slope binary variable (date of sale between March 1974 and May 1976), QFACT = tract quality index slope binary variable (date of sale between May 1976 and June 1978), LFACT = locational and economic development index estimated by using principal components, SIZ = size of tract, DPR = distance to paved road, PIC = irrigated cropland percentage, PA = number of acres of peanut allotment transferred, MR = percentage of mineral rights conveyed.

and per acre land values, the estimated changes in the tract quality coefficient generally reflect the trends in the area agricultural land markets as shown in Table VII.

The influences of time and size on per acre values for each area show a curvilinear relationship. Assuming all other factors remain the same, the values of these variables are computed for selected variable values and presented in Table XIV. The results indicate that when compared to other areas, the impact of time on per acre values is initially quite large in north central areas; however, this impact declines more rapidly than in the two other areas. For example, the computed change in the per acre land value associated with time equal to 24 (December 1973) over the previous year is $137.55; however, this computed change for time equal to 72 (December 1977) over the previous year decreases by $109.45 to $28.10 for the north central area. For time equal to 72, the computed change in per acre land values over the previous year is greater for west central and southwest areas than for the north central area.

The analysis in Table XIV further indicates the impact of tract size on per acre values is greatest in north central areas for small sized tracts whereas this impact is greater for larger tracts in west central and southwest areas. In north central areas the results show that a 40 acre tract is valued at $71.09 more per acre than an 80 acre tract while this difference in value is only $41.70 and $56.33 for west central and southwest areas, respectively. However, in the north central areas, the per acre difference in value between a 200 acre tract and a 160 acre tract is $10.63 while this value is slightly greater for the other areas. Large differences in value associated

TABLE XIV

ESTIMATES OF TIME AND SIZE INFLUENCES ON PER ACRE LAND VALUES BY AREA, OKLAHOMA

	North Central			West Central			Southwest		
	Independent Variable Value	Computed Value	Computed Interval Difference	Independent Variable Value	Computed Value	Computed Interval Difference	Independent Variable Value	Computed Value	Computed Interval Difference
					-Time-				
Dec. 72	12	164.90		12	111.70		12	81.90	
Dec. 73	24	302.45	137.55	24	207.55	95.85	24	154.30	72.40
Dec. 74	36	412.63	110.18	36	287.57	80.02	36	217.19	62.89
Dec. 75	48	495.46	82.83	48	351.74	64.17	48	270.58	53.39
Dec. 76	60	550.92	55.46	60	400.08	48.34	60	314.46	43.88
Dec. 77	72	579.02	28.10	72	432.58	32.50	72	348.84	34.38
					-Size-				
	40	-269.88		40	-142.60		40	-200.42	
	80	-340.97	71.09	80	-184.30	41.70	80	-256.75	56.33
	120	-379.35	38.38	120	-209.40	25.10	120	-289.37	32.62
	160	-400.81	21.46	160	-225.91	16.51	160	-309.72	20.35
	200	-411.44	10.63	200	-236.93	11.02	200	-322.23	12.51

with small sized tracts in north central areas may result for several reasons. In the first instance, increasing tract sizes coupled with already high land values in this area cause the total purchase price to rapidly increase. This result and limited financing opportunities available to many potential land buyers decrease competition in the north central agricultural land market as the size of tract increases. In the second instance, competition in the agricultural land market is increased by a large number of people employed in Enid and nearby towns who actively compete for the more affordable small sized tracts of land.

According to the analysis in Table XIII, the impact of location and economic development is greatest in the west central area while this impact is lowest in the southwest area. The larger coefficient could possible result because the west central is more readily accessible to Oklahoma City than other areas.

Estimated land value models further indicate the distance to nearest paved road to have a negative influence on north central per acre values while the percentage of irrigated cropland, number of acres of peanut allotment transferred, and percentage of mineral rights conveyed have positive influences on per acre values in west central areas. The percentage of irrigated cropland and the percentage of mineral rights conveyed show positive influences on per acre values in southwest areas.

In this section, the various physical land market determinants are quantified for each area. Generally these results indicate land market determinants to be different between areas, however very little may be concluded concerning why these variations occur between markets. For example, why is the influence of time and tract quality generally larger in north central areas? The analysis in the next section attempts to answer these questions by incorporating nonphysical buyer characteristic data into the area land value analysis.

Analysis of Nonphysical Land Market Determinants

In this section, nonphysical (buyer characteristics) data are incorporated into the area land value models. As mentioned in earlier chapters, this causes the number of observations to be reduced from 1310 to 519 observations. The Chow test (18) was employed to determine if the respondent and nonrespondent subsamples refer to the same structure for each area. Area land value models presented in the previous section using physical data are again estimated for the reduced (respondent) sample and the nonrespondent sample. The estimated F statistic from the Chow test does not exceed the tabled F value for the west and north central areas at the 99 percent probability level implying the two subsamples for each area are drawn from the same land market structure. For these areas the results generally indicate that it is appropriate to use land value models discussed in the previous section to estimate the influence of land buyer characteristics on per acre prices in the reduced sample.

This is not the case for the southwest area. The estimated F statistic from the Chow test exceeds the tabled F value indicating structural differences between subsamples. This probably results because of a relatively lower response rate in Jackson County. Moreover for the reduced sample, a small number of observations in Jackson County coupled with a large distribution of high priced irrigated land located more distantly from the major town (Altus) in the area leads to a negative sign for the locational and economic development index in the estimated reduced sample model. Because of this result, an additional physical variable is added to the southwest area model. This variable is a binary locational and economic development slope variable (LFACTD) included to measure this influence in Tillman County.

Estimated area land value models using both physical and nonphysical data are presented in Table XV. These models differ slightly from the models in Table XIII in that the peanut allotment acreage variable is not included in the west central model and the binary slope variable (LFACTD) is included in the southwest model to measure the influence of location and economic development in Tillman County. The peanut allotment variable is not included in the west central model because of a small significance level and a wrong expected sign. This is probably because of a low number of observations which contain this variable. The binary slope variable is included in the southwest area model for reasons discussed above. The results in Table XV indicate the influence of location and economic development in Tillman County to be positive, however, at the same time extremely small compared to other areas coefficients.

The relative influences of the physical land market determinants in Table XV are generally similar to those presented in Table XIII and discussed in the previous section.[4] The results again indicate a variation in the influence of physical land market determinants by area,

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[4]The results in Table XV indicate a small coefficient for tract quality in the southwest area for observations prior to March 1974. This is generally because of an extremely small number of observations for this period.

TABLE XV

ESTIMATED AREA LAND VALUE MODELS USING PHYSICAL AND NONPHYSICAL DATA, OKLAHOMA[a]

North Central (Model 6)		West Central (Model 7)		Southwest (Model 8)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Intercept	831.990	Intercept	420.806	Intercept	231.180
TI	14.185 (4.98)	TI	9.212 (3.94)	TI	7.150 (2.12)
TI^2	-0.091 (2.58)	TI^2	-0.046 (1.54)	TI^2	-0.006 (0.15)
QFACT	55.371 (2.33)	QFACT	44.656 (3.65)	QFACT	3.293 (0.12)
QFACT1	88.697 (3.15)	QFACT1	40.728 (2.41)	QFACT1	51.842 (1.74)
QFACT2	75.036 (2.43)	QFACT2	74.451 (4.50)	QFACT2	95.557 (3.05)
LFACT	20.509 (2.10)	LFACT	24.644 (0.78)	LFACT	-20.883 (1.07)
SIZ	3.426 (2.33)	SIZ	0.785 (2.36)	SIZ	0.883 (1.34)
$SIZ^{.5}$	-93.132 (2.70)	$SIZ^{.5}$	-28.921 (2.65)	$SIZ^{.5}$	-28.538 (1.48)

TABLE XV (Continued)

North Central (Model 6)		West Central (Model 7)		Southwest (Model 8)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
DPR	−32.885	MR^2	0.004	$MR^{.5}$	7.904
	(2.35)		(1.25)		(0.92)
		$PIC^{.5}$	10.205	PIC^2	0.026
			(1.51)		(4.19)
FTOFED	85.076	FTOFED	−117.521	FTOFED	−111.663
	(1.57)		(3.27)		(2.10)
PTFD	3.232	PTFD	−20.697	PTFD	−62.734
	(0.08)		(0.75)		(1.53)
ESTFOD	−32.968	ESTFOD	−78.840	ESTFOD	19.175
	(0.73)		(2.36)		(0.50)
NAD	−0.915	NAD	23.143	NAD	12.635
	(0.02)		(0.58)		(0.23)
ACD1	119.072	ACD1	−29.808	ACD1	−35.346
	(2.81)		(0.95)		(0.80)
ACD2	36.588	ACD2	−18.398	ACD2	19.030
	(0.76)		(0.40)		(0.40)
ACD3	93.402	ACD3	−57.787	ACD3	−73.216
	(1.49)		(1.33)		(0.94)
				LFACTD	20.920
					(0.67)

TABLE XV (Continued)

North Central (Model 6)		West Central (Model 7)		Southwest (Model 8)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
INCD1	-29.024 (0.66)	INCD1	59.482 (1.91)	INCD1	33.445 (0.75)
INCD2	12.600 (0.28)	INCD2	74.946 (2.18)	INCD2	86.542 (1.48)
Standard Deviation	215.600		143.659		134.368
Number of Observations	192		172		106
R^2	68		66		75

[a]The numbers in parentheses are t-values for the regression coefficients.

[b]TI = date of sale, QFACT = tract quality index estimated by using principal components (January 1972 to February 1974), QFACT1 = tract quality index slope binary variable (March 1974-May 1976), QFACT2 = tract quality index slope binary variable (May 1976-June 1978), LFACT = locational and economic development index estimated by using principal components, LFACTD = Tillman County locational and economic development index slope binary variable, SIZ = size of tract, DPR = distance to paved road, MR = percentage of mineral rights conveyed, PIC = percentage of irrigated cropland, FTOFED = full time off farm employment binary variable, PTFD = part time farmer binary variable, ESTFOD = established farming operation binary variable, NAD = nonagricultural binary variable, ACD1 = acres owned prior to purchase binary variable (161-480 acres), ACD2 = acres owned prior to purchase binary variable (481-1000 acres), ACD3 = acres owned prior to purchase binary variable (greater than 1001 acres), INCD1 = annual taxable income binary variable ($10,001-$30,000), INDC2 = annual taxable income binary variable (greater than $30,000).

however at the same time the inclusion of the nonphysical land market determinants in area land value models give possible indications of why this variation exists between areas. Nonphysical land market determinants which are discussed below enter the analysis through a shift in model intercepts.

The results in Table XV indicate occupational status of land buyers to significantly influence per acre land values. Both the size of the model coefficients and the t-values for the coefficients indicate land buyers employed full time off the farm (FTOFED) show a strong positive influence in other areas.[5] More specifically, land buyers in north central areas employed full time off the farm generally paid $85 per acre more for land than full time farmers. This is not true for other areas. Full time farmers paid almost $118 and $112 more per acre in west central and southwest areas than full time nonfarmers. Small coefficients and corresponding t-values indicate part time farmers (PTFD) to be competitive with full time in north and west central areas while the same values indicate part time farmers paid almost $63 less for land in southwest areas than full time farmers.

With the exception of land buyers establishing a farm (ESTFOD) in west central areas, generally small coefficients and t-values indicate that differing reasons for purchasing land have little influence on per acre values.[6] The lack of variation in per acre associated with primary

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[5]The occupational status of full time farmers is included in the model intercept. Estimated coefficients for land buyers employed full time off the farm and part time farmers represent differences in per acre values paid for land or shifts in model intercepts.

[6]Influences associated with land buyers purchasing land to expand farming operations enter the analysis through the model intercept.

reason of purchase indicates a more unified land market in north central and southwest areas with establishing (ESTFOD) and expanding farmers and nonagricultural land buyers (NAD) essentially paying the same per acre price for land than expanding farmers.

A positive relationship between large pastureland acreages and establishing farmers engaging in less labor and machinery intensive ranching operations could possibly be one of the reasons for a lower per acre land value paid for establishing farmers in west central areas. Due to a large tract quality range in west central areas relative to other areas, the establishing farming operations variable could possibly be explaining part of the variation not fully explained by the tract quality index in the model.

An interesting relation is shown by the variables included in the area models to measure the influence of acres owned prior to purchase (ACD1, ACD2, ACD3). The magnitude and t-values associated with the acreage coefficients indicate these variables to have a significant impact on per acre values in the north central area.[7] However, this is not the case for the west central and southwest areas. For the most part, the t-values associated with acreages owned prior to purchase for west central and southwest areas indicate these variables to be not significantly different from zero.[8]

The north central model suggests that land buyers owning 161 to 480 acres prior to purchase paid almost $120 more per acre than buyers

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[7]Zero to 160 acres owned prior to purchase are included in the model intercept.

[8]The coefficient associated with ACD3 is significant at the 20 percent probability level. However, no meaningful hypothesis can be made concerning the size of this variable.

who owned 0 to 160 acres. One possible explanation for this result would be incentives for expanding land ownership by both farmers and nonfarmers in the north central area.[9] The attractiveness of land as an investment in recent years has encouraged nonfarmer land buyers to invest in land. Similarly, economic incentives associated with farm enlargement have encouraged farmers in the north central area to expand their existing farming operations. More specifically, the large positive coefficient for ACD1 (161-480 acres) could be possibly interpreted to mean that farmers in this size group are forced to expand to achieve an economic sized unit or face the possibility of going out of business.

Closely related to expanding land ownership patterns is the concept of financial leverage associated with existing land ownership. The results indicate that north central land buyers may possibly use returns from land already owned to purchase and manage additional land.

The results do not suggest expanding land ownership patterns for the west central and southwest areas. One possible explanation of this is the difference between the type of farming operations in these areas and the north central area. Farming operations in west central and southwest areas are more diversified than those in the north central area. Different climatic conditions along with irrigation potentials make it possible for southwest and west central areas to diversify in a greater range of crops and intensify their farming operations

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[9]The expanding farm operations variable which primarily includes both full time and part time farmers is not statistically significant in the north central area while the number of acres owned prior to purchase are relatively large and statistically significant. This implies that expanding land ownership by both farmers and nonfarmer investors is the stronger relationship in the north central area.

therefore lessening the need for expansion of acreages for increasing farm returns. Another reason for differing impacts between areas is unlike the north central area, the influence of land buyers employed full time off the farm in west central and southwest areas appear to have a lesser impact on per acre land values. Without this dimension in the agricultural land market, the competitiveness for land would be expected to be less for these areas.

The analysis does not strongly suggest a per acre value difference between the price paid by land buyers owning 0-160 acres and those owning 481-1000 acres. One possible explanation for this result is that these farmers have achieved an economic sized unit and are able to be more selective in their land purchases.

The final acreage category indicates that land buyers in the north central area owning more than 1000 acres generally paid $93 more per acre than those owning 0-160 acres. Land buyers owning a considerable amount of land and even possibly other forms of wealth would be expected to bid more for land than those without such resources.

With the exception of North Central Oklahoma, the coefficients and associated t values generally indicate a positive relation between land buyer incomes and per acre land values.[10] In west central areas, the results indicate that land buyers with an annual taxable income of $10,001 to $30,000 generally paid $59 per acre more for land than those

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[10]Income levels between 0 and $10,000 are included in land value model intercepts.

with incomes from 0 to $10,000. Similarly, the analysis shows that land buyers in the upper income levels (more than $30,000 annual taxable income) generally pay $75 more per acre in west central areas and $87 more per acre for land in southwest areas than land buyers with lower income levels (0-$10,000) in the respective areas.

Reasons for Spatial Variations in Per Acre Land Values

The analysis of the agricultural land market generally indicates that differences in soil quality, farming practices, and land buyer characteristics account for a large part of the spatial variation in per acre land values. General soil productivity was found to be greater in the north central area than in west central and southwest areas. In addition, nonphysical land market determinants cause per acre land values to differ by area. The estimated impact of the number of acres owned prior to the purchase of additional land in the north central area indicates expanding landownership patterns by both farmers and nonfarmers. General economic pressures and a relatively low degree of farm enterprise diversification cause farm enlargement pressures for north central area farmers. Both the impact of land buyers employed full time off the farm coupled with expanding land ownership investment patterns by these land buyers indicate that nonagricultural influences are greater in the north central area. In the west central and southwest areas, the influences appear to be different. The analysis shows full time farmers to pay more for land than part time farmers and nonfarmers. In addition, the variables included to measure the influences of reasons for purchase and existing land ownership show no consistent interpretable relationship in these areas while land buyer incomes appear to show a consistent positive relation with per acre land values. One interpretation of this result would be that per acre land values in west central and southwest areas are influenced more by land buyer income levels rather than factors associated with farmers wishing to expand their farming operations in north central areas being forced to compete with nonfarm investors in the agricultural land markets.

CHAPTER V

AN ANALYSIS OF COUNTY AGRICULTURAL LAND VALUES

The primary objective of this chapter is to examine value trends and important value determinants in county agricultural land markets. Average land values for each of the six counties are presented and discussed in the following section. In subsequent sections, equations incorporating important land value determinants are estimated while the final section demonstrates two important uses of estimated land value equations.

Land buyer characteristic distributions by county appear to be very similar to their respective area distributions discussed in the previous chapter. For this reason, county land buyer characteristic distributions are presented in Table XXVI in Appendix B.

County Average Land Values

The results in Table XVI generally indicate relatively large per acre price increases in early years followed by more modest price increases in later years of the study. Between 1972 and 1975, average per acre price increases range from a high of 127 percent in Alfalfa County to a low of 34 percent in Jackson County. As indicated in earlier chapters these price changes require careful interpretation because not only are there average per acre variations in price between years but there are also variations in average tract quality and average

TABLE XVI

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF AGRICULTURAL LAND SALES BY COUNTY, OKLAHOMA

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
Alfalfa County							
Average Price, $/Acre	379	450	727	859	814	928	870
Change from Previous Year, %		19	62	18	-5	14	-6
Standard Deviation, $/Acre	118	188	341	393	404	317	242
Average Size, Acres	144	139	153	144	123	129	118
Cropland, % of Tract	76	73	72	67	76	80	85
Tract Productivity Index	65	57	64	69	69	68	72
Mineral Rights, % Conveyed	72	71	61	69	68	63	82
Number of Observations	46	47	42	49	22	31	17
Garfield County							
Average Price, $/Acre	380	415	451	648	723	821	932
Change from Previous Year, %		9	9	44	12	14	14
Standard Deviation, $/Acre	170	196	187	287	315	321	288
Average Size, Acres	136	146	156	107	146	154	150
Cropland, % of Tract	73	67	64	65	61	70	67
Tract Productivity Index	64	58	54	60	59	64	65
Mineral Rights, % Conveyed	63	59	71	69	62	66	78
Number of Observations	47	40	43	34	40	27	16
Blaine County							
Average Price, $/Acre	303	343	472	501	709	625	599
Change from Previous Year, %		13	38	6	42	-12	-4
Standard Deviation, $/Acre	165	277	223	169	225	207	155
Average Size, Acres	166	252	146	209	143	168	160

TABLE XVI (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
Blaine County (continued)							
Cropland, % of Tract	60	44	60	51	69	58	57
Tract Productivity Index	58	57	57	62	60	54	61
Mineral Rights, % Conveyed	57	35	39	12	39	21	34
Number of Observations	26	26	33	27	30	27	12
Caddo County							
Average Price, $/Acre	204	289	336	402	382	471	438
Change from Previous Year, %		42	16	20	-5	23	-7
Standard Deviation, $/Acre	108	176	178	195	172	257	196
Average Size, Acres	131	130	145	132	138	129	142
Cropland, % of Tract	34	45	38	26	24	34	24
Tract Productivity Index	48	53	49	46	44	49	45
Mineral Rights, % Conveyed	46	41	33	33	33	33	12
Number of Observations	38	58	42	43	52	54	16
Jackson County							
Average Price, $/Acre	284	304	386	381	460	523	507
Change from Previous Year, %		7	27	-1	21	14	-3
Standard Deviation, $/Acre	118	119	200	137	172	262	236
Average Size, Acres	228	124	186	139	146	156	195
Cropland, % of Tract	82	62	86	79	79	77	79
Tract Productivity Index	51	61	59	56	58	58	60
Mineral Rights, % Conveyed	90	79	60	64	62	56	59
Number of Observations	5	12	15	21	13	45	16

TABLE XVI (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[a]
Tillman County							
Average Price, $/Acre	257	297	424	452	567	596	702
Change from Previous Year, %		16	43	7	25	5	18
Standard Deviation, $/Acre	73	96	140	154	171	217	300
Average Size, Acres	194	164	160	159	146	184	137
Cropland, % of Tract	86	72	75	74	78	70	80
Tract Productivity Index	56	53	53	50	52	50	57
Mineral Rights, % Conveyed	86	79	94	93	75	75	89
Number of Observations	13	17	35	39	47	28	19

[a]Includes agricultural land which occurred during the first six months of 1978.

percentages of cropland acreages between years. For example in Jackson County, average land prices show a decrease between 1974 and 1975. However, careful examination of the results indicate that both average cropland percentages and average productivity are lower for these years.

Average land values for Alfalfa, Blaine, Caddo, and Jackson Counties show average price declines for some of the more recent years in the study indicating a higher degree of uncertainty in these markets. For example, prices in Alfalfa County show price declines in 1976. In addition, the number of transactions are 45 percent less in 1976 indicating depressed land market activity in this county. Uncertainty associated with relatively lower small grain prices and generally unfavorable weather conditions in this period are only two of the many factors which might have caused this depressed land market activity in 1976.

Price instability is shown in Alfalfa, Blaine, Caddo, and Jackson Counties during the first six months of 1978. During this period, the results show price declines while at the same time, with the exception of Caddo County, average tract productivity is higher. Moreover in both Alfalfa and Jackson Counties, the average percentage of cropland in tracts is higher during this period. In Caddo County, the seven percent decline in price in 1978 over the previous year most likely corresponds to the lower average tract productivity and a large decline in cropland acreages.

Average price per acre land prices in Garfield and Tillman Counties show no price declines. Even though the average percentage of the tract in cropland is four percent lower in Garfield County between 1977 and 1978, average per acre values for this county show increases of 14 percent. Nonagricultural influences associated with economic activity in

Enid may be one of the many possible reasons for a relatively strong agricultural land market in this county. Part of the substantial Tillman County price increase of 18 percent in 1978 is at least partially due to differing tract qualities in 1977 and 1978. During this period, both cropland acreages and average tract productivity are 14 percent higher.

The results in Table XVI indicate variations in the average size of tract transferred and the percentage of mineral rights conveyed. Average tract size transferred in Blaine, Jackson, and Tillman Counties appear to be larger than average tract size transferred in other counties. Blaine and Caddo Counties show small proportions of mineral rights conveyed in land transfers. This suggests potential future mineral production in these counties to be valued highly by land sellers. This is probably because mineral production in these counties have contributed large incomes to owners of such rights in the past. This income and expected future potential income cause sellers to convey smaller percentages of mineral rights to agricultural land buyers in these counties.

Average County Cropland and Pastureland Values

Average yearly per acre cropland values and other characteristics are presented in Table XVII. As before, cropland observations are defined to be those observations in which at least 90 percent of the tract is cropland. The relatively small number of Blaine and Caddo County sales which qualify as cropland observations is consistent with the results shown in Table I. Results in Table I generally show these counties to have smaller percentages of cropland than other counties

TABLE XVII

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF CROPLAND SALES BY COUNTY[a]

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
Alfalfa County							
Average Price, $/Acre	432	576	941	1145	987	1059	962
Standard Deviation, $/Acre	113	188	313	268	435	279	204
Tract Productivity Index	73	71	78	84	77	78	78
Number of Observations	20	21	21	26	11	17	11
Garfield County							
Average Price, $/Acre	431	448	476	821	1035	977	1167
Standard Deviation, $/Acre	69	145	235	327	497	288	160
Tract Productivity Index	68	61	56	64	74	74	85
Number of Observations	11	7	8	8	8	9	5
Blaine County							
Average Price, $/Acre	421	628	638	748	833	823	469
Standard Deviation, $/Acre	174	437	231	69	221	150	0
Tract Productivity Index	74	77	76	49	66	63	44
Number of Observations	11	6	11	2	12	4	1
Caddo County							
Average Price, $/Acre	319	473	637	829	415	962	877
Standard Deviation, $/Acre	91	233	283	14	360	256	0
Irrigated Cropland, % of Tract	17	14	35	100	0	25	99
Tract Productivity Index	73	70	57	75	56	60	59
Number of Observations	6	12	5	2	3	4	1

TABLE XVII (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
<u>Jackson County</u>							
Average Price, $/Acre	401	273	358	441	519	649	620
Standard Deviation, $/Acre	96	162	139	110	110	247	227
Irrigated Cropland, % of Tract	0	17	23	23	27	47	22
Tract Productivity Index	47	71	51	63	62	65	63
Number of Observations	2	6	6	13	7	21	10
<u>Tillman County</u>							
Average Price, $/Acre	291	397	489	570	650	843	879
Standard Deviation, $/Acre	67	33	102	126	186	146	320
Irrigated Cropland, % of Tract	0	0	8	13	0	0	29
Tract Productivity Index	59	70	61	57	58	60	64
Number of Observations	6	4	22	15	18	9	10

[a]Includes agricultural land sales which occurred during the first six months of 1978.

[b]Includes those tracts in the sample which are at least 90 percent cropland.

in the analysis.

Trends in average per acre cropland values are similar to those discussed in the previous section for all land sales. Between 1972 and 1975 per acre cropland price increases range from a high of 165 percent in Alfalfa County to a low of only 10 percent in Jackson County.[1] It is interesting to note the results indicate a small increase in Alfalfa County per acre cropland values between 1974 and the first six months of 1978. The percentage increase in price is only two percent while average tract productivity remains the same for the two years.

As might be expected, per acre cropland prices in Caddo, Jackson and Tillman Counties appear to vary directly with the average percentage of irrigated cropland. For example between 1977 and 1978, the average percentage of irrigated cropland is lower as is the per acre price. Similarly in 1978 both per acre values and irrigated cropland percentages are higher.

Average per acre pastureland values are presented in Table XVIII. Tracts consisting of at least 90 percent pastureland are included in the analysis. The results indicate the differences between county pastureland per acre values for a given year to increase with time. For example, per acre pastureland values range from $272 in Blaine County to $288 per acre in Tillman County in 1974. In 1977, these corresponding values range from $155 in Jackson County to $773 in Alfalfa County. These data should be interpreted carefully because with the

[1]Because of a small number of observations in 1972 from which the Jackson County percentage is computed, generally a small degree of confidence may be placed on this estimated percentage increase.

TABLE XVIII

AVERAGE YEARLY PRICES AND OTHER CHARACTERISTICS OF PASTURELAND SALES BY COUNTY, OKLAHOMA[a]

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
Alfalfa County							
Average Price, $/Acre	297	200	273	396	356	773	
Standard Deviation, $/Acre	0	24	132	105	0	424	
Tract Productivity Index	43	32	39	44	84	36	
Number of Observations	1	6	6	9	1	2	0
Garfield County							
Average Price, $/Acre		231	250	377	649	650	1062
Standard Deviation, $/Acre		0	0	122	371	0	0
Tract Productivity Index		27	39	50	37	30	30
Number of Observations	0	1	1	3	4	1	1
Blaine County							
Average Price, $/Acre	201	160	272	302	456	338	501
Standard Deviation, $/Acre	138	52	61	107	263	63	19
Tract Productivity Index	38	42	40	49	46	33	52
Number of Observations	6	10	6	4	3	3	2
Caddo County							
Average Price, $/Acre	154	186	285	356	326	338	351
Standard Deviation, $/Acre	81	98	104	128	152	134	140
Tract Productivity Index	40	40	41	40	39	39	40
Number of Observations	17	20	17	22	27	22	9

TABLE XVIII (Continued)

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
<u>Jackson County</u>							
Average Price, $/Acre		142		175		155	
Standard Deviation, $/Acre		80		0		2	
Tract Productivity Index		51		35		31	
Number of Observations	0	3	0	1	0	3	0
<u>Tillman County</u>							
Average Price, $/Acre			288	170	400	326	381
Standard Deviation, $/Acre			156	0	0	100	0
Tract Productivity Index			29	24	26	28	50
Number of Observations	0	0	4	1	1	2	1

[a] Includes those tracts in the sample which are at least 90 percent pastureland.

[b] Includes agricultural land sales which occurred during the first six months of 1978.

exception of Caddo County, the results are generally based on a small number of observations.

An Empirical Analysis of County Land Market Determinants

The primary objective of this section is to estimate the influence of physical and nonphysical land market determinants on county per acre land values. The relative influences of these determinants are estimated in county agricultural land value models. The following section presents and discusses the procedures used in estimating the county models while final sections present and discuss the empirical results of the analysis.

Estimation Procedure and Definition of Variables

The estimation procedure in this chapter may be described in two broad steps. The first step in the estimation procedure includes estimating county land value models using physical variables. In this case, trial regression models are used to help establish which variables best explain the variation in per acre values in each county. As described earlier, the criteria for selecting the best county models are: (1) the economic reasoning for including a land value variable in the model, (2) the amount of variation explained by including an explanatory variable in the model, and (3) the statistical significance of the equation and explanatory variables included in the model. The final step in the estimation process includes testing of the relative influences of the nonphysical (buyer characteristics) variables in each county land value model.

The per acre value of agricultural land is the variable to be explained in the following analysis. The physical and nonphysical independent variables which are used to explain county per acre land values are defined below.[2]

PRA = Price per acre (dollars)

TI = Date of sale (months)

CPI = County tract productivity index

PDC = Dry cropland (percent)

PIC = Irrigated cropland (percent)

PNP = Native pasture (percent)

PC34 = Tract acreages of soil capabilities classes three and four (percent)

DNT = Distance to nearest town (miles)

RPDNT = Ratio of population of nearest town to distance to nearest town

RPDNPM = Ratio of population of nearest principal market to distance to principal market

CMP1 = Tract market potential (denominator distances are at the first power)

CMP2 = Tract market potential (denominator distances raised to the second power)

DPR = Distance to paved road (miles)

TR = Type of road adjacent to tract

MR = Mineral rights conveyed (percent)

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[2]These variables are discussed and explained in Chapter II. Procedures for measuring physical relationships are described in Appendix A while procedures for measuring nonphysical variable relationships are described in Appendix B.

PA = Peanut allotment (acres)

SIZ = Size of tract (acres)

ALD = Alfalfa County locational binary intercept variable (1 if the tract lies in the following defined Alfalfa County bounded area, 0 otherwise: The southern boundary is a perpendicular line extending to the western Alfalfa County boundary from a point on the range 10 west line. The point is described as the extreme southeast corner of section 24, Township 28 north, and Range 10 west. The eastern boundary is described as the Range 10 west line between the previously described point and the northern Alfalfa County boundary).

FTOFED = Full time off farm employment binary variable (1 if occupational status is full time off farm employment, 0 otherwise)

PTFD = Part time farmer binary variable (1 if occupational status is part time farmer, 0 otherwise)

NAD = Nonagricultural binary variable (1 if primary reason for purchase is investment, nonagricultural development, recreation, second homesite, or other, 0 otherwise)

ESTFOD = Establish farming operation binary variable (1 if primary reason of purchase is establish farming operation, 0 otherwise)

ACD1 = Acres owned prior to purchase binary variable (1 if acres owned is between 161 and 480, 0 otherwise)

ACD2 = Acres owned prior to purchase binary variable (1 if acres owned is between 481 and 1000, 0 otherwise)

ACD3 = Acres owned prior to purchase binary variable (1 if acres owned is greater than 1001, 0 otherwise)

In many instances, tracts of land in the northwest section of Alfalfa County sell for more per acre than similar tracts in other parts of the county.[3] It is for this reason that an Alfalfa County locational variable is included in the land model to measure per acre variation in price not fully explained by other variables included in the model. The area basically includes all sections in Township 20 North from Range 10 West to the Woods County boundary and the northern four tiers of sections in Township 28 North from Range 10 West to the Woods County boundary.

The buyer characteristics variables again enter the analysis through shifts in the land value model intercepts. For example in testing the influence of occupational status (full time farmer, full time off farm employment, or part time farmer) on per acre land values, two coefficients are estimated to represent this influence. The third occupational status estimate (full time farmer in the following analysis) is included in the model intercept. In this analysis, an estimated occupational status coefficient represents a per acre difference in value paid for land between this occupational status and the occupational status included in the model intercept.

An Empirical Analysis of Per Acre Variation in Land Prices Using Tract Physical Characteristics

Estimated county agricultural land value models along with respective t-values for each coefficient are presented in Table XIX. The results generally indicate that in each county over one-half of the

[3]Several rural appraisers who are familiar with Alfalfa County land values have indicated this relation to exist.

TABLE XIX

COUNTY AGRICULTURAL LAND VALUE MODELS USING TRACT PHYSICAL CHARACTERISTICS, OKLAHOMA[a]

Alfalfa Model (Model 1)		Garfield Model (Model 2)		Blaine Model (Model 3)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Constant	20.778	Constant	225.921	Constant	4.659
TI^{2}	-0.062	$TI^{.5}$	89.734	$TI^{.5}$	62.754
	(4.15)		(15.21)		(11.67)
$TI^{.5}$	126.141	CPI^{2}	0.033	CPI	1.902
	(9.73)		(3.93)		(2.37)
CPI^{2}	0.056	$PNP^{.5}$	-19.156	PDC	2.969
	(8.26)		(4.15)		(7.81)
$PNP^{.5}$	-20.581	$PC34^{.5}$	-13.336	CMP1	0.128
	(4.48)		(2.41)		(5.12)
$RPDNT^{.5}$	3.543	$CMP1^{2}$	0.084	$DPR^{.5}$	-31.779
	(1.74)		(4.07)		(1.86)
DPR	-18.862	$CMP1^{2}$	-0.0000028	$MR^{.5}$	5.271
	(1.79)		(1.73)		(1.93)
SIZ	0.899	SIZ	1.413	SIZ	0.884
	(1.27)		(1.16)		(3.26)
$SIZ^{.5}$	-27.658	$SIZ^{.5}$	-47.206	$SIZ^{.5}$	-35.384
	(1.51)		(1.16)		(3.26)

TABLE XIX (Continued)

Alfalfa Model (Model 1)		Garfield Model (Model 2)		Blaine Model (Model 3)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
ALD	119.343 (3.55)				
Standard Deviation	184.236		186.364		137.956
Number of Observations	254		247		181
R^2	75		64		71

Caddo Model (Model 4)		Jackson Model (Model 5)		Tillman Model (Model 6)	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
Constant	36.987	Constant	612.954	Constant	326.080
TI	8.093 (6.71)	TI	4.174 (7.27)	TI	5.943 (13.88)
TI^2	-0.047 (3.40)	CPI^2	0.018 (2.02)	CPI	3.510 (4.57)
CPI	1.641 (2.06)	PIC^2	0.020 (4.68)	PIC^2	0.028 (5.69)
PIC	10.016 (4.47)	$PNP^{.5}$	-13.817 (3.14)	$PNP^{.5}$	-17.824 (5.10)

TABLE XIX (Continued)

Caddo Model (Model 4)		Jackson Model (Model 5)		Tillman Model (Model 6)	
Variable	Coefficient	Variable	Coefficient	Variable	Coefficient
PIC^2	-0.069	$DNT^{.5}$	-70.832	$DNT^{.5}$	-14.430
	(2.87)		(3.22)		(1.07)
PDC^2	0.023	$DMP2^2$	0.0000032	TR	18.569
	(6.21)		(2.49)		(3.18)
$CMP2^2$	0.00023	SIZ	1.252	SIZ	1.346
	(2.44)		(2.50)		(2.77)
$SIZ^{.5}$	-6.859	$SIZ^{.5}$	-41.700	$SIZ^{.5}$	-42.568
	(2.27)		(2.91)		(3.11)
MR	0.417	$DPR^{.5}$	-31.569		
	(1.89)		(1.33)		
PA^2	0.067				
	(2.14)				
Standard Deviation	144.340		130.552		119.181
Number of Observations	303		127		198
R^2	52		70		70

TABLE XIX (Continued)

[a]The numbers in parentheses are t-values for respective regression coefficients.

[b]TI = date of sale, CPI = county tract productivity index, PNP = native pasture percentage, PDC = dry cropland percentage, PIC = irrigated cropland percentage, PC34 = percentage of soil capability classes in three and four, RPDNT = ratio of population of nearest town to distance to nearest town, CMP1 = tract market potential, CMP2 = tract market potential with denominator distances raised to the second power, DNT = distance to nearest town, TR = type of road adjacent to tract, DPR = distance to nearest paved road, SIZ = size of tract, MR = percentage of mineral rights conveyed, PA = number of acres of peanut allotment transferred, ALD = Alfalfa County locational binary intercept variable.

variation in per acre prices are explained by physical variables in the respective models. The relative influences of these variables in county agricultural land markets are discussed below.

Date of Sale. The analysis in Table XIX indicates the date of sale (TI) variable to be highly statistically significant in explaining per acre prices of land in all counties.[4] In addition, the analysis show time to have a large impact on per acre values. For example, in Alfalfa County the computed influence of time in January 1972 is $126.08 while the same estimated influence in January 1978 is $747.35 assuming all other factors remain the same. The difference in these values represents a $621.27 increase in Alfalfa County per acre land values for the six year period.

The estimated equations show the influence of time on per acre values in north and west central counties to be nonlinear while the same influence for the southwest counties is linear. More specifically, within relevant ranges the estimated forms of the time variable for Alfalfa, Garfield, Blaine and Caddo Counties suggest that as time increases, additional unit increments have a smaller and smaller positive effect on per acre price. For Alfalfa County, a time increase from 50 to 51 increases per acre price by $2.61 while a unit increment between 60 to 61 only results in an increase in per acre price of $0.61. In Jackson and Tillman Counties, each additional unit increase in time increases per acre land values by a constant amount. For example in Jackson County, a unit change in time from 50 to 51 causes per acre values to increase $4.17 assuming all other factors remain unchanged.

[4]Date of sale is also referred to as time in the discussion.

Tract Quality. The results generally indicate that at least two variables are needed in county land value models to adequately measure the influence of tract quality on per acre land values. The results indicate the county tract productivity index (CPI) to be statistically significant in each model while the other tract quality variables appear to vary with the predominant land type of the area. For instance in Alfalfa, Garfield, Jackson, and Tillman Counties where large percentages of the land are cropland, the percentage of native pasture (PNP) shows to be statistically significant in explaining per acre land values. In these counties, the results generally indicate less productive pasturelands have a negative influence on per acre land values. This is not the case for Blaine and Caddo Counties where a larger percentage of the land is pasture. In these counties, the results show that dry cropland (PDC) acreages have a positive influence on per acre values. For example, the Blaine County land value models show that a tract that is totally dry cropland (100 percent) is expected to sell for almost $300 more per acre than a similar tract with no cropland.

The results also show the percentage of generally less productive class three and four (in most cases cropland) land (PC 34) has a negative influence on Garfield County per acre values while as expected the percentage of irrigated cropland (PIC) has a significant positive influence on per acre land values in Caddo, Jackson, and Tillman Counties. The results indicate that a tract of irrigated cropland in Tillman County is expected to sell for $280 more per acre than a tract of dry cropland assuming all other factors remain the same.

Location and Economic Development. No one variable consistently explains the influence of location and economic development on county per acre land values. The ratio of population of the nearest town to the distance to the nearest town (RPDNT) best explains the influence of location and economic development on per acre land values in Alfalfa County whereas tract market potential (CMP1 and CMP2) best explains these influences in Garfield, Blaine, Caddo and Jackson Counties. Moreover, the distance to nearest town (DNT) is included in Jackson and Tillman County land value models.

The estimated influences of location and nonagricultural influences as estimated by tract market potential differ among counties. In Garfield County, the influence is estimated to have a far reaching impact on per acre land values. The relationship suggests that successive increases in tract market potential up to 15,000 result in smaller and smaller positive influences on per acre land values. For instance, the change in per acre value resulting from an increase in tract market potential from 10,000 to 11,000 is $25.20 while such an increase of this variable from 14,000 to 15,000 results in a per acre increase of $2.80. The results indicate a constant relationship between tract market potential and per acre values in Blaine County while the estimated relationship in Caddo and Jackson Counties show that successive increases in this variable lead to larger positive increases in per acre prices. In Caddo County, an increase in market potential from 250 to 300 causes the per acre price to increase $6.33 while an increase from 300 to 350 causes per acre price to increase by $7.48.

Generally the results show that tract market potential variables best explain the impact of location and economic development on per acre values in areas where these influences are expected to be the greatest. Generally economic activity and hence nonagricultural influences are expected to be greater in those counties which include the largest towns in the study area, for instance Enid in Garfield County and Altus in Jackson County. Tract market potential does not generally explain a large part of the variation in per acre values in Alfalfa and Tillman Counties where nonagricultural influences are expected to be less.

The estimated influence of location and nonagricultural activity in Alfalfa, Jackson, and Tillman Counties diminish for additional unit increases in the distance variables. For example in Alfalfa County, the estimated difference in per acre value of a tract located one mile and two miles from a town with population of 300 is estimated to be $18.50 while this same difference between a tract located two miles and three miles is $8.19.

Road Accessibility. The analysis in Table XIX indicates the distance to the nearest paved road (DPR) to have an impact on per acre land values in Alfalfa, Blaine, and Jackson Counties. In Blaine and Jackson Counties, the analysis indicates that as the distance to the nearest paved road increases, the size of the negative influence diminishes with successive increases in this variable. In Blaine County, the estimated difference in the per acre value of a tract located one mile and two miles from the nearest paved road is estimated to be $13.16 while this same per acre difference between a tract located two miles and three miles from the nearest paved road is $10.10. The Tillman County land value model indicates per acre values in that county are influenced by the type of road (TR) adjacent to the tract. For example, the per acre difference in value associated with graveled road versus a paved road is estimated to be $37.

Size of Tract. Tract size (SIZ) is estimated to have a negative impact on per acre values in each of the counties studied. Moreover in each of the counties, this negative influence is estimated to diminish as tract size increases. In Alfalfa County, the impact of tract size is estimated by SIZ and $SIZ^{.5}$. For example in this county, a 120 acre tract is expected to sell for $18.91 an acre less than an 80 acre tract and $54.87 an acre less than a 40 acre tract.

Mineral Rights. The analysis indicates the percentage of mineral rights conveyed (MR) to a buyer to have a positive influence on Blaine and Caddo County per acre land values. The positive relation is estimated to be constant in Caddo County while in Blaine County this relation is estimated to be curvilinear. For Blaine County the estimated positive increase in per acre land values associated with mineral influences is less for greater amounts of mineral rights conveyed. In this county, the estimated difference in the per acre value of a tract with 20 percent and 30 percent of the mineral rights conveyed is estimated to be $5.30 while the same per acre difference between a tract with 30 percent and 40 percent of the minerals is $4.47. For Caddo County each percentage point increase in mineral rights increases per acre land values in this county by $0.42.

Peanut Allotment. The number of acres of peanut allotment (PA) shows a positive influence on per acre values in Caddo County. The form of the variable indicates that successive increments in peanut allotment acreages lead to greater corresponding increases in tract per acre values.[5] A tract with 20 acres of peanut allotment is expected to sell for $20.10 more per acre than a tract with 10 acres of peanut allotment. Similarly the expected per acre difference between 20 and 30 acres of peanut allotment acres is estimated to be $33.50.

Alfalfa County Locational Variable. As mentioned earlier this variable (ALD) is included in the Alfalfa County model to measure per acre variation in price not fully explained by the other land value variables. The analysis indicates that land located in the northwest part of the county generally sells for $118 more per acre than similar land in other parts of the county. Attitudes of land buyers towards owning and managing land in this area may be one of the possible reasons for this relationship.

An Empirical Analysis of the Nonphysical Relations in County Agricultural Land Markets

Agricultural land buyer characteristics (nonphysical data) are incorporated into county land value models in this section. This causes the total number of observations to be reduced from 1310 to 519 land sales observations. Estimated county land value models estimated from this reduced sample (respondent sample) are presented in Table XX and Table XXI. Estimated Blaine and Jackson County land value models differ slightly from estimated models for these same counties in Table XIX.

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[5]The peanut allotment acreage coefficient in Table XIX appears to be low. Since most peanuts irrigated in this county, part of the per acre variation associated with this variable is possibly being explained by irrigated cropland variables in the model.

TABLE XX

AN ANALYSIS OF LAND BUYER CHARACTERISTICS IN ALFALFA, GARFIELD, AND BLAINE COUNTY AGRICULTURAL LAND MARKETS, OKLAHOMA[a]

Alfalfa Model (Model 7)		Garfield Model (Model 8)		Blaine Model (Model 9)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Constant	478.352	Constant	511.303	Constant	-203.943
TI^2	-0.073 (3.19)	$TI^{.5}$	93.839 (10.86)	$TI^{.5}$	74.428 (8.19)
$TI^{.5}$	129.664 (6.24)	CPI^2	0.009 (0.65)	PDC	2.947 (4.947)
CPI^2	0.029 (2.45)	$PNP^{.5}$	-27.371 (3.39)	CMP1	0.231 (5.82)
$PNP^{.5}$	-39.700 (4.97)	$PC34^{.5}$	-33.056 (3.68)	$DPR^{.5}$	-5.325 (0.20)
$RPDNT^{.5}$	0.123 (0.03)	CMP1	0.082 (2.15)	$MR^{.5}$	14.134 (3.18)
DRP	-16.133 (0.96)	$CMP1^2$	-0.000002 (0.69)	SIZ	0.524 (1.26)
SIZ	2.285 (1.53)	SIZ	3.067 (1.51)	$SIZ^{.5}$	-21.196 (1.43)

TABLE XX (Continued)

Alfalfa Model (Model 7)		Garfield Model (Model 8)		Blaine Model (Model 9)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
$SIZ^{.5}$	-67.149 (1.90)	$SIZ^{.5}$	-77.226 (1.61)		
ALD	137.555 (2.62)				
FTOFED	61.579 (1.04)	FTOFED	118.288 (2.21)	FTOFED	-47.787 (0.83)
PTFD	-91.807 (1.74)	PTFD	45.521 (1.06)	PTFD	-21.730 (0.53)
ACD1	68.143 (1.43)	ACD1	114.529 (2.60)		
ACD2	57.642 (1.09)	ACD2	-11.550 (0.23)		
ACD3	201.130 (2.75)	ACD3	56.625 (0.76)		
				ESTFOD	-3.825 (0.07)
				NAD	-127.385 (2.36)

TABLE XX (Continued)

Alfalfa Model (Model 7)		Garfield Model (Model 8)		Blaine Model (Model 9)	
Varible[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Standard Deviation	183.944		177.956		132.768
Number of Observations	106		104		67
R^2	78		77		79

[a]The numbers in parentheses are t-values for respective regression coefficients.

[b]TI = date of sale, CPI = county tract productivity index, PNP = native pasture percentage, PC34 = percentage of soil capability classes three and four, PDC = dry cropland percentage, RPDNT = ratio of population of nearest town to distance to nearest town, CMP1 = tract market potential, DPR = distance to nearest paved road, SIZ = size of tract, MR = percentage of mineral rights conveyed, ALD = Alfalfa County locational binary intercept variable, FTOFED = full time off farm employment binary variable, PTFD = part time farmer binary variable, ACD1 = acres owned prior to purchase binary variable (161-480 acres), ACD2 = acres owned prior to purchase binary variable (481-1000 acres), ACD3 = acres owned prior to purchase binary variable (greater than 1000 acres), ESTFOD = establish farming operation binary variable, NAD = nonagricultural binary variable.

TABLE XXI

AN ANALYSIS OF LAND BUYER CHARACTERISTICS IN CADDO, JACKSON, AND TILLMAN COUNTY AGRICULTURAL LAND MARKETS, OKLAHOMA[a]

Caddo Model (Model 10)		Jackson Model (Model 11)		Tillman Model (Model 12)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
Constant	122.333	Constant	521.603	Constant	183.484
$TI^{.5}$	47.500	TI	5.634	TI	6.792
	(7.25)		(5.23)		(7.99)
$CPI^{.5}$	6.512	CPI^{2}	0.004	CPI	2.638
	(0.38)		(0.55)		(1.85)
$PIC^{.5}$	33.599	$PNP^{.5}$	-15.658	$PNP^{.5}$	-20.735
	(4.16)		(2.04)		(3.07)
$RPDNPM^{2}$	0.000016	$DNT^{.5}$	-38.150	$DNT^{.5}$	-6.625
	(1.15)		(0.96)		(0.28)
$SIZ^{.5}$	-14.016	SIZ	1.138	TR	9.781
	(3.05)		(1.61)		(1.00)
$MR^{.5}$	0.592	$SIZ^{.5}$	-39.078	SIZ	0.752
	(0.17)		(1.82)		(0.83)
PDC^{2}	0.038	PIC^{2}	0.018	PIC^{2}	0.038
	(7.44)		(2.16)		(5.61)

TABLE XXI (Continued)

Caddo Model (Model 10)		Jackson Model (Model 11)		Tillman Model (Model 12)	
Variable[b]	Coefficient	Variable	Coefficient	Variable	Coefficient
$PA^{.5}$	15.873 (1.19)			$SIZ^{.5}$	-20.213 (0.72)
FTOFED	-113.777 (2.97)	FTOFED	-87.524 (1.15)	FTOFED	-53.617 (0.83)
PTF	-16.582 (0.49)	PTFD	-94.002 (1.58)	PTFO	-55.395 (1.46)
ESTFOD	-68.006 (2.25)	ESTFOD	23.340 (0.45)	ESTFOD	25.580 (0.78)
NAD	43.617 (0.90)	NAD	143.063 (1.97)	NAD	-1.379 (0.03)
Standard Deviation	138.213		119.753		117.636
Number of Observations	119		37		72
R^2	65		80		80

TABLE XXI (Continued)

[a]The numbers in parentheses are t-values for respective regression coefficients.

[b]TI = date of sale, CPI = county tract productivity index, PIC = irrigated cropland percentage, PDC = dry cropland percentage, PNP = native pastureland percentage, RPDNPM = ratio of population of nearest principal market, DNT = distance to nearest town, SIZ = size of tract, MR = percentage of mineral rights conveyed, PA = number of acres of peanut allotment transferred, TR = type of road adjacent to tract, FTOFED = full time off farm employment binary variible, PTFD = part time farmer binary variable, ESTFOD = establish farming operation binary variable, NAD = nonagricultural binary variable.

Distance to the nearest paved road and county market potential are not included in the Jackson County reduced sample model while tract quality is not included in the Blaine County reduced sample model.[6] Similarly an alternative set of physical variables is found to best explain per acre variation in prices in the Caddo County reduced sample.[7]

The impact of land buyers occupational status on county per acre land values is estimated and presented in Table XX and Table XXI. The impact of the number of acres owned by the land buyer prior to purchase is estimated in Alfalfa and Garfield County land value models while the influence of the land buyer's primary reason for purchasing land is tested in Blaine, Caddo, Jackson, and Tillman County land value models. Both the number of acres owned prior to purchase and the primary reason for purchase variables are generally included in the analysis to measure the possible impacts of farm enlargement and nonagricultural related pressures on county per acre land values. The number of acres owned prior to purchase of additional land is included in Alfalfa and Garfield County land value models because both preliminary county agricultural land market analysis and the analysis in the previous section indicate the influence of this variable to be greater in these counties than the primary reason for purchase variable. Similarly, the primary reason for the land purchase is included in Blaine, Caddo, Jackson, and Tillman

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[6]Low levels of statistical significance and wrong expected signs associated with a high degree of correlation between explanatory variables are reasons for not including these variables in the respective land value models.

[7]In all counties but Caddo County, the results of the Chow test indicate the respondent and nonrespondent samples to be drawn from the same respective land market structure at the 99 percent level of significance.

County land value models because analyses generally indicate this variable better explains the influence of farm enlargement and nonagricultural pressures on per acre land values in these counties. The results of testing these land buyer characteristics variables in county land value models are discussed below.

Occupational Status. The analysis in Table XX and Table XXI generally indicate differing impacts of occupational status on county per acre land values.[8] In Alfalfa and Garfield Counties, the results generally show land buyers employed full time off the farm (FTOFED) pay more per acre for land than other occupational statuses. This is not the case for the other counties. Blaine, Caddo, Jackson, and Tillman County results suggest that full time farmers pay more for land than both land buyers employed full time off the farm (FTOFED) and part time farmers (PTF).

In Garfield County, both nonfarmers (FTOFED) and part time farmers appear to pay more per acre for land than full time farmers. Nonfarmers generally pay $118 more per acre than full time farmers while part time farmers pay almost $46 more per acre than full time farmers. These estimates are statistically significant at the 3 and 29 percent levels, respectively. These results alone indicate nonagricultural influences associated with Enid and other towns in the area have impact in Garfield

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[8] County model intercept terms include the occupational status of full time farmers. Estimated coefficients for other occupational statuses in respective land value models represent differences between what full time farmers (intercept term) and other respective occupational statuses (included directly in models) pay per acre for land. Estimated coefficients for land buyers employed full time off the farm and part time farmer shift land value model intercepts. For example in Garfield County, a land buyer employed full time off the farm causes the model intercept term to shift upward by 118. This is interpreted to mean that land buyers employed full time off the farm in Garfield County pay $118 more for land than full time farmers in the county.

County agricultural land markets. More specifically economic activity in this area provide off farm employment opportunities which provide income support for part time farmers and nonfarmers in this county. This additional income support enables these land buyers to compete with full time farmers in the Garfield County agricultural land market.

The estimated Alfalfa County land value model suggests that land buyers employed full time off the farm generally pay $62 more per acre than full time farmers and $153 (61.579 + 91.807) more per acre than part time farmers. In addition full time farmers pay $92 more per acre than part time farmers. These results differ from Garfield County in that part time farmers in Alfalfa County pay less per acre for land. Fewer high income off farm employment opportunities in Alfalfa County are expected to be one of the reasons for this differing result.

As mentioned earlier, the results generally show full time farmers to be more dominant in Blaine, Caddo, Jackson, and Tillman Counties. Per acre estimated differences in what full time farmers pay for land over what nonfarmers pay for land range from $114 in Caddo County to $48 in Blaine County. The Caddo County estimate is statistically significant at the one percent level while the Blaine County estimate is significant at the 41 percent level.

The relative importance of part time farmers in county agricultural markets appear to differ. Garfield County part time farmers appear to pay more per acre for land than full time farmers whereas generally small coefficients and corresponding t-values for Blaine and Caddo County models indicate that part time farmers pay prices competitive with full time farmers in respective land markets.[9] Alfalfa, Jackson, and Tillman Counties show different results. These results generally indicate full time farmers to pay more for land than part time farmers.

Acres Owned Prior to Purchase. Alfalfa and Garfield County land value models in Table XX generally indicate the acres of land owned by land buyers prior to purchase to have an impact on county per acre land values.[10] In Alfalfa County, the results generally indicate land buyers owning 161 to 480 acres (ACD1) pay $68 more per acre for land than those land buyers who own from 0 to 160 acres prior to purchase. For this county, the other acreage categories (ACD2 and ACD3) indicate a continued positive effect on per acre land values.[11] The Garfield County results differ in that the influence of these latter two acreage categories (ACD2 and ACD3) do not appear to have a significant influence on per acre values.

One possible interpretation of these results is that expanding ownership patterns by both farmers and nonfarmers (FTOFED) put upward pressure on respective county per acre values. Nonfarmers invest in

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[9] A small t-value for the part time farmer coefficient in the Caddo County model indicates full time farmers and part time farmers essentially pay the same per acre price for land.

[10] The acreage category of 0 to 160 acres owned prior to purchase is included in the model intercept.

[11] ACD2 includes land buyers owning 481 to 1000 acres prior to purchase while ACD3 includes those land buyers owning more than 1000 acres prior to purchase.

land because of the attractiveness of land as an investment.[12] For farmers, in recent years general economic conditions provide incentives and in some cases require farmers to expand their existing farming operations. In addition, ownership of land by both farmers and nonfarmers is expected to provide financial support for purchasing additional land.

In contrast with Alfalfa County results, Garfield County expanding land ownership influences are limited to land buyers owning smaller acreages (161 to 480) prior to the purchase of additional land. One possible explanation for this result would be that nonfarmer land buyers, who might be expected to occur more frequently in Garfield County, would be expected to own fewer acres than a farmer land buyer thus lessening the impact on per acre values in the upper acreage ownership categories (ACD2 and ACD3). The case in Alfalfa County may be different in that a relatively larger number of full time farmers in this area generally owning large amounts of land continue to put upward pressure on per acre land values.

Primary Reason for Purchase. The results on Table XX and Table XXI indicate the impact of reasons for purchasing land on per acre values vary by county.[13] Relatively small coefficients and corresponding t-values indicate that land buyers establishing a farm essentially pay the same price for land as expanding farmers in Blaine, Jackson,

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[12]The general concensus of land as a sound investment and recent favorable land appreciation rates are only two of the many reasons for the attractiveness of land as an investment. Another reason could be possible tax advantages associated with investment in land over other investments.

[13]Influences associated with land buyers purchasing land to expand farming operations enter the analysis through model intercepts.

and Tillman Counties. However, the results in Caddo County suggests Caddo County part time farmers generally pay $68 less than full time farmers.

The influence of nonagricultural reasons for purchase show opposite results in Blaine and Jackson Counties. In Blaine County, the results indicate expanding farmers generally pay $127 more per acre than land bought for nonagricultural purposes. The Jackson County results indicate land buyers buying land for nonagricultural purposes pay $143 more per acre than those buying land to expand existing farming operations. Caddo and Tillman County results show that both expanding farmers and nonfarmers essentially pay the same per acre price for land.

Applications of Estimated County Equations

There are generally two types of estimates that may be directly obtained from estimated county land value models (35). In the first instance, the total value of a tract of land may be estimated by substituting characteristics which accurately describe a tract of land into an appropriately estimated land value model. In the second instance, changes in a particular characteristic of a tract may be used to estimate associated changes in per acre values of a tract. For instance, what is the per acre value difference associated with a 40 acre tract versus an 80 acre tract.

These two uses are explained by way of an illustration. A hypothetical farm is described as follows:

> Hypothetical Farm: Located in Blaine County; Date of Valuation equals 78 (June 30, 1978); Blaine County tract productivity index equals 70; 75 percent cropland; county market potential equals 1000; located one mile from nearest paved road; 50 percent of mineral rights are conveyed; and size of tract is 160 acres.

Estimated Tract Value

Since the farm is located in Blaine County, Model 3 is used to estimate its per acre and total value. These values are computed below:

$$PRA = 4.659 + 62.754TI^{.5} + 1.902CPI + 2.96PDC + 0.128CMP1$$
$$- 31.779DPR^{.5} + 5.271MR^{.5} + 0.884SIZ - 35.384SIZ^{.5}$$

$$TI^{.5} = (78.0)^{.5} = 8.83$$

$$CPI = 70$$

$$PDC = 75$$

$$CMP1 = 1000$$

$$DPR^{.5} = (1)^{.5} = 1$$

$$MR^{.5} = (50)^{.5} = 7.07$$

$$SIZ^{.5} = (160)^{.5} = 12.65$$

$$PRA = 4.659 + 62.754(8.83) + 1.902(70) + 2.969(75) + 0.128(1000)$$
$$0\ 31.779(1) + 5.271(7.07) + 0.884(160) - 35.384(12.65)$$

PRA = Price Per Acre = $741.91

Total Estimated Value of the Tract = $118,705.60.

Estimated Impact of Tract Size on Per Acre Values

The impact of tract size on Blaine County per acre land values are estimated and presented below. Appropriate estimates are obtained by using the estimated Blaine County model size coefficients ($SIZ - SIZ^{.5}$) while holding all other variables constant.

40 acres	--
60 acres	-32.61
80 acres	-24.72
100 acres	-19.68
120 acres	-16.09
140 acres	-13.38

160 acres	-11.23
180 acres	-9.47
200 acres	-8.00
220 acres	-6.47
240 acres	-5.66

The above analysis shows tract size to have a negative influence on Blaine County per acre values. Moreover, the results indicate each additional one acre increase in size to have a smaller and smaller negative effect on per acre price as the total size of the tract increases. For example tract size increases from 40 to 60 acres, per acre price in Blaine County is expected to decline by $32.61.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The general objective of this study was to examine the important factors that cause inter-tract variations in per acre price in the Western Oklahoma agricultural land market with specific emphasis being placed on examining the factors that cause spatial variations in agricultural land market activity for selected counties. Other specific objectives were to analyze land market trends and characteristics of land market buyers. The general objective was accomplished through the estimation of agricultural land value models. In these models, both physical and nonphysical (land buyer characteristic) factors associated with inter-tract price variations were identified and quantified. Other specific objectives were accomplished through computing and analyzing yearly average land values (all land, cropland, and pastureland) for selected areas and counties in the Western Oklahoma agricultural land market. Moreover, distributions of various land buyer characteristics were estimated and analyzed for these areas.

Data Collection and Estimation Procedures

The primary sample for the study consisted of 1310 bona fide agricultural land market sales which occurred during the period January 1972 through June of 1978 for three selected areas in Western Oklahoma. These areas were (1) North Central Oklahoma represented by Alfalfa and

Garfield Counties, (2) West Central Oklahoma represented by Blaine and Caddo Counties, and (3) Southwest Oklahoma represented by Jackson and Tillman Counties. The primary sample size for counties range from a high of 303 observations in Caddo County to a low of 127 observations in Jackson County. The primary sample consisted of 195,090 total acres representing approximately five percent of the acreage in the six county area.

The reduced sample consisted of 519 bona fide agricultural land market sales from the primary data set for which nonphysical data were available. Nonrespondents to a Western Oklahoma land market questionnaire caused the primary sample to be reduced to 519 observations. The reduced sample size for counties ranged from a high of 110 observations (response rate of 50 percent) in Alfalfa County to a low of 38 observations (response rate of 33 percent) in Jackson County.

Agricultural land value models were used to estimate the relationship and relative influence of important physical and nonphysical land market determinants on per acre values. These models for both the primary and reduced samples were estimated for counties, areas, and the entire study area. Multiple regression techniques were used for estimating the models. Generally three criteria were used for selecting variables to be included in respective agricultural land value models. These are: (1) the economic reasoning for including a variable in a model, (2) the amount of variation explained by including a variable in a model, and (3) the statistical significance of the equation and explanatory variables included in the model.

Both relevant theory and previous agricultural land market research were used for selecting important factors to be used as independent variables in land value models. These factors included not only physical characteristics of a tract but nonphysical characteristics. Hypothesized tract physical characteristics for which data were collected included time of sale, size of tract, percentage of mineral rights conveyed, number of acres of peanut allotment transferred, and type of road adjacent to tract. In addition, several alternative variables were included in the analysis to measure the impacts of economic development, location, and tract quality on per acre values. Nonphysical variables not only were used as independent variables in land value estimation but also were used for measuring attitudes and personal characteristics of land buyers in agricultural land markets. Examples of nonphysical variables used in the analysis include land buyers occupational status, the type of farming operation, primary reason for purchasing land, and amount of land owned prior to purchasing additional land.

Average Yearly Per Acre Agricultural Land Values

The agricultural land market in Western Oklahoma was characterized by a general upward trend with large price increases between 1972 and 1975. Average per acre land values increased from $318 in 1972 to $566 in 1975. This represented a 78 percent increase. Generally favorable farm prices were likely to be the most important reason for these large price increases. For instance in the years studied, 1974 represents the year in which annual increases in per acre land values were greatest and this same year represented the year in which average wheat prices were the greatest. Favorable farm price were expected to increase farm incomes and hence bidding potential for agricultural land. They were also expected to increase the level of optimism for land buyers in agricultural land markets.

The period 1974 through June 1978 showed more modest per acre land value increases. During this period, the average per acre values increased only 20 percent. Uncertainty associated with lower small grain prices, increasing farm input costs, and in some instances unfavorable weather conditions were only some of the reasons for smaller price increases during the later years of the study.

Average per acre land values for irrigated cropland, dry cropland and pastureland also showed large price increases. Irrigated cropland per acre values ranged from $697 in 1973 to $1111 in the first six months of 1978. Dry cropland per acre average values ranged from $399 in 1972 to $826 in 1978 while for these same years average pastureland values ranged from $179 to $449 per acre.

Dry cropland prices showed interesting trends. Dryland prices increased 106 percent between 1972 and 1975, however later years showed small price increases and even price declines. Average tract productivity for cropland was one percent higher in 1978 than in the previous year, yet cropland values were seven percent less. Relatively low small grain prices coupled with increasing production costs were two of the important reasons for this depressed land market activity.

Large yearly per acre price differences were found to exist between North Central, West Central, and Southeast Oklahoma areas. In 1978, average per acre land values in north central areas were 78 percent greater than those in west central areas and almost 47 percent greater than those of southwest areas. The results indicated that at least part of these price differences resulted because of variations in average tract quality between areas. Average tract productivity in north central areas was found to be greater than average tract productivity in west central and southwest areas. However the average percentage of cropland in land transfers appeared to be greatest in the southwest area. At the same time, tract average cropland acreages in west central areas were quite low when compared to other areas.

County average per acre yearly prices were represented by large price increases for the six and one half year period. Average per acre land price increases from 1972-1978 ranged from 173 percent in Tillman County to 79 percent in Jackson County. More modest price increases and even price declines were shown for more recent time periods (1975-1978). Price instability was shown for Alfalfa, Blaine, Caddo, and Jackson Counties for the most recent time period, the first six months of 1978. For instance in Alfalfa County, average per acre price declined six percent over the previous year even though the average productivity of land sold in 1978 was almost six percent more than average productivity of land sold in 1977.

Characteristics of Agricultural Land Market Buyers

The results generally indicated that most of the agricultural land was bought for agricultural related purposes. The majority of the land buyers (83 percent) were either full time or part time farmers. The type of farming operation in the large majority was the family farm while 85 percent of the land purchasers bought agricultural land for either establishing a farm or expanding existing ones. Moreover, only 17 percent of the land buyers indicated the purchase of the land required additional machinery investment.

Several land buyer characteristics reflected positive attitudes and hence indications of possible strengths in future land market activity. Ninety-four percent of the respondents indicated their satisfaction with the land purchase and almost 67 percent of the land buyers indicated plans to purchase additional land in the future. In addition, the majority of the buyers were middle aged, well educated and in the upper income levels.

The results also indicated variations in land buyer characteristics by occupational status. Full time farmer land buyers primarily bought land for establishing a farm or to enlarge their existing farming operations whereas land buyers employed full time off the farm more frequently bought land for establishing a farm, investment, nonagricultural development, and recreation or second homesite development. The results also indicated that full time farmers owned more land, purchased less machinery with land acquisitions, had fewer nonfarm investments, and were less formally educated than part time farmers and land buyers employed full time off the farm. Similarly, land buyers employed full time off the farm tended to be slightly weighted towards the upper age and income levels.

For the most part, the results did not indicate a large difference in land buyer characteristic distributions among areas. The age distribution for the north central area tended to be distributed more toward the older age groups than other areas. In addition, the annual taxable income distribution for the north central area tended to be more evenly distributed while distributions for west central and southwest areas appeared to be slightly distributed toward the middle income levels.

Estimated Influence of Physical Agricultural Land Market Determinants

Physical tract characteristics were used to model county, area, and study area agricultural land markets. The results indicated that several tract physical characteristics have impacts on per acre agricultural land values. The impact of time, tract quality, economic development, percentage of mineral rights conveyed, the number of peanut allotment acres transferred had significant positive influences on per acre land values. The size of tract, distance to nearest paved road, the percentage of pastureland in the tract and location were found to have a negative influence on per acre land values.

The estimated impact of the physical land market determinants was found to differ among areas. The estimated change in the positive influence of time on per acre values decreased for increasing units of time for all areas. However, this decrease occurred at a more rapid rate in the north central area than other areas.

The impact of tract quality on per acre values was shown to change during the study period for each of the areas. In the north central area, the impact of tract quality on per acre values was greatest during the period March 1974 to May 1976 but then declined in the most recent period (May 1976 - June 1978). In both west central and southwest areas, the impact of tract quality on per acre land values continued to increase with time.

The impact of tract size on per acre land values was greatest in north central areas for small sized tracts whereas this impact was relatively greater for larger tracts in west central and southwest areas. The large differences in value associated with small sized tracts in north central areas may result for several reasons. In the first instance, increasing tract sizes coupled with already high land values in this area cause the total purchase price to rapidly increase. This result would be expected to limit the financing opportunities available to many potential land buyers and thus decrease competition in the north central agricultural land market as the size of tract increases. In the second instance, competition in the agricultural land market is increased by a large number of people employed in Enid and nearby areas who actively compete for the more affordable small sized tracts.

The combined impact of location and economic development was greatest in the west central area. This probably results from the proximity of the west central area to Oklahoma City.

At least two tract quality variables were needed in county land value analyses to accurately measure the impact of tract income producing ability on per acre values. The general tract productivity index was highly significant in explaining per acre land price variation in each of the counties while the other tract quality variable depended on the predominant land type of the county. In Alfalfa, Garfield, Jackson and Tillman Counties where large percentages of the land are cropland, the percentage of native pasture was found to have a negative influence on per acre values. Conversely in Blaine and Caddo Counties where a larger percentage of the land is pasture, it was found that cropland percentages had a positive influence on per acre values.

Generally less productive class three and four land was shown to have a negative influence on Garfield County per acre values. As expected in Caddo, Jackson, and Tillman Counties, the percentage of irrigated cropland was shown to have a large impact on per acre values in these counties.

No one variable consistently explained the influence of location and economic development on county per acre land values. The combined location and economic development influences on per acre land values were most accurately measured by market potential variables in Garfield, Blaine, Caddo, and Jackson Counties. The ratio of population of the nearest town to the distance to the nearest town best explained these relationships with per acre price in Alfalfa County whereas the distance to the nearest town was shown to have a negative influence on per acre values in Jackson and Tillman Counties.

Other variables that were found to have an impact on county per acre land values were road accessibility, size of tract, percentage of mineral rights conveyed, and the number of acres of peanut allotment transferred. The distance to the nearest paved road was found to have a negative influence on Alfalfa, Blaine, and Jackson County per acre land values while Tillman County better types of roads located adjacent to the first tract was found to have a positive influence on per acre values. Tract size was consistently found to have a negative influence on per acre values in all counties. Both the percentage of mineral rights conveyed and the number of acres of peanut allotment had a positive influence on Caddo County per acre land values. Similarly, the percentage of mineral rights conveyed was found to have significant positive impacts on land values in Blaine County.

Estimated Influence of Nonphysical Agricultural Land Market Determinants

Land buyer characteristics were found to have significant impacts on the per acre value paid for land in the six county study area. Nonphysical variables included in this analysis were occupational status of the land buyer, primary reason for purchasing land, whether land buyer rented the subject property prior to purchase, and land buyer income levels. The analysis generally showed full time farmers to have a large impact on per acre land values. These buyers generally paid more per acre for land than part time farmers and land buyers employed full time off the farm. The primary reason for purchase variable indicated that land buyers purchasing land for expanding farm operations and nonagricultural related reasons essentially paid the same price for agricultural land while those land buyers who bought land to establish a farm generally paid less per acre than the before mentioned land buyers. As expected, income of the land buyer was shown to have a positive influence on per acre values whereas a negative influence on per acre price was found for land buyers who rented the subject property prior to purchase. This negative relation could have resulted because those land buyers who rented the property prior to purchase were better acquainted with the sellers of land and had a longer time to negotiate a more favorable selling price. It could also possible mean that land sellers have a preference for selling land to existing farm managers.

Nonphysical land market determinants included in area land value model estimation were occupational status of the land buyers, the primary reason for the land purchase, the number of acres owned prior to the purchase, and income levels of land buyers. The occupational status of the land buyer was shown to have a strong influence on area per acre land values, however this influence was shown to vary between areas. Land buyers employed full time off the farm were generally found to pay more for land in north central areas than part time and full time farmers. In west central areas, both full time and part time farmers paid more per acre for land than those land buyers employed full time off the farm whereas in southwestern areas both nonfarmers (land buyers employed full time off the farm) and part time farmers paid less for land than full time farmers.

With the exception of land buyers establishing a farm in west central areas, the primary reason for purchase was not found to have a significant impact on per acre land values. For the west central area those land buyers getting established in farming generally paid less for land than those land buyers purchasing land for farm enlargement and other nonagricultural related purposes.

The number of acres owned prior to purchase of additional land was found to have a significant impact on north central per acre land values whereas this was not the case for the other areas. This result may be interpreted to mean that expanding land ownership patterns in the north central areas by both farmers and nonfarmers (land buyers employed full time off the farm) put upward pressure on per acre values. This indicated that nonfarmers invest in land because of the attractiveness of land as an investment, while general economic incentives have encouraged farmers to enlarge farming operations. Similarly, the general ownership of land by land buyers provided financial support for additional land purchases.

The number of acres of land owned prior to purchase was not found to have a significant explainable impact on per acre values in west central and southwest areas. One possible explanation of this result may be because of the type of farming operations in these areas.

Farming operations in west central areas were more diversified than those in north central areas. Different climatic conditions along with irrigation potentials make it possible for southwest and west central areas to diversify in a greater range of crops and intensify their farming operations therefore lessening the need for expansion of acreages for increasing farm returns.

Income levels of land buyers were found to have an impact on per acre land values in west central and southwest areas. For these areas larger income levels were associated with higher per acre prices paid for land. Ignoring nonagricultural impacts on area land markets, this result is consistent with the expected relationship of more efficient farmers being able to pay more per acre for land through their higher income levels. No significant relationship was shown between land buyer income levels and per acre price of land for north central areas.

In general, the nonphysical land market determinants indicated reasons for the spatial variation in agricultural land values. The influence of land buyers employed full time off the farm coupled with the influence of the number of acres owned prior to the land purchase by all land buyers indicated that nonagricultural influences have important impacts in the north central area. Different influences were generally indicated for the west central and southwest areas. In these areas, the full time farmer was shown to be the dominant land buyer. In addition, nonagricultural related reasons for purchase and the number of acres owned prior to purchase were shown for the most part not to have a significant impact on per acre land values while land buyer's income was found to have a consistent positive relation with per acre land values. These results indicate that the land values in the west central and southwest areas are more related to farm income producing ability while land values in the north central area are influenced more by nonagricultural related activity.

The estimated impact of occupational status and expanding land ownership patterns were tested in county agricultural land market models. These impacts were found to be similar to those findings for respective area agricultural land market analysis.

Conclusions

Evidence in the study suggests that general trends in spatial agricultural land markets were influenced by many important factors including general economic trends, income earning capacities of farmland, and nonagricultural economic development considerations. Generally favorable income earnings from farmland through relatively high prices along with other important factors generally led to rapidly increasing farmland prices during the years 1972-1975 for all areas studied. However, in more recent years (1975-1978) farm returns were generally less favorable through relatively lower farm commodity prices and increasing farm production costs. During this period, agricultural and market trends differed between areas. In more diversified farming areas, farmland prices appeared to be more stable and even increasing at modest rates while less diversified areas indicated small price increases and even price declines. Similarly during this period, areas experiencing nonagricultural development influences were characterized by stable and increasing price levels while areas where these influences were of a lesser degree experienced small price increases and even price declines. These important factors will generally be expected to continue to have impacts in future agricultural land markets. Moreover, spatial variations in future agricultural land market activity will largely depend on the variations of these important factors among area markets.

The spatial analysis of the agricultural land market indicated soil productivity (income producing capacity) and nonagricultural influences caused spatial variations in per acre land prices. In addition, the evidence in the study suggested these factors along with general economic trends, economic development considerations, expanding land ownership patterns, and land buyer's personal motives, expectations, and attitudes will have important impacts on future land market activity. Inflation, net rent increases, and advancing levels of technology as measured by the date of sale variable were shown to have important positive impacts on per acre land values. Agricultural land buyer's expectations with respect to changes in these variables will be expected to have important influence on future agricultural land values. Increasing expected rates of inflations will cause nonfarmers to bid in agricultural land markets for land as a hedge against inflation. Similarly expected net rent increases through increasing levels of technology or expected product price increases will encourage farmers to more actively bid for agricultural land.

The attitudes and personal characteristics of agricultural land buyers are expected to have important impacts on future agricultural land markets. Several of these variables in the analysis give possible indications of strengths in future agricultural land markets. A large number of the land buyers indicated their satisfaction with land purchases and also a large proportion of these buyers indicated their preference for purchasing additional agricultural land. In addition, a large number of these land buyers indicated their preference for investing in agricultural land over other nonagricultural investments. The majority of these land buyers were well educated and in the upper income levels. Continued positive attitudes toward purchase and ownership of agricultural land along with high levels of education and income will be expected to put upward pressure on agricultural land values.

Agricultural land market activitiy in the analysis was shown to be primarily characterized by expanding land ownership patterns. Over 60 percent of the land buyers indicated their primary reason for purchase was to expand farming operations. Future expansion pressures on agricultural land markets will be determined by many related factors including general economic trends, the rate of technological development and adoption, and availability of credit for financing land. Increasing levels of these factors will continue to put upward pressure on agricultural land values while a decline in the level of one or more of these factors might lead to depressed land market activity.

As mentioned above, the availability of adequate credit is expected to have important impacts on future agricultural land values. Current age levels of land buyers in the analysis suggest that a large amount of land will change ownership in the next one to two decades. Adequate credit availability for financing this land would be expected to increase land buyer bidding potentials and hence increase land value market levels whereas a scarcity of available credit for financing land purchases would be expected to lead to depressed land market activity.

Both physical and nonphysical variables in the analysis indicated nonagricultural influences to have positive impacts on agricultural land markets. General economic development in an area affects the agricultural land market in many ways. Land requirements associated with rural residences, urban, recreation, commercial, and industrial development put upward pressure on agricultural land values through changes in demand and supply of available land. In addition, higher income levels (affluence) associated with economic development of an area increase the number of nonagricultural investors bidding for agricultural land. Nonagricultural influences associated with economic development are expected to continue to have positive impacts on agricultural land markets.

Both tract size and the percentage of mineral rights conveyed to land buyers are expected to become more increasingly important in agricultural land valuation. Upward trending land markets require larger capital outlays for land purchases. For a given size of tract these larger capital requirements probably will result in a reduction in the number of potential land buyers who are able to bid for the tracts. Recent mineral shortages along with increased efforts to find and develop minerals are expected to put upward pressure on agricultural land markets through mineral right conveyances.

Evidence of the analysis indicates that agricultural land values are strongly tied to the income producing capacity of the tract. A strong world and domestic demand for food and fiber is expected to have significant positive impacts on agricultural land values. These impacts are likely to be more dramatic in areas of highly productive cropland and especially important in primarily agricultural areas where economic development is of a lesser degree.

Limitations of the Study and Need for Further Research

Further agricultural land market research might include several modifications. In this study tract sales prices were obtained from revenue stamps attached to instruments of conveyance and Federal Land Bank records. At least two advantages are associated with data obtained from Federal Land Bank sources. In the first instance, less time is required in collecting land transfer data. In the second instance, Federal Land Bank data consist of verified land sales and generally a greater degree of confidence may be placed on estimated land value results obtained from these data.

The nonphysical data incorporated in the study provided a more complete analysis of agricultural land market characteristics. However, a greater number of observations for which these data are available are needed as well as more refined land buyer characteristic data. Both more data and better refined data should provide more complete insights into the psychological aspects of agricultural land market activity. For instance, how do land buyer expectations affect land market activity? In addition, how do land buyer characteristics influence agricultural land market activity through time? Generally improved procedures for increasing questionnaire response rates along with a more refined land market questionnaire would provide data for more complete land market analysis.

Variables measuring the combined influence of locational and economic development impacts on land values proved to be more accurate measures of these influences than more traditional measures. However, more research is needed concerning the accuracy of these variables in other agricultural land markets.

In this study several factors were shown to consistently influence agricultural per acre land values. In addition, there was some evidence that the relative impacts of these variables changed through time. Future research should include a complete investigation of the stability of the factors that explain variation in prices among tracts of land.

Several land value models were used in the analysis to explain variations in per acre land values. These models may be used to estimate per acre land values, however, they are limited to the specific area and time period for which they are estimated. If the factors which influence per acre land values in an area remain stable for future time periods then land value models from this analysis may be used to obtain reasonable land value estimates. In any event, appropriate judgment would be required for using the results from an estimated land value model. Future research should include an investigation of techniques for incorporating projection potentials into agricultural land value models.

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APPENDIXES

APPENDIX A

PROCEDURE FOR COLLECTING AND COMPUTING TRACT PHYSICAL LAND MARKET VARIABLES

Physical variables describing each sale tract were collected in two related steps. The first step essentially involved the collection of primary land sales data from County Courthouse offices, Federal Land Bank offices, published county soil survey maps, and highway maps published by the Oklahoma Department of Highways. The second step of the process included computation of additional physical variables to be used in land market analyses. These two steps are described in the following sections.

Collection of Primary Agricultural Land Sales Data

The agricultural land sales data sheet was developed and used to collect primary physical characteristics of a tract. The agricultural sales data sheet is given in Figure 9.

The initial phase in the primary data collection process included collecting bona fide land sales from County Clerk and Federal Land Bank offices. Only land sales meeting the following criteria were included in the study.

1. Twenty acres or more in size.
2. Located outside the corporate limits of a city or town.

County ____________ Deed Book ____________ Page No. ____________ Sale No. ____________

Year of Sale ______________ Month of Sale ________________ No. ____________

Legal Description ______________________ Township ________ Range ____________

Grantor __________________________ Address ______________________________

Grantee __________________________ Address ______________________________

Sale Price ________________________ Revenue Stamps __________________________

Computed Sale Price ________________ Terms/Consideration ____________________

____

Assessed Values: Total __________ Improvements ______________ Land __________

Percent of Minerals Rights Transferred ______________________________________

Allotment acreage: Peanut __________________________ Cotton ________________

Size of Tract (acres) ______________________

Land Type	Acres	Percent	Soil Type	Number of Acres
Irrigated Crop				
Dry Crop				
Improved Pasture				
Native Pasture				
Woodland				
Farmstead				
Waste				
Other				

Land Type	County Index	Area Index	Western Index
Irrigated Crop			
Dry Crop			
Improved Pasture			
Native Pasture			
Woodland			

Figure 9. Agricultural Land Sales Data Sheet

Location: North ______________ East __________.

Number of Sales During Sale Month ________________________

Index of Prices Received by Farmers ______________________

Distance to paved road __________ mi. Distance to nearest town ______________mi.

Distance to nearest principal market and service center (county seat of population 5000)

__________________mi.

Distance to nearest city (pop. of 250,000) _______________mi.

Population of nearest town ____________________. Population of nearest principal

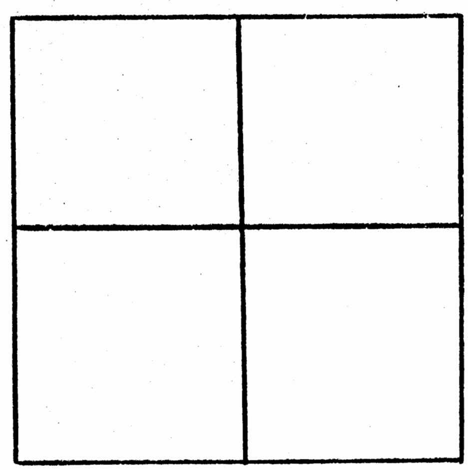
market and service center _____________________.

Interaction __________________ __________________ __________________

Market Potential Index __________ __________________ __________________

Type of road adjacent to property, check one:

_____A



0. ______ No Road
1. ______ Primitive Road
2. ______ Graded and Drained
3. ______ Natural Surface
4. ______ Gravel
5. ______ Low Paved
6. ______ High Paved

____

__________________________________ __________________________________

__________________________________ __________________________________

__________________________________ __________________________________

__________________________________ __________________________________

Figure 9. (Continued)

3. Primarily agricultural in the highest and best use.

4. Bona fide or arms length transactions (sales of partial ownership, changes in the form of ownership, and intra-family transfers were not included in the analysis).

In the case of courthouse records, detailed information on the instrument of conveyance (Warranty Deed, Sheriff's Deed, or Executor's Deed) was used to establish the validity of the sale. Generally, sales with the assumption of an existing mortgage or similar circumstances were not included in the analysis.

When a bona fide land sale was located, pertinent information concerning the land transfer was recorded on the land sales data sheet. This information was: (1) county of the sale, (2) deed book number, (3) deed book page number, (4) year and month of the sale, (5) grantee's name, (6) grantee's address when available, (7) dollar amount of revenue stamps, (8) selling price when available, (9) percentage of mineral rights conveyed, (10) size of tract in acres, and (11) any other pertinent terms or considerations concerning the land sale.

Assessed values for both land and improvements were recorded from County Assessor's offices for the year in which the sale took place. When these data were not available, appropriate information were obtained from the offices to adjust the assessed values to the appropriate year of the sale. Other pertinent information were collected from County Assessor's offices. In addition to maintaining assessed value records, some County Assessor's offices were found to maintain files for land tracts concerning land type acreages (cropland, pastureland, and wooded pastureland) and soil type acreages. In many instances, the County Assessor's offices maintained current address files for current land owners. This information (when available) was appropriately recorded on the agricultural land sales coding sheet for each sale tract.

Other county offices were also found to provide valuable information. Land owner's address files in County Treasurer's offices were used to collect the grantee's address when this information was not available in the County Assessor's office. Similarly, when land type information was not available in County Assessor's offices, this information was collected from aerial maps and files provided in County Agricultural Stabilization and Conservation Service (ASCS) offices. In addition, relevant allotment data for each tract were obtained from files in these offices.

In many cases, public information concerning land sales were collected through Federal Land Bank offices.[1] Federal Land Bank offices were found to maintain files of comparable sales which are used for appraisal purposes. These files consist of verified land sales and highly descriptive information concerning the physical characteristics of each land sale. With the exception of assessed values and land buyer's address, these files generally provided the essential tract characteristics discussed above. County Assessor's and County Treasurer's offices were used to collect essential information not provided through Federal Land Bank offices.

The number of acres of each soil type in the sale tract were estimated from soil survey aerial maps from published County Soil Surveys (11, 12, 13, 14, 15, and 16). There are several methods available for

[1]Land sales information for Blaine, Caddo, Jackson and Tillman Counties were at least partially collected through Federal Land Bank offices.

measuring land type acreages from aerial maps, however the preferred method and the method used in this study was the dot grid method (36). The dot grid method measurement method uses a transparent overlay with dots systematically arranged on a grid pattern. The overlay is placed over the soil map and the number of dots tallied for each soil type lying within the boundaries of the sample tract being evaluated. These dots are then used to compute each soil type acreage. The number of dots for a given soil type divided by the total number of dots in the sale tract equals the proportional acreage occupied by the soil type. For all soil types on the tract, both the soil type designation and the estimated number of acres of each soil type were appropriately entered on the agricultural land sales coding sheet.

County General Highway maps were used to determine both road type information and the location of the tract in the study area (17). Both the distance to the nearest paved road and the type of road adjacent to the tract were determined from county maps and recorded on the coding sheet. Distance to nearest paved road is measured in miles. If the tract was bordered on two sides by different types of roads, then the better road type was recorded.

Both the county maps and a grid system were used to determine the location of the tract in the Western Oklahoma study area. The grid system consisted of a system of north-south and east-west intersecting lines on county general highway maps. These lines were represented by section lines located one mile apart. Both the east-west and the north-south section lines were each appropriately assigned consecutive numbers. The location of a tract in the study area was then identified by the point of intersection of north-south and east-west coordinates. These coordinates were then recorded on the agricultural land sale coding sheet.

These data were collected for each of the 1310 agricultural land sales in the study area. Moreover, these data were used to compute additional tract physical variables including variables which measure tract quality, tract location, and economic development. These variables along with their computational methods are described in the next section.

Land Market Variable Computation Algorithm

Several primary tract physical variables discussed in the previous section were used directly in the analysis. These variables included: (1) percentage of mineral rights conveyed, (2) peanut allotment acres, (3) type of road adjacent to tract, (4) distance to nearest paved road, and (5) size of tract. The other physical variables and the algorithms used for computing these variables are discussed below.

Price Per Acre

Price per acre was recorded as the total selling price of the tract minus the total value of improvements divided by the tract size. The total value of improvements was computed by multiplying the assessed value of the tract improvements times the inverse of the county's assessment ratio which was obtained from the Oklahoma State Ad Valorem Tax Division.[2] For example, assume a 160 acre tract of land sold in Alfalfa

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[2]Inverse of county's assessment ratios used in this study were: (1) Alfalfa = 9.13, (2) Garfield = 10.41, (3) Blaine = 10.25, (4) Caddo = 10.12, (5) Jackson = 11.12, and (6) Tillman = 10.10.

County for $150,000. Moreover, assume the total assessed value of improvements was $1000 and the inverse of the county assessment ratio was 9.13. The total value of the improvements was then computed to be $9,130 ($1000 x 9.13). The per acre value of land for this tract was computed to be $880.44 ($150,000 - $9,130/160).

Date of Sale

The time variable was measured according to the month of the sale and its value ranges from 1 to 78. For instance, a sale occurring in the first month of the study time period, January 1972, was assigned a 1 while a sale for December 1972 was assigned a 12. The last month of the study period (June, 1978) was assigned the value 78.

Tract Quality Variable

Land Type Percentages. Land types for which percentages were computed include: (1) irrigated cropland, (2) dry cropland, (3) improved pasture, (4) native pasture, and (5) wooded land. Land type percentages were computed by expressing each land type acreage as a percentage of tract size. For example, the percentage of dry cropland for a 160 acre tract containing 80 acres of cropland was estimated to be 50 percent (80/160 x 100).

Soil Capability Class Percentages. Two soil capabilities class variables were computed for the analysis. The first variable represented the percentage of the tract in soil classes I and II while the second variable measured the percentage of the tract in soil classes III and IV. Soil capability classes for all soils in the study area are shown in Table XXII. In this table, Reinach Loam was the most productive soil in

TABLE XXII

WESTERN OKLAHOMA STUDY AREA SOILS, SOIL CAPABILITY CLASSES, AND PRODUCTIVITY INDEXES

Identification Number	Soil Name	Soil Symbol	County[a] Code	Productivity Index[b]	Capability Class
1	REINACH LOAM	RC	2	83	1
2	POND CREEK SILT LOAM	PCA	2	79	1
3	PORT CLAY LOAM	PO	2	79	2
4	PORT SILT LOAM 0-1	PRA	2	79	2
5	DALE SILT LOAM 0-1	DAA	1	79	1
6	MCCLAIN SILT LOAM	MC	1	79	1
7	PORT SILT LOAM	PR	1	79	2
8	REINACH VERY FINE SANDY LOAM	RA	1	79	1
9	DALE SILT LOAM	DA	3	79	1
10	MCCLAIN SILTY CLAY LOAM	MC	3	79	1
11	PORT CLAY LOAM	PC	3	79	2
12	PORT LOAM	PO	3	79	2
13	REINACH VERY FIN SANDY LOAM	RA	3	79	1
14	REINACH SILT LOAM 0-1	RHA	4	79	1
15	MCLAIN SILTY CLAY LOAM	MC	4	79	1
16	BETHANY SILT LOAM 0-1	BEA	2	78	1
17	GRANT SILT LOAM 0-1	GAA	2	76	1
18	SHELLABARGER FINE SANDY LOAM 0-1	SHA	2	76	2
19	VANOSS LOAM 0-1	VAA	3	75	1
20	PORT SILT LOAM	PO	4	75	1
21	BREWER SILT LOAM	BR	1	74	1
22	POND CREEK SILT LOAM 0-1	PCA	1	74	1
23	NORGE LOAM 0-1	NOA	3	74	1
24	BETHANY SILT LOAM 0-1	BEA	3	74	1
25	POND CREEK SILT LOAM 0-1	PKA	4	74	1
26	PORT SILTY CLAY LOAM	PO	6	74	2

TABLE XXII (Continued)

27	PORT CLAY LOAM	PO	5	74	1
28	SPUR CLAY LOAM	SC	5	74	1
29	REINACH SILT LOAM 0-1	REA	4	74	1
30	CRISFIELD FINE SANDY LOAM	CR	1	72	1
31	CANADIAN FINE SANDY LOAM	CA	3	72	1
32	MINCO LOAM 0-1	MNA	3	72	1
33	PORT SILT LOAM 1-3	PRB	2	70	2
34	SHELLABARGER-CARWILE FINE SANDY LOAM	SRB	2	70	2
35	POND CREEK FINE SANDY LOAM 0-1	PCA	4	70	1
36	ASA SILT LOAM	AS	6	70	2
37	POND CREEK SILT LOAM 1-3	PCB	2	68	2
38	KINGFISHER SILT LOAM 0-1	KFA	3	68	1
39	ST. PAUL SILT LOAM 0-1	SPA	3	67	2
40	MINCO VERY FINE SANDY LOAM 0-1	MNA	6	67	1
41	KIRKLAND SILT LOAM 0-1	KNA	2	66	2
42	NORGE LOAM 1-3	NOB	2	66	2
43	RENFROW CLAY LOAM 0-1	RFA	2	66	2
44	FARNUM FINE SANDY LOAM 0-3	FAA	3	66	2
45	CARWILE LOAM	CA	2	65	2
46	GRANT SILT LOAM 1-3	GAB	2	65	2
47	TELLER FINE SANDY LOAM 1-3	TFA	3	65	2
48	VANOSS LOAM 1-3	VAB	3	65	2
49	SHELLABARGER FINE SANDY LOAM 1-3	SHB	2	64	2
50	TABLER SILT LOAM 0-1	TAA	2	64	2
64	POND CREEK SILT LOAM 1-3	PCB	1	64	2
52	NORGE LOAM 1-3	NOB	3	64	2
53	POND CREEK SILT LOAM 1-3	PKB	4	64	2
54	REINACH SILT LOAM 1-3	REB	4	64	2
55	TIPTON LOAM 0-1	TTA	6	64	1
56	TIPTON LOAM 0-1	TPA	5	64	1
57	KINGFISHER SILT LOAM 1-3	KFB	2	63	2
58	PULASKI FINE SANDY LOAM	PU	2	63	2
59	KIRKLAND SILT LOAM 0-1	KRA	3	63	2

TABLE XXII (Continued)

60	RENFROW SILTY CLAY LOAM 0-1	RCA	3	63	2
61	NORGE SILT LOAM 1-3	NRB	4	63	2
62	GRANT SILT LOAM 1-3	GRB	1	62	2
63	YAHOLA SOILS	YA	1	62	2
64	GRANT SILT LOAM 1-3	GRB	3	62	2
65	MINCO LOAM 1-3	MNB	3	62	2
66	YAHOLA LOAM	YA	3	62	2
67	CYRIL FINE SANDY LOAM	CS	4	62	2
68	CYRIL FINE SANDY LOAM	CY	4	62	2
69	GRANT LOAM 1-3	GRB	4	62	2
70	YAHOLA	YA	4	62	2
71	ZANEIS LOAM 1-3	ZAB	2	61	2
72	TABLER SILTY CLAY LOAM	TAA	1	61	2
73	HOLLISTER SILT LOAM 0-1	HOA	4	61	2
74	TIPTON FINE SANDY LOAM 0-1	TPA	6	61	2
75	ENTERPRISE VERY FINE SANDY LOAM	ERA	5	61	2
76	RENFROW SILT LOAM 0-2	RCA	1	60	3
77	SHELLABARGER FINE SANDY LOAM 1-3	SHB	1	60	2
78	SHELLABARGER FINE SANDY LOAM 0-3	SHA	3	60	2
79	TABLER SILTY CLAY LOAM	TA	3	60	2
80	WANN SOILS	WA	3	60	2
81	KINGFISHER SILT LOAM 1-3	KFB	3	60	2
82	POND CREEK FINE SANDY LOAM 1-3	PCB	4	60	2
83	PULASKI SOILS	PU	4	60	2
84	SHELLABARGER FINE SANDY LOAM 1-3	SHB	4	60	2
85	MILES FINE SANDY LOAM 0-1	MEA	5	60	2
86	ALTUS FINE SANDY LOAM 0-1	ATA	5	60	3
87	GRANDFIELD FINE SANDY LOAM 0-1	GRA	6	60	2
88	ST. PAUL SILT LOAM 1-3	SPB	3	58	2
89	YAHOLA FINE SANDY LOAM	YA	5	58	2
90	CYRIL FINE SANDY LOAM	CY	6	58	2
91	HOLLISTER SILT LOAM 0-1	HOA	6	58	2
92	MINCO VERY FINE SANDY LOAM 1-3	MNB	6	58	2

TABLE XXII (Continued)

93	YAHOLA SOILS	YH	6	58	2
94	ATTICA FINE SANDY LOAM 0-3	ATB	1	57	2
95	KIRKLAND-RENFROW SILT LOAMS 1-3	KRB	2	57	3
96	RENFROW CLAY LOAM 1-3	RFB	2	57	3
97	ABILENE CLAY LOAM 0-1	ABA	5	57	2
98	ABILENE LOAM	AB	6	57	2
99	MENO LOAMY FINE SAND	MEB	2	56	2
100	MILLER CLAY	MR	2	56	3
101	TIPTON LOAM 1-3	TPB	5	56	2
102	TIPTON LOAM 1-3	TTB	6	56	2
103	NORGE LOAM 3-5	NOC	2	55	3
104	DALE SILT LOAM, SALINE	DE	1	54	3
105	TELLER FINE SANDY LOAM 3-5	TFC	3	54	3
106	RENFROW SILTY CLAY LOAM 1-3	RCB	3	54	3
107	DILL FINE SANDY LOAM 0-1	DFA	3	54	2
108	NOBLE FINE SANDY LOAM 1-3	NOB	4	54	2
109	POND CREEK SILT LOAM 1-3	PKB2	4	54	3
110	TILLMAN AND HOLLISTER CLAY LOAMS	TCA	5	54	2
111	DEVOL FINE SANDY LOAM	DFA	6	54	2
112	HARDEMAN FINE SANDY LOAM	HAA	6	54	2
113	ST. PAUL SILT LOAM 1-3	SPB	6	54	2
114	ALBION SANDY LOAM 0-1	ABA	1	53	3
115	MILLER CLAY	MR	1	53	3
116	GRANT SILT LOAM 3-5	GAC	2	53	3
117	REINACH-SLICKSPOTS COMPLEX	RE	2	53	3
118	KONAWA LOAMY FINE SAND	KOB	3	53	3
119	MILES FINE SANDY LOAM 1-3	MLB	3	53	2
120	NORGE LOAM 3-5	NOC	3	53	3
121	MILLER SILTY CLAY LOAM	ME	4	53	3
122	DALE SOILS 3-8	OLD	1	52	3
123	RUELLA LOAM 0-2	RUA	1	52	2
124	NASH SILT LOAM 1-3	NAB	2	52	2
125	WEYMOUTH-OST LOAMS	WOB	2	52	2

TABLE XXII (Continued)

126	ENTERPRISE VERY FINE SANDY LOAM 1-3	ERB	5	52	2
127	QUANAH SILT LOAM 0-1	QUA	6	52	2
128	TIPTON FINE SANDY LOAM 1-3	TPB	6	52	3
129	GRANDFIELD FINE SANDY LOAM 1-3	GRB	6	52	3
130	NORGE SILT LOAM 3-5	NRC	4	51	3
131	CARWILE-ATTICA COMPLEX 0-3	CAB	1	50	2
132	GRANT SILT LOAM 3-5	GRC	1	50	3
133	CARWILE-SHELLABARGER 0-2	CSA	3	50	2
134	GRANT SILT LOAM 3-5	GRC	3	50	3
135	KINGFISHER-GRANT SILT LOAMS 3-5	KGC	3	50	3
136	MINCO LOAM 3-5	MNC	3	50	3
137	MINCO SILT LOAM 3-5	MSC	4	50	3
138	GRANT LOAM 3-5	GRC	4	50	3
139	MILES FINE SANDY LOAM 1-3	MEB	5	50	3
140	MILLER CLAY	MR	5	50	3
141	MILLER CLAY	MC	6	49	3
142	ABILENE CLAY LOAM 1-3	ABB	5	49	2
143	MILES LOAMY FINE SAND	MFB	5	49	3
144	COBB FINE SANDY LOAM 1-3	COB	4	49	2
145	SHELLABARGER FINE SANDY LOAM 3-5	SHC	4	49	3
146	NORGE LOAM 3-5	NOC2	2	49	3
147	ZANEIS LOAM 3-5	ZAC	2	49	3
148	SHELLABARGER FINE SANDY LOAM 3-5	SHC	3	49	3
149	GRANT SILT LOAM 3-5	GAC2	2	48	3
150	KINGFISHER SILT LOAM 2-5	KFC2	2	48	3
151	MANSIC CLAY LOAM 1-3	MAB	5	48	3
152	GRANDFIELD LOAMY FINE SAND 0-1	GNA	6	48	3
153	ROSCOE CLAY	RS	6	48	3
154	HARDEMAN FINE SANDY LOAM	HAB	6	47	3
155	HARDEMAN FINE SANDY LOAM	HAC	6	47	3
156	WET ALLUVIAL SOIL	WT	3	47	5
157	KIRKLAND-SLICKSPOTS COMPLEX 0-1	KSA	2	47	4
158	DILLWYN LOAMY FINE SAND	DM	1	47	4

TABLE XXII (Continued)

159	ALBION SANDY LOAM 1-3	ABB	1	46	3
160	GRACEMONT SOILS	GP	1	46	5
161	FOARD SILT LOAM 0-1	FOA	4	46	2
162	GRACEMONT SOILS	GM	4	46	5
163	TILLMAN SILTY CLAY LOAM 1-3	TLB	4	46	3
164	GRANDFIELD LOAMY FINE SAND	GNB	6	45	3
165	FOARD SILT LOAM 0-1	FDA	6	45	2
166	SPUR CLAY LOAM	SW	5	45	5
167	GRANT LOAM 3-6	GRC2	4	45	4
168	MILES FINE SANDY LOAM 3-5	MLC	3	45	3
169	ATTICA FINE SANDY LOAM 3-5	ATC	1	45	3
170	GRANT SILT LOAM 3-5	GRC2	1	45	3
171	PRATT LOAMY FINE SAND	PSB	2	44	3
172	ZANEIS LOAM 3-5	ZAC2	2	44	3
173	MINCO VERY FINE SANDY LOAM 3-8	MOD	3	44	4
174	DILL FINE SANDY LOAM	DFB	3	44	3
175	DOUGHERTY LOAMY FINE SAND 1-3	DOB	4	44	3
176	MINCO VERY FINE SANDY LOAM 3-8	MOD	4	44	4
177	ENTERPRISE LOAMY FINE SAND 0-3	ENB	5	44	3
178	LA CASA CLAY LOAM 1-3	LAB	5	44	2
179	TILLMAN CLAY LOAM 1-3	TAB	5	44	3
180	WEYMOUTH-LA CASA CLAY LOAMS 1-3	WMB	5	44	3
181	INDIAHOMA SILTY CLAY LOAM 1-3	INB	6	44	3
182	NOBLE FINE SANDY LOAM 3-8	NOD	4	43	4
183	LELA CLAY WET	LC	3	43	4
184	KONAWA LOAMY FINE SAND HUMMOCKY	KOC	3	43	4
185	NORGE-SLICKSPOTS COMPLEX 0-3	NSA	3	43	3
186	RENFROW SILT LOAM 3-5	RSC	2	43	4
187	DOUGHERTY FINE SAND 0-3	DOB	1	43	4
188	ATTICA LOAMY FINE SAND 0-3	ASB	1	42	3
189	GOLTRY FINE SAND 0-3	GOB	1	42	4
190	PRATT LOAMY FINE SAND 0-3	PTB	1	42	3
191	NASH SILT LOAM 3-5	NAC	2	42	3

TABLE XXII (Continued)

192	PRATT LOAMY FINE SAND	PRB	3	42	3
193	ENTERPRISE VERY FINE SANDY LOAM 3-5	ERC	5	42	3
194	MILES FINE SANDY LOAM 3-5	MEC	5	42	3
195	GRANDFIELD FINE SANDY LOAM 3-5	GRC	6	42	3
196	MILLER CLAY	ME	6	42	3
197	ASA-CLAIREMONT COMPLEX	AT	6	41	3
198	TILLMAN AND FOARD SOILS	TFB	6	41	3
199	DILL FINE SANDY LOAM 1-3	DAB	5	41	3
200	BREWER DRUMMOND COMPLEX	BU	1	41	3
201	ALBION-GRANT COMPLEX 3-5	AGC	1	40	4
202	DRUMMOND SOILS 0-3	DRB	1	40	5
203	DRUMMOND PRATT COMPLEX 0-3	DTB	1	40	5
204	NORGE LOAM 5-8	NOD	2	40	4
205	LESHARA-SLICKSPOTS COMPLEX	LH	3	40	4
206	COBB FINE SANDY LOAM 3-5	COC	4	40	3
207	CLAIREMONT SOILS	CA	6	40	5
208	DEVOL LOAMY FINE SAND	DEB	6	40	3
209	ST. PAUL-HINKLE COMPLEX 0-1	STA	6	40	3
210	NORGE LOAM 5-8	NOD	3	39	4
211	GRANT-NASH SILT LOAM 5-8	GND	2	39	4
212	MILLER-SLICKSPOTS COMPLEX	MS	2	39	4
213	BROCKEN ALLUVIAL LAND	BR	2	38	5
214	RENFROW-VERNON COMPLEX 3-5	RVC2	2	38	4
215	NOBSCOT FINE SAND	NCB	3	38	4
216	KINGFISHER-SLICKSPOTS COMPLEX	KLB	3	38	3
217	WEYMOUTH LOAM 3-5	WEC	6	37	4
218	TILLMAN SILTY CLAY LOAM 3-5	TLC	4	37	4
219	PORT AND PULASKI SOILS CHANNELED	PP	4	37	5
220	GRANT LOAM 5-8	GRD	4	37	4
221	BROCKEN ALLUVIAL LAND	BR	3	37	5
222	GRANT SILT LOAM	GRD	3	37	4
223	ALBION SANDY LOAM 3-5	ABC	1	37	4
224	YAHOLA AND PORT SOILS	YP	1	37	5

TABLE XXII (Continued)

225	ALBION-GRANT COMPLEX 3-5	AGC2	1	36	4
226	WOODWARD-QUINLAND COMPLEX 1-3	WUB	1	36	3
227	LUCIEN VERY FINE SANDY LOAM 3-5	LUC	2	36	4
228	PRATT LOAMY FINE SAND HUMMOCKY	PTC	2	36	4
229	LELA,WET-SLICKSPOTS COMPLEX	LE	3	36	4
230	SHELLABARGER-TELLER FINE SANDY LOAM 5-8	STD	3	36	4
231	DOUGHERTY AND EUFAULA LOAMY FINE SAND 3-8	DUD	4	36	4
232	WEYMOUTH CLAY LOAM 3-5	WEC	5	36	4
233	FOARD-HINKLE COMPLEX 0-1	FHA	6	36	3
234	INDIAHOMA SILTY CLAY LOAM 3-5	INC	6	36	4
235	TILLMAN SILT LOAM 3-5	TEC	6	36	4
236	YAHOLA SOILS, SALINE	YA	6	35	5
237	CLAIREMONT SOILS, SALINE	CE	6	35	5
238	PRATT LOAMY FINE SAND	PRC	3	35	4
239	GRANT-NASH SILT LOAMS 5-8	GND2	2	35	4
240	NORGE LOAM 5-8	NOD2	2	35	4
241	GRANT-NASH COMPLEX 3-8	GTD2	1	35	4
242	PRATT LOAMY FINE SAND	PTC	1	35	4
243	VERNON CLAY LOAM 1-3	VEB	3	34	3
244	ST. PAUL-HINKLE COMPLEX 1-3	STB	6	34	4
245	TILLMAN-HINKLE COMPLEX 1-3	THB	6	34	4
246	STAMFORD SILTY CLAY LOAM 3-5	SMC2	6	33	4
247	ALLUVIAL LAND	AC	5	33	5
248	DILL FINE SANDY LOAM	DAC	5	33	4
249	SPUR CLAY LOAM CHANNELED	SN	5	33	5
250	KONAWA LOAMY FINE SAND 1-5	KOC2	4	33	4
251	TILLMAN SILTY CLAY LOAM 2-5	TLC2	4	33	4
252	DILL FINE SANDY LOAM	DFD	3	33	4
253	GRANT SILT LOAM 4-8	GRD2	3	33	4
254	LINCOLN LOAMY FINE SAND	LN	3	33	3
255	RENFROW-VERNON COMPLEX 3-5	RNC2	3	33	4
256	ALINE FINE SAND 0-3	ALB	1	32	4
257	KINGFISHER-LUCIEN COMPLEX 5-8	KLD2	2	32	4

TABLE XXII (Continued)

258	SHELLABARGER-TELLER FINE SANDY LOAM 5-8	STD2	3	32	4
259	NOBSCOT FINE SAND	NCC	3	32	4
260	VERNON SOILS 1-3	VEB	6	32	3
261	DEVOL LOAMY FINE SAND	DEC	6	32	4
262	NOBSCOT FINE SAND 0-5	NOC	5	31	4
263	ENTERPRISE VERY FINE SANDY LOAM 5-8	ERD	5	31	4
264	WOODWARD-QUINLAN COMPLEX 3-5	WUC	4	31	4
265	GRANT-WING COMPLEX 1-5	GWC	4	31	4
266	DRUMMOND SOILS	DR	2	30	5
267	LINCOLN SOILS	LO	6	30	4
268	ASA-OSCAR COMPLEX	AX	6	30	5
269	COBB FINE SANDY LOAM 5-8	COD	4	29	4
270	KINGFISHER-LUCIEN COMPLEX 4-8	KHD2	3	28	4
271	DILL FINE SANDY LOAM 5-8	DFD2	3	28	4
272	LINCOLN SOILS	LS	1	27	5
273	SANDY BROCKEN LAND	SB	3	27	4
274	EUFAULA LOAMY FINE SAND 1-3	EUB	4	27	4
275	VERNON CLAY LOAM 3-5	VCC2	2	27	4
276	BREAKS-ALLUVIAL LAND COMPLEX	BK	2	26	6
277	VERNON SOILS 3-5	VEC	6	26	4
278	COBB FINE SANDY LOAM	COD2	4	26	4
279	NOBSCOT FINE SAND	NCD	3	26	4
280	VERNON CLAY LOAM 3-5	VEC	3	26	4
281	ALBION-GRANT COMPLEX 5-8	AGD2	1	26	4
282	QUINLAND-WOODWARD COMPLEX 3-5	QWC	1	26	4
283	GRANT-NASH SILT LOAM 8-20	GNE	2	25	6
284	ALBION SANDY LOAM 5-15	ABE	1	25	4
285	GRANT-PORT COMPLEX 0-12	GUE	1	25	4
286	ALBION SOILS 5-12	ABE	3	25	4
287	BREAKS ALLUVIAL COMPLEX	BK	3	25	4
288	MINCO VERY FINE SANDY LOAM	MOE	3	25	4
289	DARNELL-NOBLE ASSOCIATION	DND	4	25	4
290	KONAWA SOILS 2-8	KSD3	4	25	6

TABLE XXII (Continued)

291	LUCIEN-DILL FINE SANDY LOAM 3-12	LUD	4	25	6
292	MINCO VERY FINE SANDY LOAM	MOE	4	25	6
293	ENTERPRISE VERY FINE SANDY LOAM 8-20	ERE	5	25	6
294	NOBSCOT FINE SAND 5-12	NOD	5	25	6
295	HARDEMAN FINE SANDY LOAM 8-20	HAE	6	25	6
296	HILGRAVE GRAVELLY LOAM 5-15	HGE	6	25	6
297	LINCOLN SOILS	LN	6	25	5
298	EUFAULA LOAMY FINE SAND	EUC	4	23	4
299	LUCIEN-DILL FINE SANDY LOAM	LUE	4	23	7
300	DARNELL-NOBLE ASSOCIATION	DNE	4	23	7
301	VERNON SOILS 3-5	VEC2	6	23	4
302	GRANT-NASH SILT LOAMS 8-20 ERODED	GNE2	2	22	6
303	COBB AND GRANT SOILS	CRD3	4	22	6
304	ERODED LOAMY LAND	ER	3	22	6
305	EUFAULA FINE SAND ROLLING	EFD	4	21	6
306	VERNON SOILS 5-12	VRD	2	20	6
307	VERNON-CLAIREMONT COMPLEX	VN	6	20	6
308	LIKES LOAMY FINE SAND	LDC	6	20	6
309	QUINLAN-WOODWARD COMPLEX 5-12	QWD	4	20	6
310	CLAYEY SALINE ALLUVIAL	CY	3	20	5
311	LUCIEN-ROCK OUTCROP COMPLEX	LR	3	20	7
312	QUINLAN-WOODWARD LOAMS	QWF	3	20	6
313	ALINE-TIVOLI COMPLEX 5-12	ANE	1	20	4
314	QUINLAN-WOODWARD COMPLEX 5-30	QWE	1	20	4
315	VERNON SOILS 5-12	VED	4	18	6
316	ERODED CLAYEY LAND	EC	2	15	6
317	VERNON SOILS AND ROCK OUTCROP	VS	2	15	7
318	LIKES FINE SAND	LKE	6	15	7
319	VERNON COMPLEX 5-12	VME	6	15	6
320	VERNON SOILS	VE	5	15	6
321	TALPA-ROCK OUTCROP COMPLEX	TAE	4	15	7
322	LIMESTONE COBBLY LAND	LM	4	15	7
323	ACME-GYPSUM OUTCROP COMPLEX 2-8	AGD	4	15	7

TABLE XXII (Continued)

324	BREAKS	BK	4	15	6
325	DARNELL SOILS 3-12	DAD3	4	15	7
326	TIVOLI FINE SAND, ROLLING	TRD	3	15	7
327	VERNON SOILS AND ROCK OUTCROP	VR	3	15	7
328	TIVOLI FINE SAND	TR	1	15	7
329	ROUGH BROKEN LAND	RO	3	14	7
330	ROUGH BROKEN LAND	RO	4	14	7
331	TIVOLI FINE SAND	TV	5	14	6
332	ROCK LAND	RO	6	13	7
333	HARMON STONY LOAM	HA	5	13	6
334	ROUGH BROKEN LAND	RG	5	13	7
335	VERNON SOILS 3-8	VED3	6	10	6
336	TREADWAY CLAY	TY	5	10	6
337	ROCK OUTCROP	RC	5	5	7
338	BADLAND-VERNON COMPLEX	BV	6	5	7
339	SALORTHIDS	SA	1	2	8

[a]County code identifies respective counties in the study: Alfalfa County = 1, Garfield = 2, Blaine County = 3, Caddo County = 4, Jackson County = 5, and Tillman County County = 6.

[b]Soil productivity indexes result from a ranking of all Oklahoma soils on a basis of 0-100. Important factors used in ranking the soils include soil texture, soil wetness, slope, erosion, climate, topography, and general soil productivity. This soil information was generally available through County Assessor's offices.

the study area and Garfield County. Moreover, it is classified as a class I soil. The percentage of class I and II variable for a tract entirely consisting of this soil would be 100 percent while the percentage of class III and IV soil in the tract would be zero percent.

Tract Productivity Indexes. Three tract productivity indexes were computed for each sale tract: (1) county tract productivity index, (2) area tract productivity index, (3) study area tract productivity index. The indexes differ in that each index was computed in terms of the most productive soil for the respective area. These indexes represented weighted average soil productivity. The computation of a study area tract productivity index is illustrated in Table XXIII using soil productivity indexes (ratings) from Table XXII and an hypothetical 160 acre Alfalfa County farm.

As shown in Table XXIII, Alfalfa County soil productivity indexes from Table XXII were adjusted to the most productive soil in the study area (Reinach Loam in Garfield County). The adjusted soil productivity index was then weighted by the number of acres of the soil type in the tract to obtain the weighted productivity. The estimated study area tract productivity index for the Alfalfa County farm represented the sum of weighted productivities divided by the total number of acres in the tract.

The procedures for computing county and area tract productivity indexes was almost the same. The procedures for computing a county tract productivity index differed from the procedures used to estimate a study area productivity index only in the way in which the adjusted soil productivity index was computed. For instance in estimating a county tract productivity index for the hypothetical farm in Table XXIII,

TABLE XXIII

A STUDY AREA PRODUCTIVITY INDEX COMPUTATION EXAMPLE FOR A HYPOTHETICAL 160 ACRE ALFALFA COUNTY, OKLAHOMA FARM

Soil Identification Number (1)	Soil Symbol (2)	Soil Productivity Index (3)	Adjusted Soil Productivity Index[a] (4)	Acres (5)	Weighted Productivity (Col. 4 x Col. 5)
5	DDA	79	95.2	30	2,865
21	BR	74	89.2	40	3,568
30	CR	72	86.7	30	2,601
77	SHB	60	72.2	60	4,332
Total Weighted Productivity					13,357
Computed Study Area Tract Productivity Index (13,357/160 Acres)					83.48

[a]These numbers represent productivity indexes in column three adjusted to the most productive soil in the study area. The adjusted productivity index for soil DDA is 95.2 (79/83 x 100).

the adjusted soil productivity indexes in column four would represent Alfalfa County productivity indexes adjusted to the most productive soil in that county. Similarly, area tract productivity indexes were adjusted to the most productive soil in the area.

<u>Tract Location and Economic Development Variables</u>. Tract locational, economic development and combined locational and economic development variables are computed using the data presented in Table XXIV. Data in Table XXIV present the populations and locations of towns and cities in the general Western Oklahoma study area.

The county identification matrix was used in the analysis to associate a particular town in the study area with a county for variable computation. The matrix in Table XXIV is interpreted as follows: (1) a one in column one of the matrix indicates the town to be associated with Alfalfa County, (2) a two in column two indicates the town to be associated with Garfield County, (3) a three in column three indicates the town to be associated with Blaine County, (4) a four in column four indicates the town to be associated with Caddo County, (5) a five in column five indicates the town to be associated with Jackson County, and finally (6) a six in column six indicates the town to be associated with Tillman County.

Generally the locational coordinates in Table XXIV along with the locational coordinates of the tract (primary data) were used to compute the distance between a tract and a relevant town in the area (hereafter referred to as the distance formula). For example, the distance between a tract with a north-south coordinate of 210.00 and an east-west coordinate of 112.00 and Cherokee, Oklahoma (coordinates given in

TABLE XXIV

LOCATION AND POPULATION OF TOWNS AND CITIES IN WESTERN OKLAHOMA STUDY AREA

Town or City Identification Number	Town or City	Town or City Population	County Identification Matrix	Locational Coordinates North-South	Locational Coordinates East-West	Town Identification for Study Area Market Potential Computation
1	CHEROKEE	2119	100000	208.00	115.50	1
2	BURLINGTON	165	100000	218.00	111.50	1
3	CARMEN	519	100000	196.00	109.00	1
4	ALINE	260	100000	191.25	109.75	1
5	HELENA	769	100000	193.25	119.50	1
6	GOLTRY	282	100000	192.75	126.50	1
7	JET	317	100000	202.00	125.00	1
8	AMORITA	63	100000	219.75	118.75	1
9	BYRON	72	100000	218.25	118.75	1
10	CAPRON	80	100000	217.90	103.00	1
11	ALVA	7440	100000	211.00	98.00	1
12	DACOMA	226	100000	201.50	103.70	1
13	CLEO SPRINGS	344	100000	184.25	110.25	1
14	RINGWOOD	241	100000	182.25	121.25	1
15	MENO	119	100000	182.75	124.90	1
16	FAIRVIEW	2894	100000	176.00	108.00	1
17	LAHOMA	299	120000	182.75	129.75	1
18	CARRIER	133	120000	189.00	133.75	1
19	ENID	44986	000000	184.00	142.00	1
20	HILLSDALE	77	120000	194.75	135.25	1
21	NASH	294	120000	202.00	132.25	1
22	MANCHESTER	165	100000	224.75	133.25	1
23	WAKITA	426	100000	217.00	139.50	1
24	KIOWA	1674	100000	226.00	108.00	1

TABLE XXIV (Continued)

25	WALDRON	387	100000	225.50	125.00	1
26	HUNTER	274	020000	195.00	153.75	1
27	KREMLIN	200	020000	193.75	144.25	1
28	BRECKINRIDGE	70	020000	186.25	149.75	1
29	BILLINGS	618	020000	192.50	165.00	1
30	GARBER	1101	020000	186.25	158.25	1
31	COVINGTON	605	020000	177.25	158.00	1
32	MARSHALL	420	020000	166.75	155.75	1
33	HENNESSEY	2181	020000	163.50	140.50	1
34	DOUGLAS	79	020000	174.00	153.50	1
35	WAUKOMIS	824	020000	175.50	140.50	1
36	DRUMMOND	326	020000	176.75	132.75	1
37	ORLANDO	202	020000	166.25	169.75	1
38	LAMONT	478	000000	203.75	159.75	1
39	POND CREEK	903	000000	202.25	146.00	1
40	JEFFERSON	128	000000	205.75	146.75	1
41	DEER CREEK	203	000000	211.75	162.00	1
42	MEDFORD	1304	000000	212.00	150.00	1
43	OKEENE	1421	003000	164.00	117.00	1
44	HITCHCOCK	160	003000	153.75	115.25	1
45	LONGDALE	331	003000	165.25	103.75	1
46	CANTON	844	003000	160.00	101.75	1
47	OAKWOOD	129	003000	151.25	95.00	1
48	THOMAS	1336	003000	138.00	92.00	1
49	WEATHERFORD	7959	003400	123.00	94.50	1
50	HYDRO	805	003400	124.75	101.25	1
51	BRIDGEPORT	142	003400	124.75	113.00	1
52	GEARY	1380	003400	130.50	116.50	1
53	GREENFIELD	143	003000	137.25	113.37	1
54	LOYAL	107	003000	154.25	128.25	1
55	WATONGA	3696	003000	145.50	111.50	1
56	OKARCHE	826	003000	137.00	136.00	1

TABLE XXIV (Continued)

57	HINTON	869	003400	119.50	114.25	1
58	EAKLEY	228	000400	108.00	102.75	1
59	COLONY	237	000400	111.00	96.00	1
60	CARNEGIE	1723	000400	94.25	100.00	1
61	APACHE	1421	000400	79.75	113.50	1
62	FLETHCER	950	000400	78.75	120.50	1
63	CYRIL	1302	000400	80.00	123.00	1
64	CEMENT	892	000400	82.50	126.50	1
65	VERDEN	439	000400	93.00	129.00	1
66	ANADARKO	6682	000400	92.00	120.50	1
67	FT COBB	722	000400	93.75	109.25	1
68	GRACEMONT	424	000400	100.00	119.50	1
69	CHICKASHA	14194	000400	89.50	137.50	1
70	BINGER	730	000400	108.25	115.00	1
71	LOOKEBA	165	000400	112.00	113.75	1
72	MINCO	1129	000400	108.50	137.50	1
73	BLAIR	1114	000050	71.50	58.00	1
74	MARTHA	268	000050	68.00	55.00	1
75	DUKE	486	000050	63.50	44.50	1
76	GOULD	368	000050	64.25	33.00	1
77	ELDORADO	737	000050	50.50	39.50	1
78	OLUSTEE	819	000050	55.75	52.75	1
79	ELMER	138	000056	51.00	56.50	1
80	HEADRICK	139	000056	61.25	69.25	1
81	TIPTON	1206	000056	52.50	68.50	1
82	SNYDER	1671	000056	63.50	80.00	1
83	ALTUS	23302	000050	62.50	59.50	1
84	FREDERICK	6132	000056	45.00	75.75	1
85	DAVIDSON	515	000006	34.75	72.25	1
86	HOLLISTER	105	000006	41.35	84.00	1
87	LOVELAND	36	000006	39.00	89.75	1
88	GRANDFIELD	1524	000006	34.00	94.50	1

TABLE XXIV (Continued)

89	DEVOL	129	000006	31.50	100.25	1
90	CHATTANOOGA	302	000006	51.25	96.25	1
91	MANITOU	308	000006	77.50	52.87	1
92	INDIAHOMA	434	000006	64.75	91.25	1
93	LAWTON	74470	000006	64.00	111.50	1
94	DUNCAN	19718	000000	57.00	136.50	1
95	MARLOW	3995	000000	67.00	136.50	1
96	RANDLETT	384	000000	30.25	107.50	1
97	WAURIKA	1833	000000	32.50	134.00	1
98	HASTINGS	184	000000	36.50	127.75	1
99	TEMPLE	1354	000000	36.50	120.50	1
100	WALTERS	2611	000000	43.50	116.25	1
101	GERONIMO	587	000000	55.25	112.25	1
102	FAXON	121	000000	53.75	100.75	1
103	CACHE	1106	000000	65.50	98.25	1
104	STERLING	675	000000	73.75	124.50	1
105	ELGIN	840	000000	75.75	117.50	1
106	HOLLIS	3150	000000	65.50	25.0	1
107	MANGUM	4066	000000	78.50	39.0	1
108	GRANITE	1808	000000	84.00	46.00	1
109	BRINKMAN	7	000000	87.75	38.00	1
110	WILLOW	188	000000	90.50	38.50	1
111	LONEWOLF	584	000000	86.25	63.50	1
112	COOPERTON	55	000000	77.75	84.75	1
113	HOBART	4638	000000	88.00	72.00	1
114	GOTEBO	376	000000	92.00	85.00	1
115	MOUNTAIN VIEW	1110	000000	93.75	91.75	1
116	SENTINEL	984	000000	97.75	67.50	1
117	ROCKY	260	000000	97.75	74.00	1
118	DILL CITY	578	000000	106.00	70.00	1
119	CORDELL	3261	000000	107.00	78.50	1
120	CORN	409	000000	113.00	90.00	1

TABLE XXIV (Continued)

121	BURNS FLAT	988	000000	111.00	68.00	1
122	CANUTE	420	000000	115.75	61.75	1
123	FOSS	150	000000	118.25	68.00	1
124	BESSIE	210	000000	113.50	78.25	1
125	CLINTON	8513	000000	122.50	79.00	1
126	CARTER	311	000000	102.00	49.00	1
127	ELK CITY	7323	000000	115.00	54.25	1
128	SAYRE	2712	000000	107.50	41.50	1
129	BUTLER	315	000000	130.75	67.75	1
130	ARAPAHO	531	000000	127.00	79.50	1
131	CUSTER CITY	486	000000	132.50	83.50	1
132	LEEDEY	465	000000	146.50	58.50	1
133	CAMARGO	236	000000	157.00	62.25	1
134	VICI	694	000000	166.25	61.50	1
135	PUTNAM	84	000000	146.00	80.00	1
136	TALOGA	363	000000	158.75	80.50	1
137	SEILING	1033	000000	166.50	82.50	1
138	AMES	227	000000	173.00	124.50	1
139	WAYNOKA	1444	000000	196.50	85.50	1
140	AVARD	59	000000	204.00	91.00	1
141	FREEDOM	292	000000	209.00	72.00	1
142	WOODWARD	9412	000000	186.00	55.00	1
143	SHARON	155	000000	175.00	58.00	1
144	MUTUAL	94	000000	172.00	67.00	1
145	MOORELAND	1196	000000	186.50	65.25	1
146	STRONG CITY	40	000000	133.00	45.50	1
147	HAMMON	677	000000	130.75	57.50	1
148	PERRY	5341	000000	176.00	174.50	1
149	MULHALL	250	000000	160.50	168.00	1
150	CRESCENT	1568	000000	152.50	157.50	1
151	GUTHRIE	9575	000000	147.50	167.00	1
152	CASHION	329	000000	142.00	152.50	1

TABLE XXIV (Continued)

153	KINGFISHER	4042	000000	146.25	138.50	1
154	PIEDMONT	269	000000	131.50	149.00	1
155	CALUMET	386	000000	129.50	128.00	1
156	UNION CITY	306	000000	115.00	138.00	1
157	EL RENO	14510	000000	125.00	137.00	1
158	TUTTLE	1640	000000	106.75	144.75	1
159	RUSH SPRINGS	1381	000000	72.00	136.50	1
160	NORGE	153	000000	86.00	134.50	1
161	BRADLEY	247	000000	78.50	150.75	1
162	OKLAHOMA CITY	368856	000000	131.00	167.00	0
163	OKLAHOMA CITY	368856	000000	120.00	133.00	0
164	OKLAHOMA CITY	368856	000000	110.00	158.50	0
165	DOVER	405	000000	154.75	139.75	1
166	ENID	44986	020000	188.00	144.00	0
167	ENID	44986	020000	188.00	142.00	0
168	ENID	44986	020000	188.00	140.00	0
169	ENID	44986	120000	188.00	138.50	0
170	ENID	44986	120000	186.00	138.50	0
171	ENID	44986	120000	184.00	138.50	0
172	ENID	44986	120000	184.00	136.00	0
173	ENID	44986	120000	182.00	136.00	0
174	ENID	44986	120000	180.50	136.00	0
175	ENID	44986	020000	180.50	138.00	0
176	ENID	44986	020000	179.00	140.00	0
177	ENID	44986	020000	179.00	142.00	0
178	ENID	44986	020000	179.00	144.00	0
179	ENID	44986	020000	179.00	146.00	0
180	ENID	44986	020000	179.00	148.00	0
181	ENID	44986	020000	179.00	150.00	0
182	ENID	44986	020000	179.00	151.00	0
183	ENID	44986	020000	181.00	151.00	0
184	ENID	44986	020000	183.00	151.00	0

TABLE XXIV (Continued)

185	ENID	44986	020000	183.00	149.00	0
186	ENID	44986	020000	183.00	147.00	0
187	ENID	44986	020000	183.50	145.00	0
188	ENID	44986	020000	184.50	143.00	0
189	ENID	44986	020000	186.00	143.00	0
190	ANADARKO	6682	000400	93.00	120.50	0
191	ANADARKO	6682	000400	92.00	119.75	0
192	ANADARKO	6682	000400	91.25	120.00	0
193	ANADARKO	6682	000400	92.00	121.50	0
194	ALTUS	23302	000050	64.00	62.00	0
195	ALTUS	23302	000050	64.00	60.00	0
196	ALTUS	23302	000050	64.00	58.00	0
197	ALTUS	23302	000050	64.00	57.00	0
198	ALTUS	23302	000050	62.00	57.00	0
199	ALTUS	23302	000050	61.00	57.00	0
200	ALTUS	23302	000050	61.00	59.00	0
201	ALTUS	23302	000050	61.50	60.00	0
202	ALTUS	23302	000050	62.00	62.00	0
203	LAWTON	74470	000006	64.00	107.00	0
204	LAWTON	74470	000006	63.00	108.00	0
205	LAWTON	74470	000006	62.00	110.00	0
206	LAWTON	74470	000006	61.00	110.00	0
207	COMANCHE	1862	000000	47.50	136.00	1
208	MOUNTAIN PARK	458	000000	66.00	79.75	1
209	EDMOND	16633	000000	134.00	161.00	1
210	OKLAHOMA CITY	368856	000000	119.00	162.00	1
211	WATONGA	3696	003000	146.25	110.75	0
212	WATONGA	3696	003000	145.00	110.50	0
213	WATONGA	3696	003000	145.00	112.00	0
214	WATONGA	3696	003000	146.00	112.00	0

Table XXIV) may be estimated by summing the differences of the east-west and north-south coordinates of the tract and the town.[3] The distance between the tract and the town is estimated to be 5.5 miles (210 - 208 + 115.50 - 112.00).

Many of the larger towns in the study area are represented by more than one set of coordinates. This is because these towns generally could not be represented by one point when computing distances between a tract and a nearby city or town. Consequently, several distances were computed between the tract and the boundaries of a larger city and then generally the shorter distance was chosen.

Distance to Nearest Town, Nearest Principal Market, and Nearest City. The principal market was defined as the county seat or town in the area with a population of at least 5,000. Similarly, a city was defined in the analysis as having a population of at least 250,000. Distances between a tract and all qualifying towns, principal markets, and cities were estimated using the distance formula and appropriate definitions described above. The next step then involved choosing the minimum distance for each appropriate variable. For example in determining the distance to the nearest principal market for an Alfalfa County tract of land, the procedure involved using the county identification matrix for determining appropriate towns to be considered in the analysis along with the definition of a principal market. Both distances between Alva and Cherokee (qualifying Alfalfa County principal markets) were estimated using the distance formula. The smaller computed distance was then

---

[3]The rectangular survey system makes this estimation procedure possible.

chosen to represent the distance to the nearest principal market. Similar procedures were used to compute and select the distance to nearest town and cities.

<u>Population of Nearest Town and Nearest Principal Market</u>. These variables were determined in conjunction with the distance to the nearest town and distance to nearest principal market. For example, when the distance to the nearest principal market was determined in the above Alfalfa County example, the nearest principal market and hence its population were also determined.

<u>Ratio of Population of Nearest Town to Distance to Nearest Town and Ratio of Population of Nearest Principal Market to Distance to Nearest Principal Market</u>. Once the relevant distances to the nearest town and nearest principal market and respective populations were determined, simple divisions were performed to obtain these variables. For example, from the above analysis suppose that Cherokee was determined to be the nearest principal market to the tract and to the distance to this principal market was determined to be 10 miles. The ratio of the population of the nearest principal market to the distance to the nearest principal market was then computed to be 211.9 (2119/10).

<u>Study Area Market Potential and County Market Potential</u>. Both study area and county market potential variables were computed using the information in Table XXIV, the distance formula, and the general formula for market potential computation given in Chapter II. Generally the market potential variables were computed by summing the population to distance (distance between tract and town) ratios for appropriate towns to be included in the computation procedure. In Table XXIV, all towns with a

one in the town identification for study area market potential computation column were used in the computation of a study area tract market potential variable. Towns used in computing county market potential are shown in the county identification matrix in Table XXIV. For example, all towns with a one in first column of the matrix were used in computing market potential for a tract in Alfalfa County while a two in column two of the matrix indicates towns used in Garfield County tract market potential computation.

APPENDIX B

PROCEDURES FOR COLLECTING NONPHYSICAL AGRICULTURAL LAND MARKET DATA

For the study, it was determined that an agricultural land market questionnaire would be used to collect nonphysical data concerning the characteristics of each land purchase. Generally two approaches may be used to provide satisfactory response rates from mailed questionnaires (37). These two approaches are persistence and personalism. The persistence approach generally involves successive waves of questionnaires with follow up reminders to complete and return the questionnaire. The personalism approach generally attempts to identify and anticipate reasons for nonresponse and attempts to increase prospective respondent personal involvement. The procedures used in this study and described below primarily relied on the personalism approach.

Questionnaire Procedures

The Western Oklahoma Land Market Questionnaire shown in Figure 10 was developed and sent to agricultural land buyers in the study area. A highly personalized introductory letter was developed to accompany the land market questionnaire. For sale tracts in which current addresses were available, the introductory letter included: (1) the land buyer's complete mailing address, (2) reasons for the questionnaire survey, (3) the size of tract purchased, (4) the complete legal description of

WESTERN OKLAHOMA LAND MARKET QUESTIONNAIRE

Department of Agricultural Economics
Oklahoma State University

Listed below are several questions concerning the previously described land purchase. Please answer these questions as accurately as possible by checking the blank that best describes your situation.

A. Sale Number ___(1)

B. Occupational Status
Full-time farmer or rancher ___(2)
Full-time off farm employment ___(3)
Part-time farmer or rancher ___(4)
If your answer is part-time how many days/year do you work off the farm?
0-50 days ___(5)
51-100 days ___(6)
101-150 days ___(7)
151-200 days ___(8)
201-250 days ___(9)
Type of off-farm employment
__________________________ ___(10)

C. Type of farming or ranching operation
Family farm ___(11)
Partnership ___(12)
Family Corporation ___(13)
Corporate Farm ___(14)
Comments__________________
____

D. Place of residence
City or Town ___(15)
Rural ___(16)

E. Have you established or do you intend to establish a permanent residence on this land?
yes ___(17)
no ___(18)
If your answer to the above is no what is the approximate distance of the property to your permanent place of residence? ___(19)

F. What was your primary reason for purchasing the land?
Establish own farm ___(20)
Expand farming operations ___(21)
Investment ___(22)
Non-agricultural development ___(23)
Recreation or second homesite ___(24)
Other ___(25)
Comments__________________
____

G. What was the sellers reason for selling the land?
Estate settlement ___(26)
Off-farm employment ___(27)
Financial difficulties ___(28)
Retirement ___(29)
Unknown ___(30)
Other ___(31)
Comments__________________
____

H. How many acres of land did you own prior to this purchase?
0-160 acres ___(32)
161-320 acres ___(33)
321-480 acres ___(34)
481-640 acres ___(35)
641-1000 acres ___(36)
1001-1500 acres ___(37)
More than 1500 acres ___(38)

I. How many acres of land did you rent prior to the purchase of this property?
0-160 acres ___(39)
161-320 acres ___(40)
321-480 acres ___(41)
481-640 acres ___(42)
641-1000 acres ___(43)
1001-1500 acres ___(44)
More than 1500 acres ___(45)

Figure 10. Western Oklahoma Land Market Questionnaire

J. Did you rent the subject property prior to the purchase?
Yes ___(46)
no ___(47)

K. Did the purchase of the land require the purchase of any additional machinery?
Yes ___(48)
No ___(49)

If the answer to this question is yes, what is the dollar amount of additional machinery investment required?
0-$10,000 ___(50)
$10,001-$20,000 ___(51)
$20,001-$30,000 ___(52)
$30,001-$40,000 ___(53)
$40,001-$50,000 ___(54)
Over $50,000 ___(55)

L. Do you own a substantial amount of non-farm investments such as stocks and bonds?
Yes ___(56)
No ___(57)

M. If you were given a gift of $50,000 on the condition that you invest the money in stocks, bonds, or agricultural land, how would you invest the money?
Stocks ___(58)
Bonds ___(59)
Agricultural Land ___(60)

N. Are you completely satisfied with your dedision to purchase land?
Yes ___(61)
No ___(62)
Comments____________________
____

O. Do you plan to purchase additional agricultural land in the future?
Yes ___(63)
No ___(64)
Comments____________________
____

P. If for some reason you were forced to give up your right of ownership to the land today, would the land be transferred to a family member or relative or would the land be sold to someone on the open market?
Transferred to relative ___(65)
Sold on open market ___(66)
Other ___(67)

If your answer to the above is a family member or relative, would you expect the family member or relative to maintain ownership of the land?
Yes ___(68)
No ___(69)
Comments____________________
____

Q. To properly summarize the results, we would like the following personal information.

Sex
Male ___(70)
Female ___(71)

Marital Status
Married ___(72)
Single ___(73)

Education
Less than high school ___(74)
High school ___(75)
Some college ___(76)
College graduate ___(77)

Current age
20-30 ___(78)
31-40 ___(79)
41-50 ___(80)
51-60 ___(81)
61-70 ___(82)
Over 70 ___(83)

Annual Taxable Income
Less than $5000 ___(84)
$5000-$10,000 ___(85)
$10,001-$20,000 ___(86)
$20,001-$30,000 ___(87)
$30,001-$40,000 ___(88)
Over $40,000 ___(89)

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE.

TO RETURN THE QUESTIONNAIRE, seal it in the enclosed pre-addressed envelope and deposit it in any mail box. The postage has been provided.

If you would like a copy of the results of this questionnaire after they are compiled, mail your request to Lonnie R. Vandeveer, Research Assistant, Dept. of Agricultural Economics, Oklahoma State University, Stillwater, Oklahoma 74074.

Figure 10. (Continued)

the land purchased, (5) a statement insuring that response information would be used and held in confidence, (6) personal signatures of recipients of questionnaire data, and (7) sale tract identification number. The letter is illustrated in Figure 11. These data used in writing this letter were accessed through the primary data set discussed in Appendix A.

The initial mailing of the questionnaire included: (1) an introductory letter, (2) a copy of the land market questionnaire, (3) a stamped addressed envelope for the return of the questionnaire, and (4) a preliminary summary of average per acre land values for the prospective respondent's county. An example of average per acre land values sent to prospective Tillman County respondents is shown in Figure 12. Average per acre land values were included in the questionnaire procedures to encourage better response rates through increased involvement of the prospective respondent in the land market survey.

Approximately one month after the first mailing of the questionnaire, the same questionnaire was mailed to nonrespondents. This mailing included (1) a highly personalized introductory letter similar to the first introductory letter, (2) another land market questionnaire, and (3) a stamped addressed envelope for return of a completed questionnaire. The second introductory letter is shown in Figure 13.

Response Rates and County Respondent Land Buyer Characteristic Distributions

Land market questionnaire response rates by county are shown in Table XXV. The analysis shows that initially 1196 questionnaires were mailed for the study area with a response rate of 28 percent. Moreover,

Dept. of Agr. Economics
Ag Hall, Room 308
Okla. State University
Stillwater, Ok. 74074
November 6, 1978

ORVILLE ANTHONY
501 E KEY
ANADARKO, OK 73005

Dear Property Owner:

The price of agricultural land in Oklahoma continues to increase at a rapid rate. Enclosed is a summary of average land values for your county. These increases are of concern to many people interested in maintaining our current form of agriculture. As part of a research project in the Department of Agricultural Economics at Oklahoma State University, we are trying to gather information about how the ownership of agricultural land is changing and the implications of this for the future.

In an effort to accomplish this objective, information has been collected on 1300 farm sales that have occurred recently. Our search indicates that you purchased 160 acres all or partially in Section 28, Township 9N, Range 9W. It would be very helpful to us for you to fill out the enclosed questionnaire and return it in the enclosed stamped addressed envelope. No postage is required.

Each questionnaire is numbered so that we can associate your response with the data already collected on the property transfer. However, all responses will remain confidential with no names attached to any analysis performed. Your cooperation will be very much appreciated.

Sincerely,

Darrel Kletke

Darrel D. Kletke
Associate Professor

Lonnie R. Vandever

Lonnie R. Vandevear
Research Assistant
0857

Figure 11. Introductory Letter Which Accompanied Initial Mailing of the Western Oklahoma Land Market Questionnaire

Average Per-Acre Agricultural Land Prices and Other Characteristics of Land Sales, Tillman County, Oklahoma, 1972-June 1978.[a]

Characteristics of Land Sales	1972	1973	1974	1975	1976	1977	1978[b]
				All Land Sales			
Average Price, $/acre[c]	258	322	438	467	611	608	718
Change from Previous Year, %		25	36	7	31	0	18
Standard Deviation, $/acre	74	103	141	151	237	231	302
Cropland, % of Tract	86	72	76	75	79	71	82
Number of Observations	13	17	35	39	47	28	19
				Cropland Sales[d]			
Average Price, $/acre[c]	294	445	510	577	743	873	886
Change from Previous Year, %		51	15	13	29	17	1
Standard Deviation, $/acre	66	58	90	121	300	157	330
Number of Observations	6	4	22	16	19	9	10

[a]This table briefly reports the results of a survey of the Tillman County agricultural land market. The survey was confined to 198 land sales which were: (1) forty acres or more in size; (2) located outside the corporate limits of a city or town; (3) primarily agricultural in highest and best use; and (4) bona fide transactions (sales of partial ownership, changes in form of ownership, and intrafamily transfers were not included in the survey). Average per acre values include the value of land and improvements.

[b]Includes agricultural land sales which occurred during the first six months of 1978.

[c]Average agricultural productivity of land sales may vary by year.

[d]Cropland sales consist of sale tracts in the survey for which at least 90 percent of the tract is cropland (includes both dryland and irrigated cropland).

Figure 12. An Example of Preliminary Average Per Acre Land Values Sent to Prospective Land Market Questionnaire Respondents in Tillman County, Oklahoma

Dept. of Agr. Economics
Ag. Hall, Room 308
Okla. State University
Stillwater, Ok. 74074
December 1, 1978

FORREST JERLINK

JET, OK 73749

Dear Property Owner:

In early November we sent you a questionnaire concerning the property you recently purchased and a table of agricultural land values for your county. The purpose of the questionnaire is to analyze trends surrounding the agricultural land market. As indicated by the table of land values, the price of agricultural land has doubled over the past seven years. Many people are concerned with these high prices and their impact on who owns and will own our agricultural land. Any information that you can supply will help provide valuable insights on future land market trends and land ownership patterns.

If you have responded to our land market questionnaire, we would like to thank you for your cooperation. If you have not had a chance to respond to the questionnaire, we would very much appreciate your taking a few minutes to answer our questions. For your convenience another questionnaire is enclosed. Again, our search in public records indicates that you purchased 160 acres all or partially in section 17, township 27N, range 9W. You may return the questionnaire in the enclosed stamped addressed envelope. No postage is required.

Each questionnaire is numbered so that we can associate your response with the data already collected on the property transfer. All responses will remain confidential and in no case will your name ever be associated or attached to any analysis performed. Thank you for your cooperation.

Sincerely,

Lonnie R. Vandeveer
Research Assistant
0045

Darrel D. Kletke
Associate Professor

Figure 13. Introductory Letter Which Accompanied Second Mailing of the Western Oklahoma Land Market Questionnaire

TABLE XXV

LAND MARKET QUESTIONNAIRE RESPONSE RATES BY COUNTY AND STUDY AREA, OKLAHOMA

Counties	First Mailing of Questionnaire			Second Mailing of Questionnaire			Composite Response	
	Number Mailed	Number of Responses	Response Rate	Number Mailed	Number of Responses	Response Rate	Number	Rate
Alfalfa	222	75	34	147	35	24	110	50
Garfield	234	74	32	157	31	20	105	45
Blaine	166	43	26	122	26	21	69	42
Caddo	286	77	27	208	46	22	123	43
Jackson	114	22	19	92	16	17	38	33
Tillman	174	42	24	132	32	24	74	43
Study Area	1196	333	28	858	186	22	519	43

the second mailing included 858 mailed questionnaires with a response rate of 22 percent. At this point it was decided not to mail a third questionnaire. This was at least partially due to the general feeling that a few land buyers gave indications of resistance following the mailing of the second questionnaire.

Data in Table XXV show the county composite response rates ranged from 50 percent in Alfalfa County to 33 percent in Jackson County. One possible reason for the lower response rate in Jackson County was the poor timing of mailed questionnaires with the Jackson County cotton harvest. Questionnaires mailed at a later date may have resulted in a better response rate for this county.

Characteristics of agricultural land buyers by county are shown in Table XXVI. Percentage response distributions given in this table may be used to compute the actual number of county respondents to a particular question. More specifically, the full time farmer occupational status for Alfalfa County is interpreted to mean that 69.1 percent of the land buyers in this county were full time farmers. The actual number of full time farmer respondents is computed to be 76 (0.691 x 110 respondents).

TABLE XXVI

CHARACTERISTICS OF AGRICULTURAL LAND BUYERS BY SELECTED COUNTIES, OKLAHOMA, 1978

Question	Questionnaire Response Percent Distributions by County						
	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
Occupational Status							
Full Time Farmer	69.1	58.1	42.9	52.0	55.3	67.6	58.0
Full Time Off Farm Employment	11.8	15.2	14.5	19.5	13.2	8.1	14.3
Part Time Farmer	17.3	25.7	40.6	25.2	28.9	21.6	25.4
No Response	1.8	1.0	2.9	3.3	2.6	2.7	2.3
Number of Days/Year Part Time Farmer Works Off the Farm							
0-50 Days	11.1	17.9	7.1	8.6	41.7	12.5	13.6
51-100 Days	16.7	3.6	14.3	14.3	0.0	18.8	11.4
101-150 Days	44.4	0.0	17.9	14.3	8.3	18.8	15.9
151-200 Days	5.6	17.9	39.3	11.4	16.7	12.5	18.2
201-250 Days	22.2	60.7	21.4	51.4	33.3	37.5	40.9
No Response	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Type of Off Farm Employment							
Retired	9.4	4.7	7.9	5.5	6.3	9.1	6.8
Self-Employed	9.4	7.9	7.9	12.7	12.4	45.5	17.0
Professional	34.4	16.3	18.4	16.4	12.4	9.1	18.4
Para-Professional	12.5	20.9	10.5	12.7	6.3	13.6	13.6
Skilled Labor	9.4	7.0	13.2	16.4	6.3	0.0	10.2
Unskilled Labor	6.2	2.3	15.8	20.0	12.4	9.1	11.6
Government Agencies	3.1	7.0	10.5	12.7	6.3	0.0	7.8

TABLE XXVI (Continued)

Question	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
	Questionnaire Response Percent Distributions by County						
Type of Off Farm Employment (Continued)							
Student	0.0	0.0	0.0	0.0	18.8	0.0	10.5
No Response	15.6	18.6	15.8	3.6	18.8	13.6	13.1
Type of Farming Operation							
Family Farm	79.1	82.9	73.9	87.0	84.2	87.8	82.6
Partnership	14.5	7.6	15.9	9.8	10.5	10.8	11.4
Family Corporation	13.6	3.8	5.8	0.8	5.3	1.4	3.1
Corporate Farm	0.0	1.0	1.4	0.0	0.0	0.0	0.4
No Response	2.7	4.8	2.9	2.4	0.0	0.0	2.5
Place of Residence							
City or Town	40.9	37.1	40.6	19.5	57.9	44.6	36.8
Rural	59.1	62.9	58.0	79.7	39.5	55.4	62.6
No Response	0.0	0.0	1.4	0.8	2.6	0.0	0.6
Distance of Property from Permanent Place of Residence							
Adjacent to Residence	2.2	3.5	3.4	8.8	3.4	3.7	4.3
Less than 5 Miles	40.4	34.1	33.9	42.5	17.2	40.7	36.9
5-10 Miles	23.6	22.4	27.1	26.2	41.4	24.1	25.8
11-15 Miles	7.9	11.8	4.9	8.8	13.8	13.0	10.6
16-20 Miles	9.0	7.1	6.8	1.3	6.9	1.9	5.5

TABLE XXVI (Continued)

Question	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
	Questionnaire Response Percent Distributions by County						
<u>Distance of Property from Permanent Place of Residence</u> (Continued)							
Greater than 20 Miles	11.2	9.4	3.3	8.8	10.3	13.0	9.3
No Response	5.6	11.8	13.6	3.7	6.9	3.7	7.6
<u>Primary Reason for Land Purchase</u>							
Establish Own Farm	25.5	17.1	13.0	30.1	39.5	33.8	25.4
Expand Farming Operations	63.6	63.8	71.0	56.1	47.4	54.1	60.3
Investment	3.6	16.2	10.1	10.6	7.9	9.5	9.8
Non-Agricultural Development	0.0	0.0	1.5	0.0	5.3	0.0	0.6
Recreation or Second Homesite	1.8	2.9	0.0	0.0	0.0	1.4	1.2
Other	5.5	0.0	4.4	3.3	0.0	1.4	2.7
No Response	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<u>Sellers Reason for Selling Land</u>							
Estate Settlement	40.0	41.9	44.9	24.4	31.6	39.2	36.8
Off Farm Employment	3.6	2.9	4.3	4.9	5.3	2.7	3.9
Financial Difficulties	14.5	10.5	15.9	8.3	13.2	5.4	10.8
Retirement	20.0	21.0	14.5	30.1	23.7	33.8	24.1
Unknown	11.8	14.3	14.5	27.6	18.4	9.5	16.6
Other	8.2	9.5	5.8	4.9	7.9	9.5	7.5
No Response	0.0	0.0	0.0	0.0	0.0	0.0	0.4

TABLE XXVI (Continued)

Question	Questionnaire Response Percent Distributions by County						
	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
Acres Owned Prior to Purchase							
0-160 Acres	41.8	43.8	39.1	49.6	47.4	50.0	45.3
161-320 Acres	14.5	14.3	20.3	19.5	15.8	17.6	17.0
321-480 Acres	11.8	16.2	8.7	12.2	10.5	9.5	11.9
481-640 Acres	4.5	13.3	4.3	4.1	10.5	8.1	7.1
641-1000 Acres	15.5	5.7	5.8	8.9	10.5	8.1	9.2
1001-1500 Acres	4.5	3.8	2.9	3.3	2.6	2.7	3.5
More than 1500 Acres	5.5	2.9	14.5	2.4	2.6	4.1	5.0
No Response	1.8	0.0	4.3	0.0	0.0	0.0	1.0
Acres of Land Rented Prior to Purchase							
0-160 Acres	30.9	43.8	31.9	59.4	60.5	40.5	43.9
161-320 Acres	10.0	12.4	13.0	10.6	7.9	10.8	11.0
321-480 Acres	9.1	14.3	8.7	6.5	10.5	9.5	9.6
481-640 Acres	10.0	5.7	17.4	4.1	2.6	10.8	8.3
641-1000 Acres	12.7	16.2	17.4	10.6	5.3	13.5	13.1
1001-1500 Acres	19.1	3.8	7.2	1.6	2.6	5.4	7.1
More than 1500 Acres	7.3	3.8	4.3	4.9	10.5	9.5	6.2
No Response	0.9	0.0	0.0	2.4	0.0	0.0	0.8
Did Respondent Rent Property Prior to Purchase							
Yes	18.2	30.5	21.7	21.1	7.9	20.3	21.4
No	81.8	69.5	78.3	78.9	92.1	79.7	78.6
No Response	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE XXVI (Continued)

Question	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
	Questionnaire Response Percent Distributions by County						
Did Land Purchase Require Purchase of Additional Machinery							
Yes	11.8	11.4	15.9	22.8	28.9	23.0	17.7
No	88.2	88.6	84.1	77.2	68.4	77.0	82.1
No Response	0.0	0.0	0.0	0.0	2.6	0.0	0.2
Additional Machinery Investment Required[a]							
0-$10,000	2.7	5.7	7.2	15.4	13.2	5.4	7.9
$10,001-20,000	5.5	1.0	4.3	4.1	5.3	9.5	4.6
$20,001-30,000	0.0	1.9	4.3	0.8	7.9	4.1	2.3
$30,001-40,000	1.8	1.0	0.0	0.8	2.6	0.0	1.0
$40,001-50,000	0.0	0.0	0.0	1.6	2.6	1.4	0.8
Over $50,000	1.8	1.9	0.0	0.8	0.0	0.0	1.2
No Response	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ownership of Non-Farm Investments							
Yes	12.7	18.1	11.6	17.9	7.9	8.1	13.9
No	85.5	81.9	87.0	80.5	86.8	91.9	84.8
No Response	1.8	0.0	1.4	1.6	5.3	0.0	1.3
How Would Respondent Invest a Gift of $50,000							
Stocks	2.8	4.8	4.3	2.4	0.0	6.8	3.7
Bonds	7.3	10.5	5.8	3.3	7.9	5.4	6.6
Agricultural	87.2	81.9	87.0	92.7	86.8	86.5	87.3
No Response	2.8	2.9	2.9	1.6	5.3	1.4	2.5

TABLE XXVI (Continued)

Question	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
	Questionnaire Response Percent Distributions by County						
Respondent's Satisfaction with Land Purchase							
Yes	93.6	92.4	92.8	98.4	97.4	91.9	94.4
No	6.4	7.6	5.8	0.8	2.6	8.1	5.2
No Response	0.0	0.0	1.4	0.8	0.0	0.0	0.4
Respondent's Plans to Purchase Additional Land							
Yes	63.6	59.0	62.3	70.7	76.3	75.7	66.9
No	22.7	32.4	30.4	17.1	21.1	20.3	23.9
Undecided	13.6	8.6	5.8	12.2	2.6	4.1	9.1
No Response	0.0	0.0	1.4	0.0	0.0	0.0	0.2
Upon Termination of Land Ownership, Respondent's Choice of Land Transfer							
Transfer Land to Relative	75.5	72.4	72.5	73.2	81.6	68.9	73.4
Sell Land on Open Market	22.7	22.9	18.8	23.6	13.2	31.1	22.9
Other	1.9	1.9	4.3	1.6	0.0	0.0	1.7
No Response	0.0	2.9	4.3	1.6	5.3	0.0	1.9
Likelihood of Respondent's Relative to Maintain Ownership of Land[b]							
Yes	100.0	94.7	94.0	97.8	77.4	86.5	94.2
No	0.0	4.0	6.0	2.2	19.4	13.5	5.8
No Response	0.0	1.3	0.0	0.0	3.2	0.0	0.0

TABLE XXVI (Continued)

Question	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
	Questionnaire Response Percent Distributions by County						
Sex							
Male	94.5	87.6	94.2	91.9	92.1	98.6	92.9
Female	5.5	12.4	2.9	8.1	7.9	1.4	6.7
No Response	0.0	0.0	2.9	0.0	0.0	0.0	0.4
Marital Status							
Married	85.5	83.8	76.8	83.7	78.9	83.8	82.9
Single	5.5	8.6	2.9	5.7	13.2	9.5	6.9
No Response	9.1	7.6	20.3	10.6	7.9	6.8	10.2
Education							
Less than High School	3.6	6.7	7.2	9.8	5.3	9.5	7.1
High School	26.4	38.1	39.1	37.4	26.3	18.9	32.0
Some College	27.3	23.8	14.5	16.3	31.6	36.5	23.9
College Graduate	42.7	31.4	36.2	36.6	34.2	35.1	36.4
No Response	0.0	0.0	2.9	0.0	2.6	0.0	0.6
Current Age							
20-30	13.6	10.5	5.8	12.2	13.2	20.3	12.5
31-40	15.5	18.1	23.2	26.8	23.7	20.3	21.0
41-50	26.4	32.4	27.5	26.8	34.2	25.7	28.3
51-60	30.0	27.6	26.1	19.5	18.4	25.7	25.0
61-70	11.8	6.7	4.3	11.4	7.9	8.1	8.9
Over 70	1.8	2.9	8.7	3.3	2.6	0.0	3.1

TABLE XXVI (Continued)

Question	Questionnaire Response Percent Distributions by County						
	Alfalfa	Garfield	Blaine	Caddo	Jackson	Tillman	All Counties
Annual Taxable Income							
Less than $5,000	6.4	5.7	7.2	5.7	13.2	1.4	6.0
$5,000-$10,000	15.5	15.2	13.0	12.2	5.3	10.8	12.9
$10,001-$20,000	16.4	23.8	21.7	21.1	21.1	35.1	22.9
$20,001-$30,000	16.4	14.3	20.3	19.5	23.7	21.6	18.5
$30,001-$40,000	14.5	8.6	2.9	13.0	7.9	9.5	10.2
Over $40,000	24.5	20.0	20.3	25.2	21.1	21.6	22.5
No Response	6.4	12.4	14.5	3.3	7.9	0.0	7.1
Number of Respondents	110	105	69	123	38	74	519
Response Rate	49.5	44.9	41.6	43.0	33.3	42.5	43.4

[a]Expressed as a percentage of all respondents.

[b]Expressed as a percentage of those respondents indicating that land would be likely transferred to a relative.

VITA[2]

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