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Market for Agricultural Land in the Rural-Urban Fringe of Dothan, Alabama



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Market for Agricultural Land in the Rural-Urban Fringe of Dothan, Alabama¹

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INTRODUCTION

URBAN GROWTH has been accompanied by changes in land uses and variations in land values in rural-urban fringe areas throughout the South. Conversion of agricultural land to nonagricultural uses in an urbanizing area appears to have had a marked effect on nearby rural land values. Urban growth over the past few decades has also affected the availability of farmland in these localized markets. Frequently, what was once farmland becomes either transitional land or land converted to nonagricultural uses, such as residential areas or commercial development. This study analyzes shifts in agricultural land uses and values at the periphery of a moderately sized metropolitan area where urban growth has been experienced during the last two decades.

An analysis of a rural-urban fringe land market can be beneficial to members of both the rural and urban communities. Decision makers in all sectors of the economy need information about the transition of rural-urban fringe areas in order to better manage their land and related resources. Value-related information could be used by farmers to help forecast two important factors in production planning, the

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viability of alternative land uses and the value of the land itself. Also, government agencies at the national, state, and local levels develop land use policy based, in part, on available knowledge of land markets and the nature of the owners. Furthermore, knowledge of the land markets and the transitional process could provide governments with better projections of the property tax base and future revenues.

Political leaders at both the national and state levels are concerned about the adequacy of the U.S. agricultural land base for food and fiber at "reasonable" prices in the future (2). This national concern is valid, but more recent attention has been focused on the agricultural land bases near urbanizing areas (11). As an example, in June 1990, Delaware's House Agriculture Committee began writing the first of a two-phase Farm Preservation Act designed to protect farmland from overdevelopment caused by urbanization pressures. Also, many states have passed "Right to Farm" legislation to help guarantee that farmers are not forced out of business in these transitional and other areas. Local lawmakers use their knowledge of land markets to assist in making decisions regarding property valuation, tax treatment, and zoning restrictions.

As rural agricultural land is developed into nonagricultural uses and taxes rise in transitional areas, farmers are continuing to withdraw from agricultural production because of the high opportunity costs associated with urban-related demand for land. Although the current-use assessment alternative has helped farmers address taxation problems in Alabama and other states, higher land values associated with these changes have prompted many farmers to sell their land to capture the appreciated value.

Appraisers can also benefit from such a study of the factors affecting rural land values in the fringe area of a growing city. Rural appraisers are commonly confronted with the problem of estimating the value for such tracts. Appraisers often use income and market (sales comparison) approaches in this situation and find these two methods sometimes result in poor estimates of value because of the influence of nonagricultural factors. Statistical analyses to determine the factors explaining these changes in value in the fringe and their magnitudes can prove valuable to appraisers. By analyzing the number and nature of sales and estimating the

influence of such factors as location and other tract characteristics on the value of the land, the appraiser can possibly derive a more accurate estimate of the property's value.

RELATED LITERATURE

Numerous articles have been written that analyze and discuss factors which influence rural land values. The land market in the rural-urban fringe has been found to be affected by many factors, some of which relate to the income producing potential of the property, while other factors are associated with market forces and more aesthetic or psychological aspects of the property. A Texas study indicated that the primary reasons for purchasing rural land are for an investment, a hedge against inflation, a country retreat, a rural homesite, or a place for outdoor recreation, such as hunting or fishing (13). Other important reasons were to engage in farming or ranching, and to subdivide or develop the property for nonagricultural uses. The most frequently identified reasons for selling rural land near urban areas was "to make a profit" or to retire from farming. Bryant and Russwurm (3) conducted a survey in 1981 to identify the various motives for moving to the countryside. Their findings included reasons such as a desire for greater privacy, aesthetic perspectives associated with country living, and freedom of choice in land-use decisions.

Other studies examining the value and availability of agricultural land have been undertaken. In a study by Richetto (17), farmland along the Connecticut River Valley for 11 municipalities showed a 20 percent decrease in acreage from 1952 to 1972 because of urban pressures. Fishel (8) and Plaut (11) have shown that between 2 and 3 million acres are converted from agricultural to nonagricultural uses in the United States each year. The National Agricultural Land Study (NALS) estimated that 23 million acres of agricultural land were converted to nonagricultural uses between 1967 and 1975 (8).

The conversion of farmland to nonagricultural use in the rural-urban fringe has been brought about by many factors. Several studies have shown that increases in urban population and incomes have increased the demand for rural land. Population and income growth have increased the derived demand for all land through increased demand for food and

fiber, while also increasing the direct demand of rural land for residential, commercial, industrial, and recreational purposes (15). Bryant and Russwurm (3) found that, with increases in population and incomes, city dwellers are apt to migrate from the city to more rural environments. The consequences of increasing land values have been associated with changes in agricultural structure and a redistribution of income (12). Pyle (14) indicated that some of the reasons for migrating into the rural areas could be attributed to improved transportation and communication systems.

Demand for land arises from the various direct and derived uses to which land may be allocated. Residential, industrial, and recreational developments are forms of the direct demand for land. Derived demand is determined by the productive capacity of the land, its location, and other advantages inherent with the land, rather than the land itself. The combination of both the direct and derived demand for the property are reflected in the price levels. These price and availability changes in the rural-urban fringe have influenced the ownership, land use, and land values in several transitional areas in the South (15).

Several studies (5,7) indicated that land located in the fringe areas of metropolitan cities usually involves more capital intensive uses. Barlowe (1) argues that the conversion of agricultural land to nonagricultural uses is higher in urbanizing areas because the market will direct land to its highest and best use. Reynolds and Tower (15) found that distance to a major city has a negative effect on land values; that is, the greater the distance to the city, the lower the values. In a study of the rural-urban fringe area in Prince William County, Virginia, Clonts (6) also found that distance to the urban periphery and presence of an urban access highway affected land values. Dillman and Cousins (7) noted that accessibility to the property was a key determinant of land use decisions.

Agricultural land values in the rural-urban fringe can also be affected by the potential urban uses of the land. Shonkwiler and Reynolds (18) found that the potential-use valuation of a tract, when properly incorporated in a hedonic model, summarizes a host of factors which may not be directly observed or easily quantified. A study in Florida indicated that tracts with residential and commercial develop-

ment potential tend to have higher per acre values (16). A study conducted on the rural-urban fringe of Huntsville, Alabama, found that the degree of urban influence associated with agricultural land had a positive effect on land value (19). Lopez et al. (10) reported that speculation on future development potential can cause the market value of the land to rise above the rural value before the actual conversion takes place.

OBJECTIVES AND METHODS

Dothan, Alabama, has experienced urbanization pressures during the past 20 years, developing from a primarily agricultural economy to one of the fastest industrializing cities of its size in the Southeast. This developing economic center for the Wiregrass area has attracted an influx of individuals and industry which has resulted in substantial population growth, from 36,733 in 1970 to 53,589 in 1990. Migration of commercial and industrial organizations into this area also has created a stronger economy and has promoted higher incomes for residents. Increases in population and incomes have influenced the value of agricultural land surrounding the city.

An analysis of agricultural land markets and values in a transitional area such as Dothan can contribute to an enhanced understanding of the development process for small to mid-sized municipalities. The Dothan Metropolitan Statistical Area (MSA) is an area well suited for this type of study because of the importance of agriculture to the local economy and the relatively rapid population and economic growth experienced. Shifting patterns of land use and the relative importance of factors affecting land values can be evaluated and compared in the transitional area.

The primary objective of this study was to analyze the transitional nature of the agricultural land market in a rural-urban fringe and estimate the impact of selected factors affecting the price for agricultural land contiguous to a moderately sized city such as Dothan. Because the supply of land is relatively fixed in the short run, various demand-related factors were expected to be the primary determinants of agricultural land value in the rural-urban fringe, with development/urbanization factors being a component of this set.

Contributing factors were grouped into locational, physical, and sales characteristics associated with specific properties in the study area. Because a variety of social, political, and macro-economic factors have also affected this land market over time, a time trend variable was introduced to explain variation attributable to such factors as inflation, population, and incomes.

A pooled cross-sectional and time-series data set was collected using a survey of qualified (identified below) land transitions in the Dothan area during 1970-90. Attempts were made to include only "bona fide" sales (market transactions in which the price is derived in free and open negotiations between a well-informed seller who is able, willing, and under no compulsion to dispose of the property and a well-informed buyer who is able, willing, and under no compulsion to buy the property in question) of agricultural land. Other transactions, such as foreclosure sales, tax sales, and sales between relatives, were excluded from the data base.

The size of the tract and its location and primary uses were other key considerations for determining eligibility for the data base. The primary focus of this study centered around the conversion of agricultural land in transitional areas. Thus, land already used for nonagricultural purposes at the time of the sale was considered ineligible and, therefore, was not included in the sample. Also, tracts which were less than 4 acres in size were omitted because there is relatively no agricultural demand for such small acreage in this area. The 4-acre size limit was based on the smallest tract purchased for agricultural uses, as verified from responses provided in returned questionnaires.

Undeveloped property located in a residential subdivision or industrial park at the time of sale also was considered ineligible for inclusion because there would be little rational demand from the agricultural sector for such property. The rationale for this specific criterion is based on the fact that once these undeveloped tracts are classified as predominantly residential or commercial, they are technically no longer considered feasible for agricultural production due to high values initiated by the urban demand.

Other parcels excluded from the study were those inside the Ross Clark Circle, an urban highway system surrounding the central business district of Dothan. Many of the

tracts that were inside the city limits prior to 1970 were omitted from the sample because of the level of urbanization that had already occurred in this area. Although there is some agricultural land remaining in this area, the amount is limited. Thus, the primary tracts used in this study were immediately outside the 1970 Dothan city limits, up to 15 miles from the central business district of Dothan, the area believed to encompass land experiencing the effects of conversion of agricultural land to nonagricultural uses. The area comprised parts of Geneva, Dale, Henry, and Houston counties, with Houston County being dominant, figure 1.

The area encompassing the 15-mile radius of Dothan was divided into 20-acre segments, using a grid system, and these segments were numbered consecutively to facilitate sampling. The grid system separated the land sections in each township into 32 20-acre tracts. From these segments, a random sample of tracts was selected by computer, using a random number generating procedure. These 20-acre segments may have identified farms with hundreds of acres of land, as well as several smaller parcels that comprise the segment or join in that area.

Tract ownership and transfers for selected parcels from 1970 to 1990 were traced by examining Alabama property records located in the Revenue Commissioner's Office in the respective county courthouses. These property record cards contained information concerning tract ownership, ownership transfers, land use, appraised land values, value of improvements, and current-use assessment data. County deed records also were used to identify ownership transfers and possibly sale prices for the property. Estimates of market values were obtained by mail questionnaires sent to the respective landowners concerning value and use information for their land. Also, secondary market data compiled by the Federal Land Bank Association of South Alabama and First South Production Credit Association were used to supplement data collected from the survey respondents. Land schedule reports, which indicate values based on location, use, and topography factors, were obtained from the county tax assessors to assist in identifying valid market values for particular tracts.

Analyses were conducted for the Dothan fringe land market and the rural and urban components of this area. The

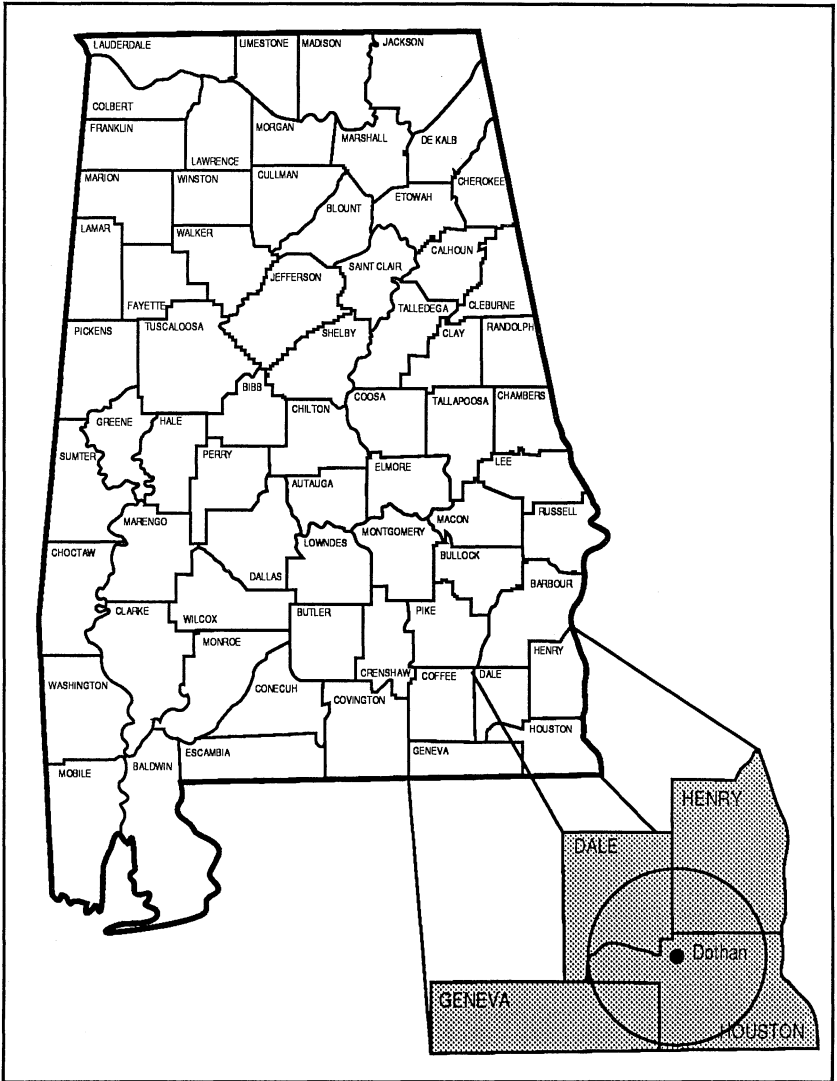


FIG. 1. Four-county study area surrounding Dothan, Alabama.

rural market, which included 101 observations located more than 8 miles from the central business district, was highly agriculturally oriented. This area is not included in the Dothan city limits and has not undergone the same degree of urbanization experienced by tracts in closer proximity to

Dothan. The urban segment, which included 42 observations, consisted of tracts within 8 miles of the central business district of Dothan.

STUDY AREA

Dothan is the major city in Houston County and serves as the economic center for the Wiregrass area of southeast Alabama. This area is home to a large, widely diversified, and stable industrial base, as well as an expansive agricultural sector. As a retail center for the area, the city serves 21 counties in southeast Alabama, southwest Georgia, and northwest Florida. The four counties which were at least partially included in the sampled area experienced an 18 percent increase in population between 1970 and 1990, about half the rate observed in Dothan.

Dothan is uniquely located for manufacturing and distribution because there is no other city of equal size within a 100-mile radius. The city is served by 4 railroads, 7 highways, 27 motor freight lines, an inland waterway system, and a regional airport. Dothan has 10 elementary schools, 4 middle schools, 2 senior high schools, 3 vocational schools, and 6 private schools. Some of the major manufactured products include automotive pulleys, latex products, tires, small motors, magnetic tapes, cigars, hair care products, fertilizers, plywood, and clothing. Agriculture is also an important component to the overall economy of Dothan and the surrounding area. The major income producing agricultural enterprises in the study area are peanuts, cattle, and broilers.

Farm numbers in each of the sampled counties have exhibited varying degrees of decline over the last three decades. Since 1964, these counties have experienced more than a 33 percent reduction in farm numbers. Houston and Henry counties experienced the greatest decline in the number of farms, about half.

The Wiregrass area is a part of the Coastal Plain belt, which consists of gently rolling to hilly woodlands that are dominated by pine trees. There are also large areas of open land used for cultivated crops and pasture. Deep soils with sandy surface layers are common. Within the 15-mile radius of Dothan, the soil and slope are fairly uniform with respect

to agricultural and timber uses. Therefore, the impacts of soil type and slope on value were not directly analyzed in this study, though land use variables served as proxies to reflect some variation in soil capability.

MODEL SPECIFICATION

Variations in land values in the Dothan rural-urban fringe were specified as being a function of variables which could be broadly classified as locational, physical, and sale. Three models were estimated using pooled cross-sectional and time-series data obtained from questionnaires received from a random sample of 143 owners of tracts in the study area. The first model, the fringe, represented the entire 15-mile radius around the center of Dothan, while the other models were urban and rural components of the overall model. The urban model represented parcels within 8 miles of Dothan's central business district, the distance within which location relative to the city had a significant impact on value as derived from the overall model. The urban model subsample included 42 tracts which were considered to have a higher degree of urban influence than tracts located in the rural segment. While this model was denoted as being urban, all of the 42 tracts were in agricultural uses at the time of purchase. The third model, the rural component, attempted to isolate the level of urban influence on value of land in the agricultural periphery. The results of the component models were compared to better understand the factors affecting each sub-sector of the rural-urban fringe. The nature of estimated models was conditioned by previous related research, knowledge of the subject land market, economic and related theory, and statistical considerations. The fringe land value model was specified as follows:

$$\begin{aligned}
 \text{BLVPA} = & b_0 + b_1\text{DISTDO} + b_2\text{DISTDOQ} + b_3\text{DISTUSHY} \\
 & + b_4\text{DISTHYQ} + b_5\text{SW} + b_6\text{SE} + b_7\text{NE} + b_8\text{SZ} \\
 & + b_9\text{SZQ} + b_{10}\text{PCTROW} + b_{11}\text{PCTPAST} + b_{12}\text{PRF} \\
 & + b_{13}\text{PNDSTRM} + b_{14}\text{URBANINF} \\
 & + b_{15}\text{TMTREND} + e_i;
 \end{aligned}$$

where,

BLVPA = bareland value per acre (value adjusted for residential and farm improvements, merchantable timber, and peanut quota available on the tract);

b_0 = an intercept term;

location variables are,

DISTDO = straight-line distance from the tract to the center of Dothan, Alabama (Metropolitan Area);

DISTDOQ = distance to Dothan squared;

DISTUSHY = distance to nearest U.S. highway;

DISTHYQ = distance to U.S. highway squared;

SW = 1 if the property was located southwest of the city of Dothan and 0 if otherwise (Northwest = base);

SE = 1 if the property was located southeast of the city of Dothan and 0 if otherwise (Northwest = base);

NE = 1 if the property was located northeast of the city of Dothan and 0 if otherwise (Northwest = base);

physical characteristics are,

SZ = size of the tract in acres;

SZQ = tract size squared;

PCTROW = percent of tract in cultivation (percent in timber = base);

PCTPAST = percent of tract in pasture (percent in timber = base);

PRF = 1 if the property had any type of paved road frontage at the time of purchase and 0 if otherwise;

PNDSTRM = 1 if a pond or all-weather stream was present on the property and 0 if otherwise;

and sales characteristics are,

URBANINF = 1 if the property was directly influenced by residential, commercial, or industrial development and 0 if otherwise;

TMTREND = annual time trend variable;

e_i = error term assumed to be independent, normally distributed, with a mean of 0, and a homogeneous variance.

Locational Factors

Locational factors tend to be extremely important in defining the value of land. Location of property can be classified in terms of where the tract is situated with respect to population centers, transportation routes, markets, or other areas where the demand would be more intense. Both distance and the quality of access are important. The characteristics of the area near the property also are key determinants for defining the desirability of alternative locations. Both of these locational aspects were used in evaluating relevant location variables.

Distance to Dothan (DISTDO) should have an inverse relationship with value because of the higher opportunity costs associated with alternative uses of the property near the city. Tracts of land located closer to an urban center have the potential for more intense uses beyond agricultural production, such as residential, commercial, or industrial development. A curvilinear relationship was specified to test whether values declined more rapidly in close proximity to the city. If such a relationship holds, the coefficient for DISTDOQ will be positive, while the DISTDO coefficient will be negative.

Distance to a major U.S. highway (DISTUSHY) should also have a negative impact on land values; that is, the greater the distance to an urban access highway, the lower the price per acre for the land. Such a relationship relates to accessibility of the property and costs and time requirements for commuting to work, shops, schools, etc. Also, location closer to a major highway would be of an advantage for residential, commercial, and industrial uses because of the benefit of easy access. A curvilinear relationship also was formulated in the model to reflect the nonconstant rate of change between distance to a U.S. highway and value per acre. Since the impact of a major U.S. highway was expected to decrease at a decreasing rate, the parameter estimates for DISTUSHY and DISTHYQ were expected to be negative and positive, respectively.

Dothan is similar to many other cities in the United States that exhibit growth in certain distinct patterns and directions. Many large metropolitan areas have defined areas for industrial, residential, and commercial development, which often relate to zoning regulations, natural barriers, and other aspects, such as traditional land use development patterns, transportation routes, etc. Many cities have well defined high rent districts or subdivisions which attract the more affluent residents.

The northwest section of Dothan has traditionally included the highest valued residential property in the city. Many of the subdivisions in this area have minimum square footage requirements that limit lower valued houses from being developed (9). This type of restriction maintains the property values in these subdivisions, and also limits the ability of lower income families to locate there. The northwest section not only contains the majority of higher valued residential property, but also includes much of the middle income residential subdivisions around the Dothan area.

Much of the commercial development has followed this residential growth pattern. Retail stores, shopping malls, etc. have been more intensively located in this section because of the potential for customers. The northwest section of Dothan has incurred the largest amount of growth and annexation of any section in the study area since 1970 which has resulted in substantial appreciation in land values over the last 20 years. Undeveloped agricultural land located to the northwest of Dothan also should reflect this kind of appreciation in value but to a lesser degree. Because of this directed growth, tracts located in the southeast, southwest, and northeast quadrants should have lower values when compared to tracts in the northwest section.

Physical Characteristics

Physical characteristics of land are the features or attributes which are below the surface, part of the surface, or attached to the surface of the earth. These characteristics may include any attribute associated with the land itself which influences its use and resulting value. For instance, tract size (SZ) is a key physical factor. As tract size increases, so does the initial investment or money outlay for

purchase. Large financial expenditures limit some potential buyers in the market due to the financial constraint. Also, high valued uses of land, such as residential or industrial development, generally require less acreage than do farming and other lower valued uses. Tract size is hypothesized to reflect a curvilinear relationship, with value per acre declining more slowly as tract size increases. Therefore, the coefficient for SZ was expected to have a negative sign, while the coefficient for tract size squared (SZQ) was expected to be positive.

Use of a tract is a physical characteristic which influences value. When evaluated in relation to forest use, percent of a tract in cultivation (PCTROW) and percent of a tract in pasture (PCTPAST) were expected to show a positive impact on value. Generally, these are more intensive agricultural uses of the land than timber production and should result in higher net returns and land values. Another explanation for the higher values would relate to nonagricultural demand for such tracts. These open land areas would require only minimal clearing costs if they were to be used for residential or commercial purposes. Therefore, the parameter estimates for PCTROW and PCTPAST were expected to be positive when compared to woodland and, furthermore, the coefficient for PCTROW would be expected to be larger than that for PCTPAST because row crop production generally generates higher net returns to the land.

Tracts with paved road frontage (PRF) are more accessible and generally have a greater number of uses than property lacking such access. This relationship would be especially true in the rural-urban fringe, where nonagricultural development is prevalent. Thus, the parameter estimate for PRF was hypothesized to be positive.

Presence of an all-weather stream or pond (PNDSTRM) on the property was expected to positively influence land value. A natural water source on the property would offer potential for irrigation, pond construction, or recreation.

Sale Characteristics

Sale characteristics are the particular conditions present in a market or for a tract of land which influence how a buyer or seller perceives the attractiveness of the land. The level of urban influence variable (URBANINF) was formu-

lated to estimate the impact that potential for agricultural land being converted to residential, commercial, or industrial uses would have on value. Previous studies have indicated that land that has the potential to be converted to these urban uses sells for a significantly higher price (16). This transitional factor was based on tracts of agricultural land that were developed into residential, commercial, or industrial uses after the property was sold and was designed to detect urban influence in cases where the distance to Dothan (DISTDO), distance to a major U.S. highway (DISTUSHY), and other urban related variables were insufficient for detecting a high value associated with urban demand. Therefore, the URBANINF variable was expected to have a positive impact on value.

A time trend variable (TMTREND) was introduced into the model to explain variations in land values attributable to Dothan's growth and inflationary pressures over the last 20 years. Because Dothan has had a 74 percent increase in population since 1970 and inflationary pressures have been present, a positive coefficient was expected.

The fringe data set was separated into subsets, urban and rural, based on the impact of location of the tract relative to the central business district of Dothan. The models used for comparing the rural and urban sectors of the Dothan rural-urban fringe were specified similarly to the overall model with the exceptions of deletion of curvilinear terms for DISTDO and DISTUSHY variables, the variables for locational quadrants for Dothan, and the variable representing presence of an all-weather pond or stream. These specifications were designed to permit a more detailed analysis of differences between the two markets and lessen multicollinearity in the component models.

RESULTS

General

Distance from each tract to the center of Dothan ranged from 3 to 15 miles, with an average of 10.4 miles, table 1. For the urban and rural segments, average distances to Dothan were 5.3 and 12.4 miles, respectively. Many of the tracts were in close proximity to a U.S. or Alabama highway. Overall, these distances averaged 3.6 and 1.9 miles, respec-

tively, for tracts in the fringe area, 1.7 and 1.2 miles for the urban segment, respectively, and 4.3 and 2.2 for the rural segment. Highway 231 is one of the most traveled highways in south Alabama based on average daily traffic counts. Overall, parcels were 8.8 miles from Highway 231. Rural parcels were typically more than twice as far as urban parcels from this major transportation route.

TABLE 1. LOCATIONAL CHARACTERISTICS OF AGRICULTURAL LAND TRANSFERS IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, FOR URBAN, RURAL, AND FRINGE MARKET SEGMENTS, 1970-90

Characteristic	Unit	Market segment ¹		
		Urban	Rural	Fringe
Distance to:				
Dothan	mi.	5.3	12.4	10.4
Major U.S. highway	mi.	1.7	4.3	3.6
Ross Clark Circle	mi.	3.2	10.3	8.2
Nearest State highway	mi.	1.2	2.2	1.9
U.S. Highway 231 North	mi.	4.6	10.5	8.8
Nearest town with pop. > 2,000	mi.	4.6	5.6	5.3
Dothan airport	mi.	7.3	12.1	10.7
Tracts located in:				
Northeast quadrant of Dothan	pct.	21.0	31.0	28.0
Northwest quadrant of Dothan	pct.	43.0	32.0	35.6
Southeast quadrant of Dothan	pct.	19.0	9.0	11.9
Southwest quadrant of Dothan	pct.	17.0	28.0	24.5

¹Sample sizes are 42, 101, and 143 for the urban, rural, and fringe market segments, respectively. The fringe market is composed of the urban and rural segments.

Several towns in the area in addition to Dothan had populations of more than 2,000, such as Slocomb (2,153), Headland (3,327), Midland City (2,003), and Ashford (2,165). Tracts included in the analysis were typically within 5 miles of a city with more than 2,000 population, regardless of the urban or rural orientation of the land market, table 1.

Average tract size was 82 acres for the fringe market and 57 and 93 acres for the urban and rural components, table 2. Cropland and woodland were major uses of the land in the fringe area. Interestingly, allocation of tracts to cultivation claimed a larger portion of the tracts in the urban segment. Woodland use was consistent for tracts within each segment, claiming about a third of the tract.

For the overall fringe area, about a fifth of the tracts had community water service, table 2. However, as would be expected, tracts located in the urban segment were four times more likely to have public water than rural tracts. A well developed transportation system was apparent within the fringe area of Dothan, with about three-fourths of the tracts having paved road frontage. Such access was not greatly different between the urban and rural segments of the fringe area. About a fifth of the tracts had a house present and there was generally no difference between tracts in the rural and urban segments with respect to presence of a house on the tract.

TABLE 2. PHYSICAL CHARACTERISTICS OF AGRICULTURAL LAND TRANSFERS IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, FOR URBAN, RURAL, AND FRINGE MARKET SEGMENTS, 1970-90

Characteristic	Unit	Market segment ¹		
		Urban	Rural	Fringe
Tract size	ac.	56.8	92.6	82.1
Cropland	ac.	27.4	36.4	33.8
Pasture	ac.	9.7	15.9	14.1
Woodland	ac.	19.7	39.8	33.9
Percent of tract in:				
Cultivation	pct.	55.0	46.0	49.0
Pasture	pct.	11.0	19.0	17.0
Woodland	pct.	34.0	34.0	34.0
Tracts with:				
Community water service	pct.	41.0	10.0	19.0
Paved road frontage	pct.	88.0	70.0	76.0
House on property	pct.	19.0	22.0	21.0

¹Sample sizes are 42, 101, and 143 for the urban, rural, and fringe market segments, respectively. The fringe market is composed of the urban and rural segments.

For the fringe area, bare land value of agricultural land ranged from \$167 to \$5,600 per acre, with an average of \$1,227, table 3. The value of timber averaged \$25 per acre and the value of peanut quota averaged \$152 per acre for those with a quota base. Tracts in the urban segment had bare land values ranging from \$400 to \$5,600 per acre and averaging \$2,282. Rural tracts had an average of \$788 per acre, with a range from \$167 to \$3,000 per acre.

In the fringe, 36 percent of the transactions were consummated using a real estate agency, table 3. Fifty-two percent of the transactions in the urban segment and 30 percent in the rural segment involved real estate agencies. About a fifth

TABLE 3. SALE CHARACTERISTICS OF AGRICULTURAL LAND TRANSFERS IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, FOR URBAN, RURAL, AND FRINGE MARKET SEGMENTS, 1970-90

Characteristic	Unit	Market segment ¹		
		Urban	Rural	Fringe
Value per acre for:				
Bare land	dol.	2,282	788	1,227
Timber	dol.	11	31	25
Peanut quota	dol.	180	145	152
Transactions negotiated				
with real estate agency	pct.	52	30	36
Cash transaction	pct.	17	25	22
Transaction financed by:				
Local bank	pct.	46	36	40
Seller	pct.	31	33	32
FLB or PCA	pct.	14	14	14
FmHA	pct.	3	8	7
Other	pct.	6	9	7
Tracts experiencing				
direct urban influence	pct.	24	11	15

¹Sample sizes are 42, 101, and 143 for the urban, rural, and fringe market segments, respectively. The fringe market is composed of the urban and rural segments.

of the transactions were for cash in the fringe area. Transactions in the rural segment were slightly more inclined to be for cash. Local banks and sellers were primary sources for financing these land transfers, accounting for two-thirds to three-fourths of the transactions. Local bank financing was most prevalent for transfers in the urban segment, accounting for 46 percent of the total transactions financed.

As would be expected, tracts experiencing direct urban influences were most common in the urban segment of the fringe (24 percent). Fifteen percent of the tracts in the overall fringe were experiencing such pressures, while, in the rural segment, 11 percent had direct urban pressures.

Land transfers in the fringe were about equally divided between buyers having farm and nonfarm interests, table 4. Twenty-nine percent of the farm oriented buyers in the fringe were full-time farmers, while 18 percent were part-time farmers. Nonfarm interests were much more prevalent in the urban segment, affecting two-thirds of the transactions. In the fringe, half of the buyers identified the reason for purchasing the tract as being related to farming, while slightly less than a third of the buyers in the urban segment offered this motive.

For the fringe, nearly twice as many buyers perceived the area surrounding the parcel they purchased to be rural rather than urban oriented, table 4. In the urban segment, about a fourth each of the buyers perceived the area to be rural or urban and the remaining half defined the area as being a mix of rural and urban interests. In the rural segment, three-fourths of the buyers perceived the area to be rural, while the rest recognized a mixed rural-urban orientation.

TABLE 4. CHARACTERISTICS OF BUYERS INVOLVED WITH AGRICULTURAL LAND TRANSFERS IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, FOR URBAN, RURAL, AND FRINGE MARKET SEGMENTS, 1970-90

Characteristic	Unit	Market segment ¹		
		Urban	Rural	Fringe
Occupation:				
Full-time farmer	pct.	19	33	29
Part-time farmer	pct.	14	20	18
Nonfarm	pct.	67	47	53
Reason for purchase:				
Agriculturally related	pct.	31	60	50
Perception of surrounding property:				
Rural	pct.	29	74	60
Urban	pct.	26	0	8
Mixed	pct.	45	26	32
Year property transferred:				
1970-79	pct.	21	14	16
1980-90	pct.	79	86	84

¹Sample sizes are 42, 101, and 143 for the urban, rural, and fringe market segments, respectively. The fringe market is composed of the urban and rural segments.

Much of the activity in the fringe agricultural market occurred in the 1980's. Eighty-four percent of the transactions were between 1980 and 1990, table 4. The market for agricultural land in the urban segment was somewhat more active in the 1970's, 21 versus 14 percent of the transactions in the rural segment.

Land Use Transition and Urbanization

In analyzing land use transition in the rural-urban fringe, surveyed tracts were classified according to their dominant use at the time of purchase and this use was compared to the dominant use when the parcel was sold or, as of 1990, if it had not been sold. The goal was to distinguish between tracts primarily used for urban purposes (residential, commercial, or industrial) and tracts which were primarily still

used for farming or other agricultural purposes. Some of the tracts which were used for agricultural purposes had a house on the property. Because these properties did not have the same urbanization influence as a subdivision use, they were classified as a mixed farm/rural residence use. The classification of dominant use of the tract was based on what the owner stated as the primary use of the tract when it was purchased.

Some of the property owners considered their property to be a mixed farm use, while others considered it to be primarily residential. To provide a more uniform criterion for defining dominant use of a tract, a comparison was made between the owner's identified dominant use and the county appraiser's classification of what the dominant use was as specified on the property record cards. For example, a buyer purchases 20 acres of undeveloped, agricultural land and states that its primary use was residential. To compare this type of use with that of 20 acres of land purchased to build a residential subdivision, property records were examined to confirm the most accurate classification of dominant land use on the specific property. Because subdivision development would have a greater influence on value, the rural residences with greater than 75 percent in cultivated, pasture, or timber land were classified as a mixed farm/rural residence use. This category provided results which could easily be distinguished from tracts with a higher valued urban influence, such as a subdivision. The mixed farm/rural residence category also was used to represent tracts that had no dominant agricultural use that accounted for more than 75 percent of the acreage in the tract.

Results from the 143 surveyed tracts in the fringe area indicated that 21 tracts, representing 9 percent of the acreage surveyed, were developed into nonagricultural uses between 1970 and 1990, table 5. Of these 21 tracts, 10 tracts (48 percent) came from land that was previously used for row crops, 3 tracts (14 percent) came from pasture uses, 5 tracts (24 percent) came from mixed farm/rural residence uses, and 3 tracts (14 percent) came from land that was previously dominated by timber uses. A review of the transition by year indicated that two-thirds of the conversions in use to the residential/commercial/industrial category occurred after 1983. Thus, it is probable that urban pressures are just be-

TABLE 5. CHANGES IN DOMINANT LAND USE OF AGRICULTURAL LAND TRANSFERS IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Initial use ²	Dominant land use when the property was sold, ¹ number of tracts					
	Row crop	Pasture	Mixed farm/ rural residence	Timber	Residential/ commercial/ industrial ³	
	No.	No.	No.	No.	No.	
Row crop	58 (41%)	42 (72%)	1 (2%)	4 (6%)	1 (2%)	10 (18%)
Pasture	14 (10%)	0 (0%)	10 (72%)	1 (7%)	0 (0%)	3 (21%)
Mixed farm/ rural residence	42 (29%)	1 (2%)	2 (5%)	32 (76%)	2 (5%)	5 (12%)
Timber	29 (20%)	1 (3%)	0 (0%)	2 (3%)	24 (83%)	3 (11%)
Total	143 (100%)	44 (31%)	13 (9%)	38 (26%)	27 (19%)	21 (15%)

¹Figures indicate the number and percentage () of the total tracts classified by their dominant use at sale, or as of 1990.

²Figures indicate the number and percentage of the total tracts classified by dominant use when the property was purchased.

³Represent nonagricultural uses.

ginning to become important in the agricultural land market in Dothan's fringe.

Such relationships would indicate that cultivated land, which is often prime land, was the most attractive land use category for transition to nonagricultural uses. Prime lands generally offer the best sites for development based on slope, drainage, and lack of clearing costs. A review of the soil survey maps to determine the amount of prime land in the 15-mile radius area of Dothan indicated that the majority of prime land was allocated to cultivation and not to pasture or timber uses.

Of the original 58 tracts classified as row crop land, 42 (72 percent) remained in cultivation, table 5. Ten (72 percent) of the 14 tracts classified as pasture remained in their initial use, 32 (76 percent) of the 42 tracts classified as a mixed farm/rural residence use remained in their initial use, and 24 (83 percent) of the 29 tracts classified as timberland remained in their initial use. Analyses of these percentages indicates that shifts of land to nonagricultural uses were occurring, but at a fairly slow pace.

In the rural sector, 11 percent of the 101 tracts shifted to intensive residential/commercial/industrial uses, table 6. When analyzing this 11 percent transition in land use in the rural sector, 36 percent (four tracts) transferred from mixed farm/rural residence uses. Many of these mixed farm/rural residences contained a mixture of open land and forest acreage. Much of the urban transition in the rural sector was in the form of residential development, cases in which presence of trees on the property would enhance the beauty of the landscape. Another 28 percent (three tracts) of the total transitional land came from row crop lands. Based on percentage results, the rural segment of the fringe remained agriculturally oriented over the 1970-90 period. Seventy-eight percent of the land in cultivation remained in its former dominant use, while 75 percent of the pastureland, 77 percent of the mixed farm/rural residences, and 78 percent of the timberlands remained in their original uses. Seventy-three percent of the conversions to residential/commercial/industrial uses in the rural sector occurred after 1983, further emphasizing the nascence of the urban impact in the agricultural land market in the fringe.

Analysis of land-use transitions in the urban sector indi-

TABLE 6. CHANGES IN DOMINANT LAND USE FOR AGRICULTURAL LAND TRANSFERS IN THE RURAL SECTOR OF THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Initial use ²	Dominant land use when the property was sold, ¹ number of tracts					
	Row crop	Pasture	Mixed farm/ rural residence	Timber	Residential/ commercial/ industrial ³	
	No.	No.	No.	No.	No.	
Row crop	35 (35%)	27 (78%)	1 (3%)	3 (8%)	1 (3%)	3 (8%)
Pasture	12 (11%)	0 (0%)	9 (75%)	1 (8%)	0 (0%)	2 (17%)
Mixed farm/ rural residence	36 (36%)	1 (3%)	1 (3%)	28 (77%)	2 (5%)	4 (12%)
Timber	18 (18%)	1 (5%)	0 (0%)	1 (5%)	14 (78%)	2 (12%)
Total	101 (100%)	29 (29%)	11 (11%)	33 (32%)	17 (17%)	11 (11%)

¹Figures indicate the number and percentage () of the total tracts classified by their dominant use at sale, or as of 1990.

²Figures indicate the number and percentage of the total tracts classified by dominant use when the property was purchased.

³Represent nonagricultural uses.

cated that the level of urbanization was much more intense than that revealed in the rural segment. Of the 42 agricultural tracts in the urban sector, 10 (24 percent) were developed into urban uses, with nearly two-thirds being converted after 1983, table 7. The majority of the land transferred to nonagricultural uses (70 percent) was previously used for row crops. This relationship can be attributed to greater levels of commercial and industrial property being developed within 8 miles of Dothan. Businesses would generally prefer to develop on open land with level slopes, rather than clearing and changing the topography. This lack of demand for timberland by developers is clearly indicated by the 91 percent of timberlands that remained in their original use.

Statistical Results

This section includes an analysis of the estimated impact of locational, physical, and sale characteristics of agricultural land on values in the rural-urban fringe of Dothan, Alabama, between 1970 and 1990. Three models (fringe, rural, and urban) were estimated. The fringe model is evaluated in the first subsection and the rural and urban models are evaluated in the latter subsections.

Fringe Model

The fringe model explained 69 percent of the variation in the bare land value of agricultural land in the rural-urban fringe of Dothan, table 8. Seven of the nine specified variables in the model were significant and all had expected coefficient signs.

The distance from the tract of land to Dothan (DISTDO and DISTDOQ) was an important variable affecting value. A curvilinear relationship was isolated reflecting a decreasing rate of change with greater distance. Value per acre evidenced much response to distance for tracts near Dothan and the rate of change leveled off at approximately 8 miles, other factors held constant, figure 2. For example, a typical tract to the northwest of Dothan located 5 miles from the city's center with paved road frontage and an urban influence would be expected to sell for \$2,757 per acre in 1991, while another tract with similar physical and sale characteristics but located 8 miles away from Dothan would sell for \$1,727 per acre. If this tract were located in the southeast quadrant and

TABLE 7. CHANGES IN DOMINANT LAND USE FOR AGRICULTURAL LAND TRANSFERS IN THE URBAN SECTOR OF THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Initial use ²	Dominant land use when the property was sold, ¹ number of tracts				
	Row crop	Pasture	Mixed farm/ rural residence	Timber	Residential/ commercial/ industrial ³
	No.	No.	No.	No.	No.
Row crop	23 (54%)	15 (65%)	0 (0%)	1 (4%)	7 (31%)
Pasture	2 (5%)	0 (0%)	1 (50%)	0 (0%)	1 (50%)
Mixed farm/ rural residence	6 (15%)	0 (0%)	1 (16%)	4 (66%)	1 (16%)
Timber	11 (26%)	0 (0%)	0 (0%)	10 (91%)	1 (9%)
Total	42 (100%)	15 (36%)	2 (4%)	5 (12%)	10 (24%)

¹Figures indicate the number and percentage () of the total tracts classified by their dominant use at sale, or as of 1990.

²Figures indicate the number and percentage of the total tracts classified by dominant use when the property was purchased.

³Represent nonagricultural uses.

TABLE 8. PARAMETER ESTIMATES AND STANDARD ERRORS FOR FACTORS INFLUENCING PER ACRE LAND VALUES IN THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Parameter	Estimate	Standard error
Intercept	4,770.79*	507.83
Distance to:		
Dothan (DISTDO)	-772.71*	102.95
Dothan squared (DISTDOQ)	33.04*	5.36
Major U.S. highway (DISTUSHY)	-234.75*	88.94
Major U.S. highway squared (DISTHYQ)	18.84***	10.21
Tract located:		
Northeast of Dothan (NE)	-150.82	154.59
Southeast of Dothan (SE)	-493.39**	195.68
Southwest of Dothan (SW)	-41.26	164.11
Tract size (SZ)	-1.70	1.40
Tract size squared (SZQ)	0.0013	0.0024
Percent of tract in cultivation (PCTROW)	371.32**	168.58
Pasture (PCTPAST)	336.06	240.17
Pond or stream on property (PNDSTRM)	136.08	140.30
Paved road frontage (PRF)	284.32**	149.35
Urban influence (URBANINF)	475.51*	178.08
Influence by year (TMTREND)	35.88	12.07
N (number of observations)		143
Coefficient of determination (R ²)69
Standard error of estimate (SEE)		671.60

*Significant at .01 level

**Significant at .05 level

***Significant at .10 level

lacked an urban influence, projected values would be \$1,789 at 5 miles and \$759 at 8 miles.

Distance to a major U.S. highway (DISTUSHY) was important in explaining the decrease in per acre land values. The significance of the curvilinear component (DISTHYQ) would further suggest that for each additional mile to a major highway, the value per acre decreased at a decreasing rate until only a small incremental change occurs after a distance of about 4 miles, figure 3. For example, a typical tract 1 mile from a major U.S. highway would sell for \$1,719 in 1991, while the price per acre would decrease about 25 percent (to \$1,292 per acre) for a similar tract located 4 miles from the highway. If the same parcel were located in the southeastern section from Dothan, values would be \$1,221 at 1 mile and \$799 at 4 miles.

Location of the tract in the northwest quadrant relative to Dothan was a significant factor affecting bare land value. Tracts of agricultural land, which were located southeast (SE) of the central business district of Dothan, averaged \$493 per acre less than similar property in the northwestern

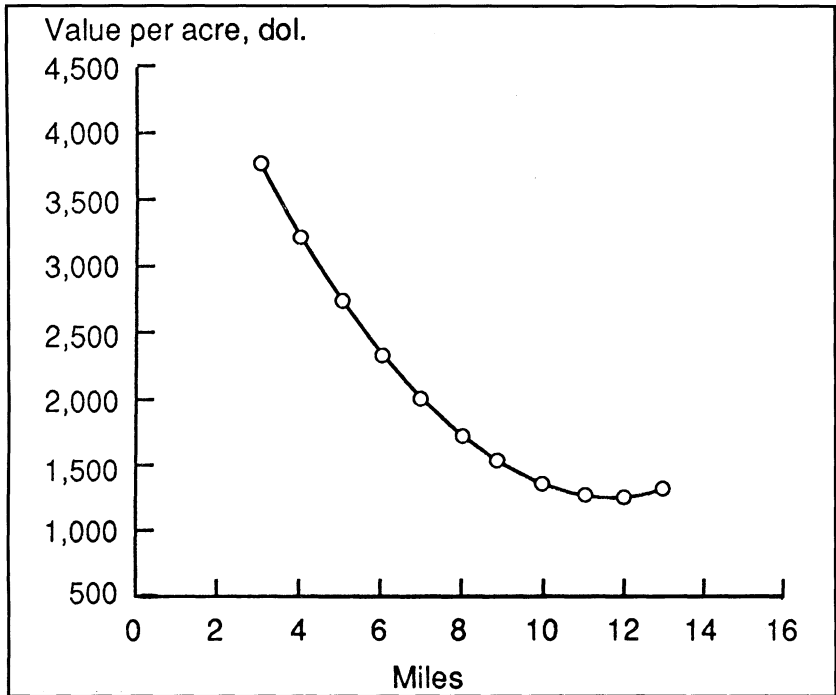


FIG. 2. Relationship of bare land value per acre and distance to the central business district for typical tracts of property with paved road frontage and urban influence in the rural-urban fringe of Dothan, Alabama, 1991.

section. In the fringe, values were consistent between tracts located in the northwest and the northeast and southwest quadrants.

The importance of agricultural use variables was also reflected in the results. Based on the income potential of the land, tracts that had a higher degree of capital intensive uses, such as row crop farming, resulted in higher values. Percent of tract in cultivation (PCTROW) had a positive impact on value relative to uses, such as timber. For each additional 1 percent of cultivated land on a tract, bare land value increased by \$3.71 per acre.

Presence of paved road frontage (PRF) on a tract influenced value, adding \$284 per acre to the value of the property relative to similar tracts lacking such frontage. Two key factors seemed to explain why this variable had such a positive impact on land value in the rural-urban fringe. First, the study indicated that 75 percent of the tracts surveyed

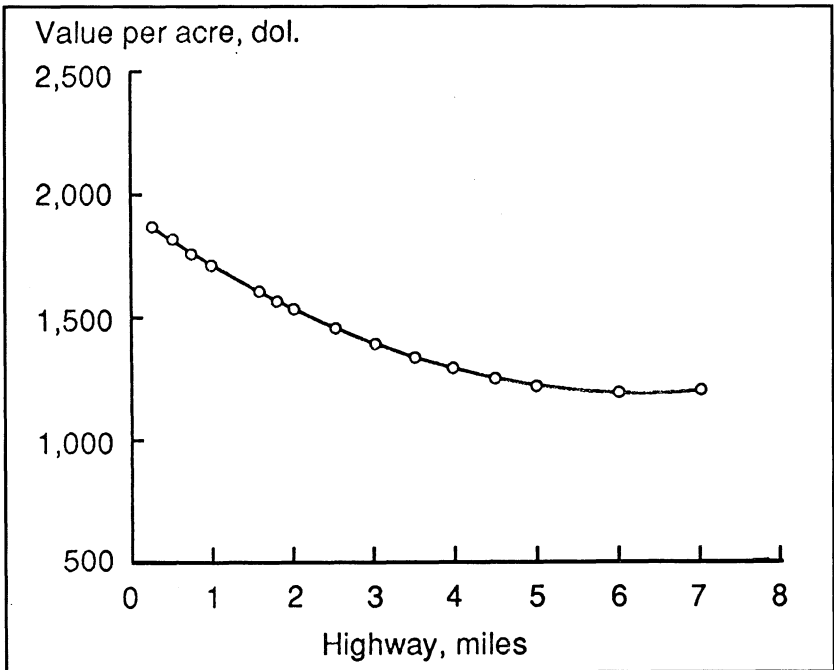


FIG. 3. Relationship of bare land value per acre and distance to a U.S. highway for typical tracts of property with paved road frontage and urban influence in the rural-urban fringe of Dothan, Alabama, 1991.

had paved road frontage and, second, the results also indicated that over 50 percent of the buyers stated their reason for purchasing the property was for nonagricultural purposes, which would generally benefit from such frontage.

The amount of urban influence (URBANINF), as measured by land use factors, also had a significant impact on agricultural land values in the rural-urban fringe. Relative to tracts that remained in agricultural uses, property which was developed into urban uses had values which averaged \$475.51 per acre higher.

The time trend variable (TMTREND) was developed to account for the effects of such factors as Dothan's growth and inflationary pressures in the market over the 1970-90 period. Over this period, the per acre value of agricultural land increased on an annual basis by \$35.88.

Rural Model

The rural model explained 48 percent of the variation in

per acre bare land values in the rural segment of the fringe, table 9. Six of the seven specified variables were significant. As was expected, distance to Dothan (DISTDO) did not significantly affect value for tracts located beyond 8 miles from the central city. However, location relative to a U.S. highway was important. Value declined by \$32 per acre per mile within the 10-mile range. A significant curvilinear relationship between value and distance to a U.S. highway was not isolated in the rural segment model and hence the square term was omitted.

TABLE 9. PARAMETER ESTIMATES AND STANDARD ERRORS FOR FACTORS INFLUENCING PER ACRE BARE LAND VALUES IN THE RURAL SEGMENT OF THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Parameter	Estimate	Standard error
Intercept	401.15	247.38
Distance to Dothan (DISTDO)	6.32	16.56
Distance to major U.S. highway (DISTUSHY) ...	-32.44*	13.95
Tract size (SZ)	-2.15*	0.67
Tract size squared (SZQ)	0.0027**	0.0012
Percent of tract in cultivation (PCTROW)	319.53*	97.83
Percent of tract in pasture (PCTPAST)	178.57	127.81
Paved road frontage (PRF)	242.13*	73.39
Urban influence (URBANINF)	404.52*	110.95
Influence by year (TMTREND)	12.12***	6.64
N (number of observations)		101
Coefficient of determination (R ²)48
Standard error of estimate (SEE)		312.96

*Significant at .01 level

**Significant at .05 level

***Significant at .10 level

Tract size (SZ) had a significant impact on agricultural land value in the rural sector of the fringe; as size of a tract increased, value per acre of agricultural land decreased at a declining rate. With all factors except tract size held constant, for example, a typical 10-acre tract of land with paved road frontage would be expected to sell for \$996 per acre and a 100 acre tract would sell for \$829 per acre (a 17 percent decrease in value). If these tracts had a direct urban influence, values would have been \$1,401 per acre for the 10-acre tract and \$1,234 for the 100-acre tract. Above 300 acres in size, the per acre value for agricultural land became fairly stable and the percentage change in price due to changes in size were relatively small.

The importance of agricultural use variables was reflected by the percent of a tract in cultivation (PCTROW). When

compared to timber use, each percentage point increase in cultivated land on a tract increased bare land value by \$3.19 per acre. This change in value can be associated with the direct income-producing ability of cultivated land used for row crops, especially peanuts. The impact of percent of a tract in pasture or timber on value was similar in the rural sector.

Paved road frontage (PRF) also influenced the per acre value in the rural sector. When evaluated in comparison to tracts without any type of paved road frontage, the presence of paved road frontage added \$242.13 per acre to the value of the property. At least 70 percent of the tracts in the rural sector had some type of paved road frontage.

The amount of urban influence (URBANINF) on agricultural land in the rural sector had a significant impact on land values, explaining 19 percent of the variation in bare land values. Relative to tracts where farming remained the primary use, property that was developed into nonagricultural uses had values that were on average \$404.52 per acre higher.

The time variable (TMTREND) indicated that agricultural land value increased over the 1970-90 period by \$12.12 per acre per year in nominal terms. This variable reflected such factors as growth in the area and inflation during the 1970-90 time frame.

Urban Model

The urban and rural models were specified identically to facilitate a comparison of the effects of the selected variables in the two respective market segments. Variables in the urban model explained 65 percent of the variation in per acre bare land values (BLVPA), table 10. Three of the seven selected variables were significant and all but one had appropriate expected signs.

As anticipated, distance to Dothan (DISTDO) had an inverse relationship with value; that is, as the distance to Dothan increased, the value of the land decreased. Within this 8-mile radial distance from the center of Dothan, every 1-mile increase in distance resulted in a decrease in land value of \$528 per acre. A curvilinear relationship was not isolated within this range.

Another locational factor that was important in influencing value in the urban sector was the distance to a major

TABLE 10. PARAMETER ESTIMATES AND STANDARD ERRORS FOR FACTORS INFLUENCING PER ACRE BARE LAND VALUES IN THE URBAN SECTOR OF THE RURAL-URBAN FRINGE OF DOTHAN, ALABAMA, 1970-90

Parameter	Estimate	Standard error
Intercept	2,770.79**	1,114.49
Distance to Dothan (DISTDO)	-528.43*	133.05
Distance to major U.S. highway (DISTUSHY) ...	-372.42***	191.86
Tract size (SZ)	18.59	12.61
Tract size squared (SZQ)	-0.0764	0.0610
Percent of tract in cultivation (PCTROW)	623.57	473.17
Percent of tract in pasture (PCTPAST)	421.92	799.19
Paved road frontage (PRF)	370.05	616.07
Urban influence (URBANINF)	596.87	463.31
Influence by year (TMTREND)	87.68**	39.53
N (number of observations)		42
Coefficient of determination (R ²)65
Standard error of estimate (SEE)		1,047.33

*Significant at .01 level
 **Significant at .05 level
 ***Significant at .10 level

U.S. highway (DISTUSHY). As the distance between a major U.S. highway and a tract of agricultural land in the urban sector increased, bare land value per acre decreased \$372 per mile. Again, a linear function was sufficient to explain the variation in value within the 8-mile range of the city.

Dothan's growth and the impact of inflation on agricultural land values in the urban segment of the fringe was important. The time variable (TMTREND) indicated that land values increased on an annual basis by \$87.68 per acre within the urban segment of the fringe, other factors held constant.

Model Considerations

In specifying the variables for each of the respective models, care was taken to avoid problems with multicollinearity; that is, a high degree of relationship between explanatory variables. From the data base, a few of the variables had a close linear association with some of the other more important ones. The distance to Dothan variable was a dominant factor affecting value, but was highly correlated with some of the other physical and sale characteristic variables in the data set, such as use of a real estate agency, presence of a community water service, and distance to the nearest town with a population greater than 2,000. Services such as use of a real estate agency and availability of public water were common for tracts in proximity to the central city. A large

majority of the tracts which were closer to Dothan identified Dothan as the nearest town with a population of more than 2,000. Therefore, entry of these variables into the model would result in redundant measures of the variation of distance to Dothan. Multicollinearity would result and specification of the individual impacts of the variables would be difficult. Thus, they were excluded from the estimated model.

Peanut acreage and peanut poundage quota associated with a tract of agricultural land were believed to be important determinants of land values, but these factors had a high degree of linear association with the percentage of land in cultivation and tract size. The relationships can be attributed to the fact that much of the cultivated land in this area is utilized for peanut production. Because of nematode problems associated with producing peanuts on the same acreage every year, rotational practices are necessary. This rotational program would result in additional acreage being needed on a farm to meet peanut quota levels and maximize desired returns. Because of the additional acreage requirements necessary for peanut production, poundage quota was determined to be correlated with tract size and percent row crop and thus could not be effectively included in the models.

SUMMARY AND CONCLUSIONS

This study analyzed the impact of economic activity in a moderately sized city on the use and value of agricultural land located in the nearby fringe area. The influence of population centers on land value stems from the basic economic elements of supply and demand. Agricultural land near these larger cities provides benefits to other sectors of the population in addition to the farming community. Property needed for residential, commercial, and industrial development in cities and fringe areas has created a high demand for nearby rural land. This relationship is apparent in increased per acre values and shifts in land use in these urbanizing areas.

Primary data for this study were derived from a random sample of land transactions which had taken place between 1970 and 1990. Previous and current landowners were interviewed by mail questionnaires to collect value and use information for these transactions, along with other characteristics of the subject properties. Supplemental data from the

Revenue Commissioner's Office (mapping and appraisal) in each of the counties were also obtained to assist in this analysis. The study area comprised a 15-mile radius around the center of Dothan. Analyses of land transactions involving agricultural land in the fringe area were conducted, in addition to specific studies of the rural and urban components of this area. The rural sector consisted of 101 tracts which were at least 8 miles from the center of Dothan, while the urban sector consisted of 42 tracts within an 8-mile radius of the center of Dothan. The distance delineation of 8 miles was derived from initial estimates from the fringe model that indicated that the distance to Dothan variable became insignificant at about 8 miles. Rural and urban segments of the fringe were analyzed in an effort to determine the effects of similar variables in each market area.

Some of the most notable findings from the general characteristics analysis included the number of tracts purchased for nonagricultural purposes. Fifty percent of the properties in the rural-urban fringe that were sold between 1970 and 1990 were purchased for uses other than farming. Conversion of agricultural land to nonagricultural uses was most prominent during the latter part of the 1970-90 period. In the fringe, two-thirds of the parcels converted to nonagricultural uses were transferred after 1983. Similar percentages for the rural and urban segments were 73 and 60 percent, respectively. This higher level of nonagricultural influence in the urban sector translated into higher average per acre values: \$2,282 in the urban segment versus \$788 in the rural segment.

The rural-urban fringe of Dothan has not yet undergone the level of transition in use or incurred the loss in surrounding agricultural land that other larger cities in the United States have experienced. Based on the survey results, 21 of 143 (15 percent) surveyed tracts in the fringe area were developed into primarily residential, commercial, or industrial uses. The rural sector exhibited an even milder degree of land use transition, with only 11 percent (11 tracts) of the tracts being converted to nonagricultural uses. The urban sector experienced a higher degree of land use transition, with 24 percent (10 tracts) of the agricultural tracts surveyed being developed over the past 20 years.

When defining potential problems that may be associated

with development and loss of agricultural land in an urbanizing area, care should be taken in evaluating not only the quantity of agricultural land lost to urban uses, but also the quality of the land. From analysis of the soil survey reports, much of the prime agricultural land in the Dothan area was cultivated acreage. The analysis of land use transition in the fringe and urban sector indicated that 48 and 70 percent, respectively, of the tracts that were developed into intensive nonagricultural uses came from land that was previously used for cultivation. However, 72 percent of the cultivated land surveyed in the fringe remained in its original use after the property was transferred.

The fringe model was effective in explaining per acre bare land values for property located within a 15-mile radius of the center of Dothan. The model had favorable structural characteristics with good explanatory power. The seven significant variables, which explained 69 percent of the variation of agricultural land values in the rural-urban fringe, were distance to the center of Dothan, distance to a major U.S. highway, location relative to Dothan, percent in cultivation, presence of paved road frontage, urban influence, and time. Marginal impacts for distances to Dothan and a U.S. highway were found to decrease in magnitude up to about 8 and 4 miles, respectively.

Both the rural and urban models also performed well in explaining bare land value within their respective market segments, though multicollinearity affected the ability to isolate impacts of the respective variables. Variables analyzed in the rural and urban models explained 48 and 65 percent of the variation in per acre bare land values, respectively. As anticipated, the locational factors were the most significant in the fringe and urban sector models. The distance to Dothan variable alone explained 38 percent of the variation in land values in the fringe and 34 percent of the variation in the urban model. Alternative uses of a tract of land tend to be much greater near urban areas, which can affect the income potential of the land. For property near Dothan, agricultural land becomes more attractive to developers, investors, homeowners, and others.

Another locational factor which was significant in all three models was the distance to a major U.S. highway. The value of a tract of land located near a highway can be reflected in

the residential and business benefits associated with such location. As with location relative to a large city, location relative to a major transportation route reflects many of these similar potential use qualities. A location with easy access often has greater potential for alternative, higher income-producing uses. Location is one of the most important factors to consider when evaluating a commercial site. In retail terms, locations near a major highway offer a larger degree of exposure for and improved access to a business' products and services. Because the number of potential customers who would increase due to a location with easy access, the potential sales would also increase. This relationship between location and income is reflected in higher property values.

The results of this study also support the hypothesis of nonlinear relationships between the value of land and certain locational factors. The curvilinear components of distance to Dothan and distance to a major U.S. highway were significant in the fringe model. The distance to Dothan variable and the quadratic component (distance squared) explained 52 percent of the variation in land values in the fringe area. This curvilinear combination indicated that as distance of a tract to Dothan or a major U.S. highway increased, the value of that property decreased at a decreasing rate. These curvilinear relationships were not significant in the segment models, indicating constant rates of change in value with increased distance.

The results from the aggregate model indicated that average per acre values for tracts to the southeast of Dothan were substantially less (\$493) than those in the northwestern section, other factors held constant. The northwest section of Dothan is the fastest urbanizing section in the Dothan area, while the southeast section has been the least impacted by Dothan's 20 years of growth. This relationship is confirmed by the path of annexation since 1970. From a residential and commercial standpoint, the southeast section has primarily been a stable, agriculturally oriented market.

Urban influence was a significant factor in the fringe and rural sector models. The amount of urban influence associated with a tract of agricultural land was based on the presence of nonagricultural uses of the tract compared to tracts where agriculture was still the dominant use. The urban

influence variable was developed to explain urban impacts not associated with the locational variables, and can be related to the residential, commercial, or industrial development potential for the land. Some of the attributes of a specific property site would be difficult to measure or quantify with limited data. Aesthetic or psychological aspects of why people decide to purchase and develop a specific tract would be very difficult to accurately measure. Tracts in the fringe that were determined to have direct urban influence averaged \$475.51 per acre more than tracts with no such influence, while tracts in the rural sector with urban influence averaged \$404.52 per acre more than similar tracts with no such influence. From these results, tracts of agricultural land that were developed into urban uses were valued much higher than tracts that remained in farming. This relationship is consistent with the findings of a study conducted in Florida in which tracts that exhibited commercial or residential potential had higher values than did properties used for agriculture (18).

The time variable was significant in all three of the land value models. Tracts in the fringe study area increased in value on an annual basis by \$35.88 per acre. This increase accounted for Dothan's growth over the 1970-90 period, along with inflationary pressures that had taken place during this time span. The value increase over time in the rural segment was much less than noted in the urban segment, \$12.12 versus \$87.68. Thus, the appreciation in land values over time has been much greater for land nearer Dothan.

The influence of physical characteristics of the land on value was more apparent in the rural model analysis. In the rural sector, tract size exhibited a nonconstant impact on value, with value per acre declining at a decreasing rate as tract size increased. This relationship can be attributed to the fact that larger tracts of land require greater financial outlays, which often limit the number of potential buyers in the market.

The amount of land in a tract devoted to row crop uses was significant in both the fringe and rural models, adding \$3.71 and \$3.19 for each additional percentage point of the acreage in row crop production. The significance of this variable can be related to the income producing capacity of cultivated land uses. Because many residents in the rural sector derive

a majority of their income from farming, especially peanut production, row crop land is very valuable when compared to less intensive uses such as pasture or timber. Cultivated land obtains a portion of its value from its direct and potential income producing ability. Cultivated lands are more attractive development sites due to their usually favorable slope characteristics and reduced clearing and preparation costs.

Although the rural sector had much less urban influence than did the urban sector, there was still a strong nonagricultural impact. This impact can be illustrated from the results that indicated that about 40 percent of those who purchased property in the rural sector stated nonagricultural purposes were the primary reasons for purchase. The results also indicated that 50 percent of the land purchased in the fringe area was to be used for purposes other than farming. For residential developers to purchase row crop land for development, they must first meet the farmer's basic opportunity costs that would be associated with selling the land. Generally, the developer must offer a price that substantially exceeds the farm income-derived value of the property.

Increases in agricultural land values can be attributed to the potential income producing ability of the land and expectations of capital gains when land is converted to nonagricultural uses. Speculation can be based on potential use. Therefore, high valued, undeveloped tracts may be priced high because the tract is in a location where an urban use would be a viable option. Over 50 percent of the buyers stated that their reason for purchase was nonagricultural development, but in fact only 15 percent of the tracts in the fringe were actually developed after purchase. This differential could be an indication of the level of speculation apparent in the Dothan fringe.

Dothan is a city with specific locational growth patterns. The degree of urban expansion to the north and west was strong, while urban expansion to the southeast was limited. Continued urbanization in the Dothan area will enhance the demand for agricultural land and create higher land values in the areas of growth.

The Dothan rural-urban fringe is a diverse land market. The objectives set forth in this study were conclusive in identifying the significance of the various locational, physical, and sale characteristics associated with variations in per

acre bare land value, though more definitive models could have been estimated if high correlations between several variables had not existed. By differentiating the urban and rural sectors of the Dothan fringe, a better analysis of the overall market was made.

Based on the results of the study, the Dothan rural-urban fringe area remains agriculturally oriented. However, there were indications of accentuated nonagricultural pressures, especially within 8 miles of the central city. Although certain areas had several strong urban influences from the nonagricultural sector, the overall findings suggest that the levels of urbanization were not of the degree to classify the entire aggregate area as primarily urban. Only 15 percent of the agricultural land in the Dothan fringe was developed into nonagricultural uses, and 72 to 83 percent of the tracts sold remained in their previous agriculturally related uses.

Agricultural land values in the Dothan area are strongly influenced by peanut production, though statistical factors limited isolation of this impact. If the peanut program were eliminated, the area would experience an adverse economic impact. Many people in this area are directly or indirectly employed in the production, marketing, or processing of peanuts. Although the value and quantity of peanut quota were not specified in the three models, the percentage of land in cultivated uses served as a proxy measure for this characteristic.

Dothan and the Wiregrass area are important to the State's agricultural economy. Loss of prime agricultural land to urban uses can adversely affect agricultural production and the farm economy. While agricultural land in the Dothan fringe is not being overrun by urban interests, it is clearly being affected, especially within the 8-mile range and to the west of the city. This analysis suggests that such pressures accentuated in the latter half of the 1980's. Barring unforeseen instability in the local economy, expectations are for greater urban pressures on the fringe land market in the 1990's.

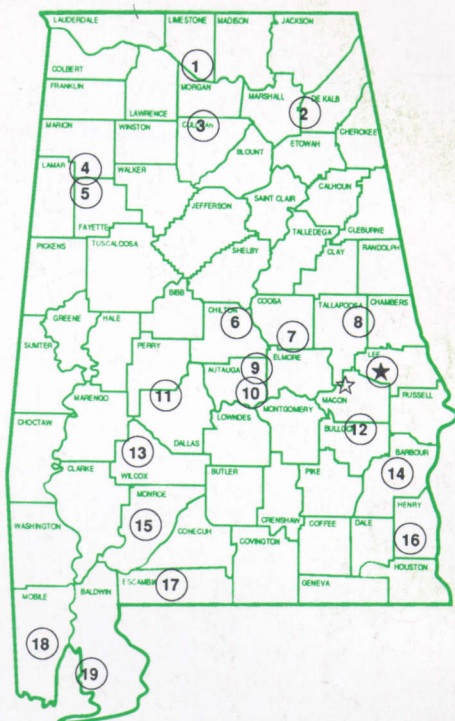
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Alabama's Agricultural Experiment Station System AUBURN UNIVERSITY

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Research Unit Identification

- ★ Main Agricultural Experiment Station, Auburn.
- ☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Chilton Area Horticulture Substation, Clanton.
7. Forestry Unit, Coosa County.
8. Piedmont Substation, Camp Hill.
9. Forestry Unit, Autauga County.
10. Prattville Experiment Field, Prattville.
11. Black Belt Substation, Marion Junction.
12. The Turnipseed-Ikenberry Place, Union Springs.
13. Lower Coastal Plain Substation, Camden.
14. Forestry Unit, Barbour County.
15. Monroeville Experiment Field, Monroeville.
16. Wiregrass Substation, Headland.
17. Brewton Experiment Field, Brewton.
18. Ornamental Horticulture Substation, Spring Hill.
19. Gulf Coast Substation, Fairhope.