Farm Operations Facing Development: Results from the Census Longitudinal File

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Abstract: This paper examines farms in areas undergoing development, using a longitudinal file constructed by linking several agricultural censuses. Individual farms are followed over the 1982-97 period. Survival, exit, and entrance rates are presented for three types of farms: recreational, adaptive, and traditions. The three types of farms are located where one would expect. Traditional farms are concentrated in nonmetropolitan (nonmetro) counties, while adaptive farms are concentrated in metro core counties. Recreational farms are least common in nonmetro nonadjacent areas, where off-farm opportunities are fewest. The concentration of adaptive farms in metro core counties does not appear to be the result of these farms simply surviving an urban environment better than traditional and recreational farms. In fact, adaptive farms have lower survival rates than traditional farms. Adaptive farms instead had a relatively high entrance rate.

Keywords: urban development, urbanization, specialty agriculture, high-value agriculture, farming, farm structure

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Introduction

Concerns about development near urban areas have arisen periodically, particularly since the widespread use of the automobile following World War II (Heimlich and Anderson). Development can adversely affect the environment and lead to higher infrastructure and transportation costs. On the other hand development produces the low-density suburbs that appeal to the American public. Development also affects farms. Increasing population and off-farm employment near urban areas presents both problems and opportunities for farmers. Quantifying development's effects on farming is difficult, because of a scarcity of data that follow individual farms.

This paper examines individual farms in areas undergoing development, using a longitudinal file constructed from five agricultural censuses. We calculate survival rates for three types of farms: recreational, adaptive, and traditional. Heimlich and Barnard (1991) developed this farm classification earlier for an analysis of farms in the Northeast. They hypothesize that adaptive farms intensify production on a small number of acres to survive in an urban environment.

Substantial differences in survival rates existed among the types of farms, and adaptive farms were more heavily concentrated in developing areas. Before discussing our findings any further, however, we will present more information on the longitudinal data, the geographic units used to identify developing areas, and the definition of the types of farms.

An earlier version of this paper was prepared as part of a planned publication to brief incoming officials of the Bush administration on urban sprawl. Urban sprawl proved to be too complex a topic for a short briefing report, however, and the report was instead published as an Economic Research Service (ERS) monograph (Heimlich and Anderson, 2001). The present paper expands our earlier analysis, documents our use of the longitudinal file, and provides a guide to future users of the file.

Data

The source of data used here is the 1997 Census of Agriculture Longitudinal File. Data from five censuses (1978, 1982, 1987, 1992, and 1997) were merged for individual farms. As a result, individual farms were followed for a 20-year period. The file contains 4.5 million observations—any farm in businesses during the 20-year period—and 85 analysis variables (see Appendix I). We were able to follow farms for 16 years, from 1982 to 1997, a substantial share of the farmers' life cycles.[1]

The longitudinal file attempts to follow individual operations rather than operators. Operationally, the longitudinal file follows "CFN's" or census file numbers. A farm is defined as going out of business when there is no response to the census questionnaire or the questionnaire is returned with a statement

[1] Gross sales for 1978 from the longitudinal file, unfortunately, added up to approximately four times the published amount. In contrast, estimates of gross sales agreed with the published totals for the four other census years. Because sales were a key variable in our analysis, we dropped the year 1978.

that the establishment is no longer operating as a farm. The disappearance of a farm in a given census year is indicated by zeros for all variables.[2]

Because the file follows farms rather than operators, an operation changing hands does not necessarily mean that the original farm went out of business and a new farm appeared on the longitudinal file. Most likely, a change in the operator due to life cycle events, such as a widow or child assuming operation of a farm upon the death of an operator, would not trigger a change in the CFN.

Other events, however, would result in the termination of a farm on the file. For example, the disappearance of the farm through sale of the land for nonfarm purposes, the absorption of the farm into another, or the division of the farm into separate farming businesses could result in a farm going out of business on the longitudinal file. For a list of some possible transactions and whether they would trigger a change in CFN, see Appendix II, "Farm Exit and Entrance in the Longitudinal File."

Most census observations have a nonresponse weight of 1, meaning they represent only themselves. Some farms have a weight of 2 and represent themselves plus another farm whose operator failed to provide a response. Nonresponse weights correct for whole farm nonresponse:

> Whole farm nonresponse to the census occurred when a response was never received for a record. If the record was a large farm, as defined by value of production or acreage, or a unique farm operation, intensive telephone or personal followup was conducted during census processing to obtain a response. If these attempts failed, either the NASS survey database, the census historic database, or other more current sources were used to impute data for the record (U.S. Dept. Ag., 1999, p. C-2)

In other words, all the nonresponse weights are 1 for large farms.

Whole farm nonresponses ranged from 10 to 14 percent of all farms during the census years examined here. Nonresponse weights are not used in this paper when following farms between censuses year. The tables discussing the characteristics of recreational, adaptive, and traditional farms in 1997 use weighted data, however.

Peterson and Gale (1991) devised a way to calculate nonrepsonse rates and use these rates to correct for the failure of farmers to respond to the census questionnaire. They allocated nonrespondents among continuing, exiting, and entering farms, based on four assumptions. In the future, we may revise the Peterson and Gale approach, with an emphasis on adjustments involving more than two census years. Our present paper, however, emphasizes (1) understanding how the longitudinal file works and (2) following farms over time. Note that the number of entrants and exits will be overestimated and continuing farms will be underestimated in this paper, because we do not adjust for nonresponse. This bias is more of a problem for small farms than for large farms, and the bias becomes more of a problem when longer time periods are considered.

[2] In some cases, a particular farm on the longitudinal file may have different CFN's in different years but is still counted as the same farm. This can occur for farms located in more than one county. County location is one of the items contributing to the CFN, and a farm located in two counties is assigned to the county containing the majority of its value of production. If a farm rents more land in one county in one census year than in another, the CFN may change. Or the change in crop mix or price levels may shift the location of the farm's production enough to change its CFN. In such cases census personnel still link the records for individual census years when creating the longitudinal file.

The Geography

Farms in this analysis were sorted into four county groups based on their location:

- Metropolitan core (578 counties).
- Metropolitan edge (258 counties).
- Nonmetropolitan, adjacent to a metropolitan area (999 counties).
- Nonmetropolitan, not adjacent to a metropolitan area (1304 counties).

The first two categories are a major focus of this paper, since many of these counties are currently experiencing urban development or have experienced development over the past two decades.

For brevity, "metropolitan" and "nonmetropolitan" are shortened to "metro" and "nonmetro" in this paper. The U.S. Office of Management and Budget (OMB) defines metro areas as geographic areas with a large population nucleus (generally at least 50,000 inhabitants), plus adjacent communities that are socially and economically integrated with that nucleus (U.S. Dept. Comm., Cen. Bur., 1993, pp. A8-A9). Metro designations as of 1993, based on the 1990 Population Census, are used in this report. Nonmetro counties are a residual, the part of the Nation lying outside metro areas.

Metro counties are not necessarily heavily urbanized. After each population census, many nonmetro counties are reclassified to metro, because they contain a city that grew to a population of 50,000, or because an existing metro area grew beyond its previous boundaries (Cromartie, 2001, p. 17). As a result, many metro areas, particularly, new ones, contain extensive areas that are rural in nature. In metro edge counties, a majority of the population is rural, defined by the Census Bureau as living outside a place with at least 2,500 inhabitants. Metro core counties are more heavily urbanized, with at least 50 percent of the population living in urban areas. Separating metro counties into edge and core categories helps in analysis of changes in agriculture in more sparsely settled areas on the expanding metro-nonmetro boundary.

Like metro counties, nonmetro counties are also diverse, and nonmetro counties can be categorized into smaller, more homogeneous groups. Nonmetro counties are sorted into two groups in this paper, those adjacent to metro areas and those that are not adjacent (Butler and Beale, 1994). One would expect urban influences on farming to be stronger in adjacent counties than in nonadjacent counties.

Classifying Farms

Each farm was grouped into one of three categories each census year, using the recreational, adaptive, and traditional groups based on the earlier work of Heimlich and Barnard (1992). The definitions developed in the earlier study could not be exactly duplicated in this section, since Heimlich and Barnard used the detailed financial and production data collected by the Farm Costs and Returns Survey (FCRS). The longitudinal data used here are much less detailed. A discussion of each category follows.[3]

Recreational

Identifying the recreational group is fairly simple. As in the earlier article, it includes any farm with sales less than $10,000. Farms with sales this low are very small and have little ability to generate income for the farm family.

[3] Dollar values used as criteria to form the groups are defined in 1997 dollars. Values for earlier years are adjusted with the producer price index for farm products.

Adaptive

The adaptive group is a little more difficult to identify, but it is defined to include farms that produce relatively high-value products. The adaptive group includes farms with sales of $10,000 or more if they have sales of more than $500 per acre of land. Specializing in high-value products allows these farms to adjust to increasing land prices, population density, and continuing conversion of local agricultural land to nonfarm uses.

An alternative criterion in the Heimlich-Barnard article was that farms have sales of $10,000 and more than one-third of sales come from high-value crops or livestock. This criterion is more difficult to duplicate from the longitudinal file, because sales are not estimated by commodity. However, the longitudinal file has identified each farm's specialization, or the commodity that accounts for more than 50 percent of the farm's sales.[4] Thus, we classify farms specializing in high-value production as adaptive on the longitudinal file. It is not possible, unfortunately, to identify crops removed under contract, another criterion for adaptive farms in the article.

Traditional

The traditional group is derived as a residual. However, farms with sales greater than $500 per acre were classified as traditional in the article, if they received more than one-third of their income from conventional livestock or conventional crops with high gross receipts, such as dairy, cotton, rice, and tobacco. Excluding specific specializations approximates this procedure in the longitudinal file. One would expect to find traditional farms most common in nonmetro counties, where there is less competition for land and labor and fewer off-farm job opportunities.

Characteristics, 1997

Farms in the three farm categories—recreational, adaptive, and traditional—were largely located where one would expect. About three-fourth of the traditional farms were located in nonmetro counties, while more than one-half of adaptive farms were located in metro core counties. Recreational farms were more evenly distributed across the four county groups. Only 12 percent of recreational farms were located in metro edge counties, which reflects the relatively small number of counties (258) in this group. More detailed information about the three types of farms follows.

Adaptive Farms

As of 1997, adaptive farms were most prevalent in metro core counties, where they made up about 15 percent of all farms (table 1). Their share of farms in the other county groups was substantially less, between 3 and 5 percent. Adaptive farms have some advantages in developed areas (Heimlich and Barnard, 1991). Specializing in high-value products allows farms to compete with nonfarm uses for land and labor.

High-value commodities also allow farms to use less land than traditional farms producing lower margin commodities, which is an advantage in areas with high-priced land. Within a given county group, the average acreage was far less for adaptive farms than for their traditional counterparts, although sales per acre were higher for adaptive than traditional farms (table 2). The difference in sales per acre was most

[4] High-value specializations include: Vegetables and melons, fruits and tree nuts, horticultural specialties, and animal specialties (fur-bearing animals, rabbits, horses, ponies, bees, fish in captivity except fish hatcheries, worms, and laboratory animals).

pronounced in metro core counties, where adaptive farms sold nearly seven times as much per acre as traditional farms. This means the average metro core farm sold about twice as much as the corresponding traditional farm, on about one-fourth as much land.

Similarly, average value of land and buildings per acre was at least two times higher for adaptive than traditional farms. The largest difference was in metro core counties, where the value of land and buildings for adaptive farms was nearly four times the corresponding estimate for traditional farms.

Off-farm job opportunities are also available in urbanized areas to supplement farm income. Adaptive farmers were most likely to report a nonfarm occupation in metro edge counties, where 39 percent reported a nonfarm occupation (table 3). Interestingly, a slightly smaller share of metro core farmers (36 percent) reported a nonfarm occupation, which may reflect the larger size of adaptive farms (measured in sales) there. Adaptive farmers were least likely to report a nonfarm occupation in nonmetro nonadjacent counties, where only 30 percent had a nonfarm occupation (table 3). Fewer nonfarm employment opportunities may explain the relatively small share of these operators with off-farm jobs.

Traditional Farms

Traditional farms accounted for the highest share (52 percent) of farms in nonmetro nonadjacent counties (table 1). They also accounted for nearly half (45 percent) of all farms in nonmetro adjacent counties. Traditional farms were the largest in nonmetro adjacent counties, averaging 1,311 acres, nearly double the next highest average acreage for traditional farms (table 2). Sales per farm, however, were somewhat higher in metro core counties ($212,700) than in nonmetro nonadjacent counties ($171,100) due to higher average sales per acre.

The highest average value of land and buildings per farm for traditional farms ($910,000) occurred in metro core counties, where adaptive farms had about the same value per farm ($903,100). Although the average value per acre for traditional farms in metro core counties ($1,300) was about one-fourth that of their adaptive counterparts ($4,900), traditional farms averaged nearly four times as much land.

Traditional farm operators within each of the four county groups were less likely to report a nonfarm occupation than their recreational or adaptive counterparts (table 3). Between one-third and one-fourth of traditional farm operators reported an off-farm occupation, with the smallest share reporting a nonfarm occupation in nonmetro nonadjacent counties (26 percent).

Recreational Farms

Recreational farms accounted for 50 to 60 percent of all farms, except in nonmetro nonadjacent counties (table 1). The smaller, 44-percent share in nonmetro nonadjacent counties may reflect relatively fewer off-farm opportunities in those counties, making it more difficult to combine off-farm work with a farm residence. Regardless of county group, however, roughly 70 percent of recreational farmers reported a nonfarm occupation (table 3).

Long-term Exits: 1982-97

The longitudinal data were used to follow farms existing in 1982. As shown in figure 1, the share of farms that went out of business during the 1982-97 period varied within a fairly tight range, between 66 and 79 percent. Traditional farms were the least likely to exit, with little geographic variation in the share of these farms exiting.

Farms classified as recreational in 1982 were the most likely to exit by 1997, regardless of county group. For example, 10 to 12 percent more recreational than traditional farms went out of business, depending on the area. One reason why recreational farms were less likely to get through the entire 1982-97 period may be that most of their owners did not rely on them for their living. As a result, exiting would not affect them much economically. Data from the 1995 FCRS indicate that small farm operators who do not report farming as their occupation gave "a rural lifestyle" as their highest-ranking goal from farming (Hoppe, 2000). In contrast, farmers depending on farming for substantial portions of their income reported survival of the farm as their most important goal.

Adaptive farms did have a survival advantage over recreational farms, with 4 to 7 percent fewer adaptive farms exiting, depending on the county group. However, they did not appear to have much of a long-term survival advantage when compared with traditional farms. In the case of adaptive farms, the percentage exiting varied geographically, with the percentage declining with distance from the metro core counties. Adaptive farms may have a survival advantage over recreational farms in metro core or metro edge counties. But, adaptive farms survive better where there is less development.

Note that the classification by type of farm in figure 1 is based on 1982 data, and the farm may not be in that category by the end of the 1982-97 period. Figure 2 shows 1982 farms still in existence 1997, classified by their type of farm in both 1982 and 1997.

Surviving recreational farms had a strong tendency to remain in that category over time. Approximately three-quarters of the surviving recreational farms in each county group remained in the recreational category in 1997. Most surviving recreational farms that changed categories became traditional farms, with changes to traditional increasing with distance from the metro core counties. Barriers to entry for traditional farms may be less as population density decreases. For example, land for more extensive agriculture may be cheaper to buy or rent in less densely settled areas. On the other hand, 7 percent of the surviving recreational farms became adaptive in metro core counties, perhaps to take advantage of local urban markets.

The farmers who shifted their operation from recreational to either adaptive or traditional tended to be younger than other recreational farmers in 1982. The average age of recreational farmers who shifted to either of the other categories was 46 years, compared with 52 years for all recreational farmers in 1982 (table 4). The farmers who shifted appear to have been a relatively young group with expanding operations, although most of the operations involved still had sales less than $100,000 by 1997.

The likelihood of surviving adaptive farms remaining in the adaptive category varied with geography. Seventy-four percent of surviving adaptive farms remained adaptive in metro core counties (fig. 2). This percentage declined with increasing distance from the metro core counties, falling to just over 50 percent in the two groups of nonmetro counties. Surviving adaptive farmers could continue in business in the most densely populated counties by specializing in high-value products.

Adaptive farms tend to be labor and management intensive, in terms of the operator's time, due to the products they produce. As adaptive operators age, they may want to scale back their operation. Nearly 80 percent of the adaptive farmers who became recreational were at least 55 years old by 1997, and the average age of the group was 65 years (table 5).

Operators who did not want to scale back to the recreational level of sales could shift out of high-value crops into other specializations. For example, cattle production is a common specialization among retired operators, because of its relatively low labor requirements (Hoppe, 2001, p. 11). Adaptive farmers shifting to traditional production tended to be younger than those shifting to the recreational category. As

was the case with surviving recreational farms, adaptive farms shifting to the traditional category increased inversely with distance from metro core counties (fig. 2).

The overwhelming majority of surviving traditional farms (80 percent) remained in their original category, with only minor variations by county group. Surviving traditional farms that became recreational tended to have relatively low sales in 1982, and their operators averaged 51 years of age, compared with 49 years for all of the 1982 traditional farms (table 6). By 1997, the average age of operator for those that shifted to recreational was 64. The operators of these farms appear to have spent at least part of the 1982-97 period phasing down their operations. In contrast, traditional farmers who shifted to adaptive or who remained traditional averaged 43 and 45 years of age in 1982, respectively. They also had a relatively high percentage of farms with sales greater than $100,000 in 1982.

Intercensus Survival and Entrance

The percentage of farms leaving business over the 1982-97 period for each group may seem high. The percentages in figure 1, however, represent attrition over a 16-year period. Comparable published data on survival of nonfarm businesses over periods that long is nonexistent. Data do exist on business survival over shorter periods of time. For example, 76 percent of all U.S. businesses existing in 1992 survived until 1996 (U.S. Small Business Administration, 2000, p. 5). Fortunately, the longitudinal file allows us to estimate survival rates for shorter periods than 1982-97. Table 7 presents survival and entrance rates for the three kinds of farms, by county group, for the three six-year periods between censuses.

The survival rate for a given period shows the percentage of farms in a group that existed at the beginning of the period that still were in business at the end of the period, either in the same group as at the beginning of the period or in one of the other two groups. Exit rates are not presented here, since they are equal to 100 percent minus the survival rate. The entrance rate shows the percentage of new farms that entered the group during the period, using the number of farms in the category at the beginning of the period as the denominator.

When examining the survival and entrance rates, two caveats should be kept in mind. First, survival rates are understated, while entrance and exit rates are overstated, because we made no attempt to correct for nonresponse, as discussed in the data section. Second, the table presents no information on the shifts of surviving farms into different categories. For example, as farmers age they may scale back their operations and move from the adaptive and traditional categories to the recreational categories. This explains why we still have recreational farmers, despite relatively low survival rates and entrance rates for the group during the first two time periods.

All the survival rates in table 7 are less than the 76-percent rate for all U.S. businesses mentioned above, although the traditional category comes fairly close with survival rates between 65 and 69 percent. The traditional category also consistently had the lowest entrance rates, around 25 percent. Entrance rates for the traditional group were always less than exit rates, which implies gradually declining numbers of traditional farms, either through farm consolidation or conversion of farms to nonfarm uses.

Adaptive farms consistently had survival rates that fell between those for recreational and traditional farms. However, the entrance rate was higher for adaptive farms than for traditional farms, regardless of time period and location, and it was higher for adaptive farms than for recreational farms, except during the last time period. Despite the relatively low survival rate, high-value enterprises are attractive to many new operators.

One thing that stands out in table 7 is the stability of survival rates across time and place. Approximately two-thirds of traditional farms survived each period, regardless of location or time period. Similarly, between 59 and 65 percent of adaptive farms survived each period, with slightly higher survival rates for the later time periods and for nonmetro counties. Survival rates of recreational farms were also restricted to a fairly narrow band, between 52 and 59 percent. These data suggest that the farm crisis of 1980's had little or no effect on survival rates. A stronger statement about the effects of the farm crisis, however, would require examination of the 1978-82 period.

There appears to have been more temporal variation in entrance rates. For example, entrance rates for recreational farms increased from approximately one-third in the first two periods to one-half for the last period, regardless of location. In addition, entrance rates for adaptive farms dipped in the middle period in all locations. Understanding these variations in entrance rates would probably require analysis of changes in the off-farm economy, particularly in the case of residential farms.

Regional Differences

So far this analysis has been restricted to the national level. We will now present a bit of information on two ERS resource regions, the Heartland and Prairie Gateway (fig. 3), the regions that are a focus of another paper in this symposium. This will allow us to see if conclusions at the national level are also valid at a more local level. To keep this paper to a manageable length, we will restrict the discussion to:

- The 1997 distribution of farms by the four county groups and three farm types within each region.
- The long-term exits of farms existing in 1982 by county group and farm type within each region.

Distribution of Farms in the Heartland and Prairie Gateway

Farms in general were more likely to be located in nonmetro counties in the Heartland and Prairie Gateway than in the Nation as a whole. About two-thirds of all U.S. farms were located in nonmetro areas (table 1), compared with about three-fourths in the two regions (table 8). Thus, all three farm categories were more likely to be nonmetro in the two regions than at the national level, reflecting the rural nature of the regions.

One striking difference between the Nation and the regions was the share of adaptive farms located in metro core counties. Less than one-third of adaptive farms in the two regions were in metro core counties compared with over half at the national level. Some high-value crops produced for processing (such as sweet corn and green peas in the Midwest) are grown on fairly large farms where proximity to a processing plant is more of an advantage than proximity to urban markets.

There were also some differences between the regions and the Nation in the composition of farms within county groups. About 7 percent of metro core farms in the two regions were adaptive, about half the 15-percent rate for the U.S. As was the case at the national level, however, the adaptive share of farms was less in the other county groups. Traditional farms dominated the Heartland, accounting for at least 60 percent of the farms in each group. In the Prairie Gateway, the distribution of farms in the county groups was closer to the National distribution. For example at both the national level and in the Prairie Gateway, the share of farms in the traditional category exceeded 50 percent only in nonmetro nonadjacent counties.

Long-term Exits in the Heartland and Prairie Gateway

For recreational and traditional farms in the Heartland and Prairie Gateway (fig. 4), exit rates were similar to those reported for the Nation (fig. 1). About three-fourth of recreational farms went out of business in

each region, regardless of county group, with slightly smaller shares exiting in the Prairie Gateway (fig. 4). In both regions, approximately two-thirds of the traditional farms in each county group exited over the 1982-97 period, again with little variation by county group.

For adaptive farms, however, each regional pattern differed from the national pattern. At the national level, the share of adaptive farms exiting in each county group fell between the shares for the corresponding groups of recreational and traditional farms. In the Prairie Gateway, in contrast, the exits for each group of adaptive farms were much closer to the exits for the corresponding group of recreational farms. For adaptive farms in the Heartland, exits were much closer to those for traditional farms.

As was the case at the national level (fig. 2), surviving recreational and traditional farms tended to remain in their original category in the two regions (fig. 5). However, adaptive farms were much less likely to remain in that category in the two regions than at the national level. In fact, surviving adaptive farms in the Heartland that were not located in metro core counties were more likely to become traditional farms than remain adaptive. This shift from adaptive to traditional faming may reflect a regional competitive advantage in traditional agriculture.

Summary and Implications

At the national level, the three types of farms were located where Heimlich and Barnard suggested. Traditional farms were concentrated in nonmetro counties, while adaptive farms were concentrated in metro core counties. Recreational farms were least common in nonmetro nonadjacent areas, where one would expect off-farm opportunities to be fewest.

The concentration of adaptive farms in metro core counties, however, does not appear to be the result of these farms simply surviving an urban environment better than traditional and recreational farms. In fact, adaptive farms had lower survival rates than traditional farms, regardless of county group or time period. Adaptive farms instead had a relatively high entrance rate. Farmers entering the business may be attracted to high-value crops and livestock because the high sales and potential for high margins.

Nevertheless, there still appears to be a relationship between long-term survival and specialization in high-value enterprises for farms in more urbanized counties. About three-quarters of the adaptive farm in metro core counties in 1982 that stayed in farming over the whole 1982-97 period were still adaptive in 1997 (fig. 2). In contrast, only 58 percent of metro edge farms and just over 50 percent of nonmetro farms continued as adaptive farms during the same period. At least some of the farmers in more urbanized areas found it worthwhile to operate adaptive farms for an extended period of time.

The discussion in this section so far has been drawn from the national-level analysis. One must be careful in drawing conclusions from national-level data and applying them locally, however. As illustrated in the examination of the Heartland and Prairie Gateway, conclusions drawn at the national level may not necessarily hold at the regional level.

We have carried cross-tabulation as far as it can go. Future research will use logit models to help predict which farms are likely to survive and which are likely to exit. Logit models may also be useful in determing factors related to farms shifting from one category to another and understanding regional differences. From the information presented here, it appears that the age of the operator in the initial period is an important variable in explaining survival of the farm and shifts in the farm from one category to another, even though the longitudinal file attempts to follow the operation and not the operator. Another possible use of the longitudinal file would be to test whether counties with farmland preservation had higher likelihood of farm survival.

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Appendix I
Analysis Variables on the Longitudinal File

Appendix table 1. Analysis variables on the longitudinal file

Description	Name	1978	1982	1987	1992	1997
Value of sales – total	VALSAL78-97	x	x	x	x	x
Value of sales for broilers	BROILER97					x
Value of sales for fattened cattle	FATCATL97					x
Value of sales of hogs and pigs	HOGPIG97					x
Value of sales for turkeys	TURKYS97					x
Government payments	GOVPAY78-97			x	x	x
Value of land and buildings	VLB82-97		x	x	x	x
Expenses – total	SUMEXP87-92			x	x	x
Expenses – interest	INTEXP87-97			x	x	x
Days worked off farm	DYSWOF87-92			x	x	x
Land in farms	LIF78-97	x	x	x	x	x
Standard industry classification code	SIC78-97	x	x	x	x	x
Age	AGE78-97	x	x	x	x	x
Occupation	OCC78-97	x	x	x	x	x
Race	RACE78-97	x	x	x	x	x
Gender	SEX78-97	x	x	x	x	x
Hispanic	SPORIG78-97	x	x	x	x	x
Tenure	TENURE78-97	x	x	x	x	x
Type of business organization	TYPORG78-97	x	x	x	x	x
Reporting state and county	RSC78-97	x	x	x	x	x
Acres irrigated	ACRIRR78-97	x	x	x	x	x
Non-response weight	NRW82-97		x	x	x	x

Appendix II
Farm Exit and Entrance in the Longitudinal File

Because the longitudinal file follows farms rather than farm operators, an existing farm does not necessarily end and a new farm begin when a farm changes hands. The table below gives examples of transactions, with their likely effects on the Census File Number's (CFN). A termination of a CFN indicates a farm exit, and issuing a new CFN indicates a farm entrance. Note that this list should not be considered to cover all possible transactions.

Land rented by the original farm is not considered, to simplify the table. "Operator" means the primary operator, in the case of legal or informal partnerships. This table is drawn up for family farms, which includes proprietorships, partnerships, and family corporations (see Hoppe, 1996), but a similar table could be created for nonfamily farms.

Remember that the longitudinal file is not truly longitudinal. Rather than identifying farms and following them as time progresses, it uses data collected in the past for another purpose (the agricultural census). Thus, it is sometimes difficult to claim with certainty that every instance of the transactions listed below will affect CFN's as indicated. This explains the use of "likely" in the column heading.

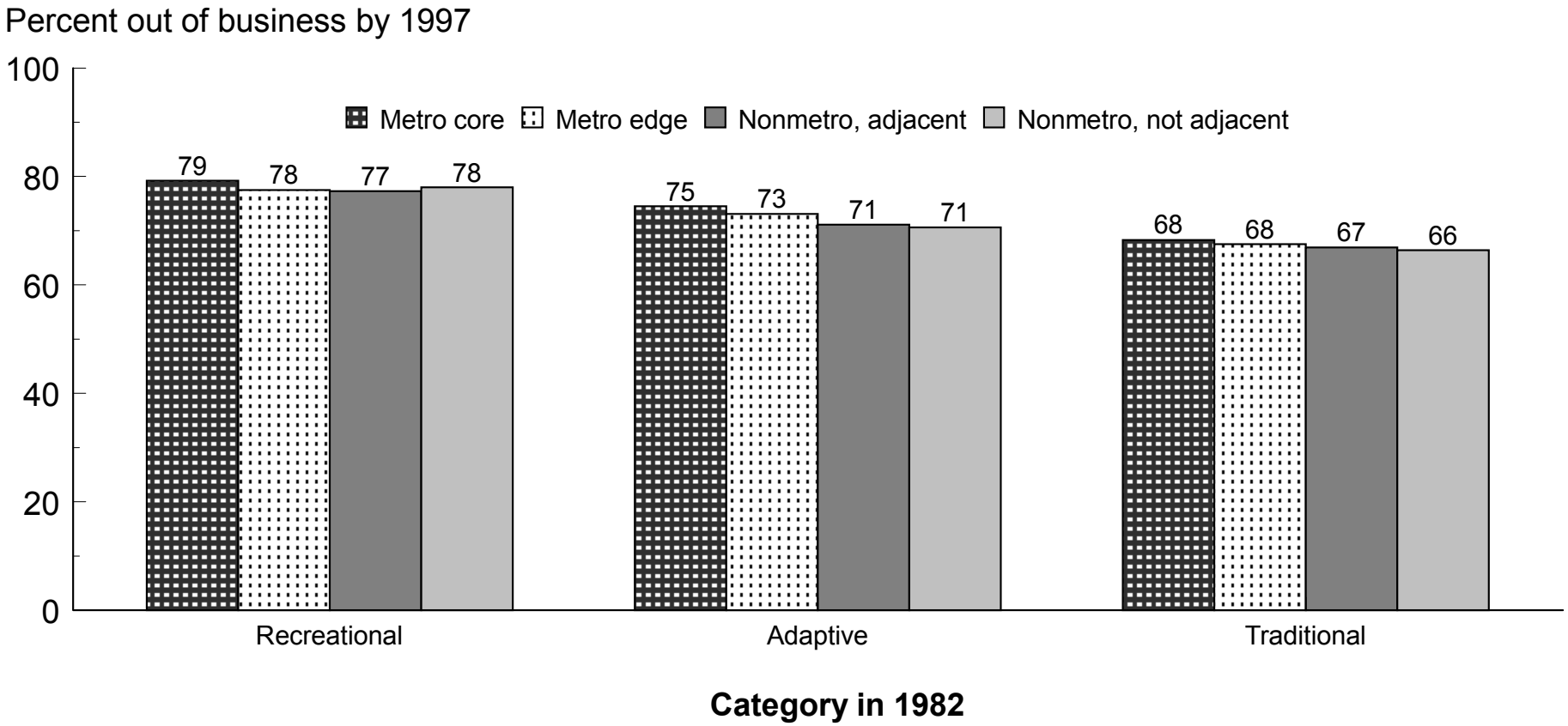
Appendix table 2. Likely effects of various transactions on Census File Numbers

Transaction:	Likely effect on CFN's		
	No change in old CFN	Old CFN terminated	New CFN issued
Farm continues with original acreage owned by the operation:			
• Under current operator	**x**		
• Farm is sold to:			
◦ Relative	**x**		
◦ Someone else	**x**		
• Operator retires, farm continues under a junior operator with no change in title.	**x**		
Entire farm is sold to another operation		**x**	(Purchasing farm has its own CFN)
Original farm is divided into two or more smaller farming operations:			
• A portion of the original acreage continues under the original operator	**x**		**x**
• All of the farms have new operators		**x**	**x**
Operator no longer farms but rents out farmland			
• Renter operates farm as a separate unit	**x**		
• Renter operates the rented land as part of an exiting farm.		**x**	(Renting farm has its own CFN)
Part of original farm is sold for nonfarm use. Part continues as a farm.	**x**		
Entire farm is sold for nonfarm use.		**x**	

Figure 1

Farms existing in 1982 that were out of business by 1997, by farm category

Most farms went out of business between 1982 and 1997, regardless of farm category or location

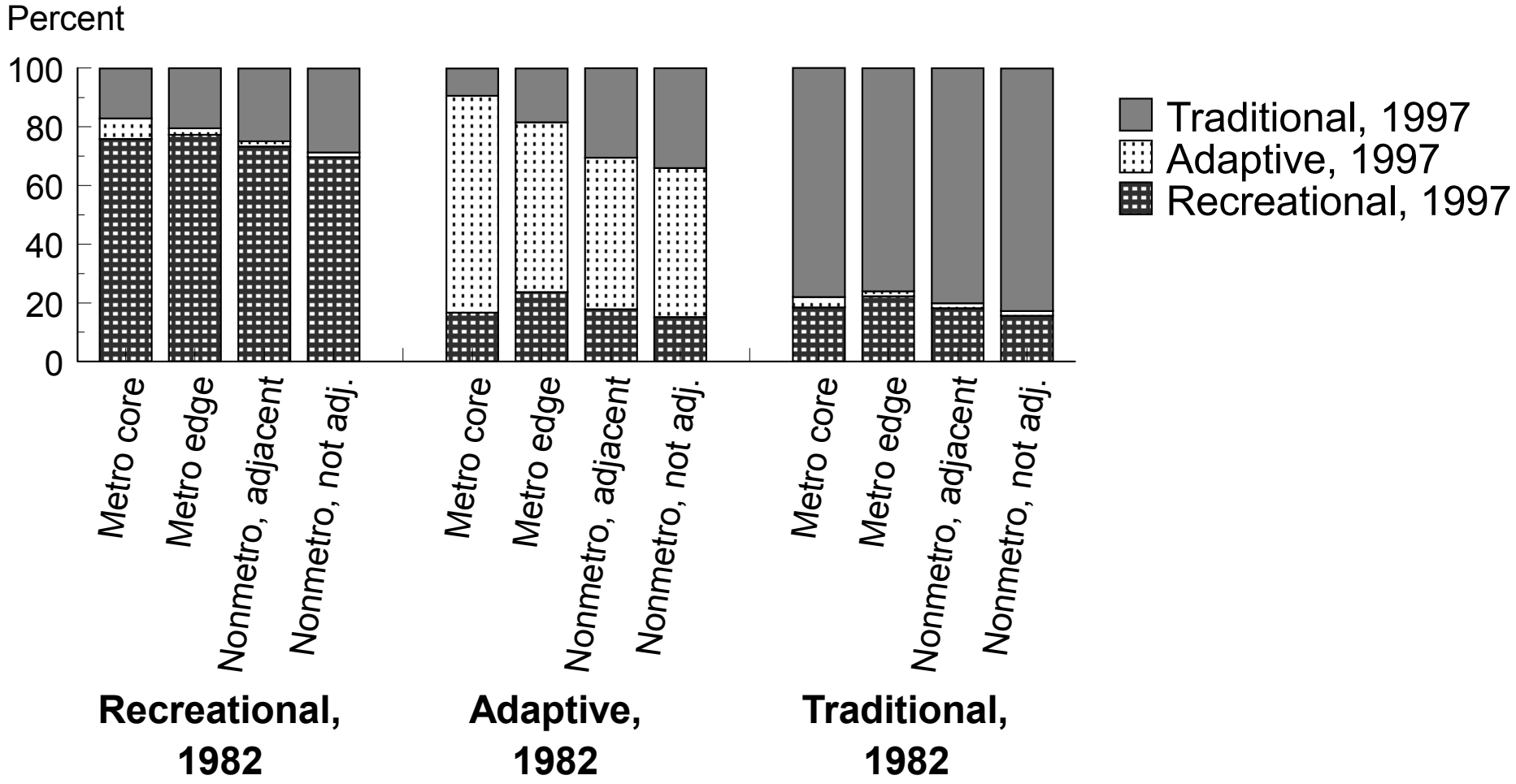


Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Figure 2

Ending classification of farms existing in 1982 that were still in business in 1997, by farm category

Farms tend to remain in the same categories



Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

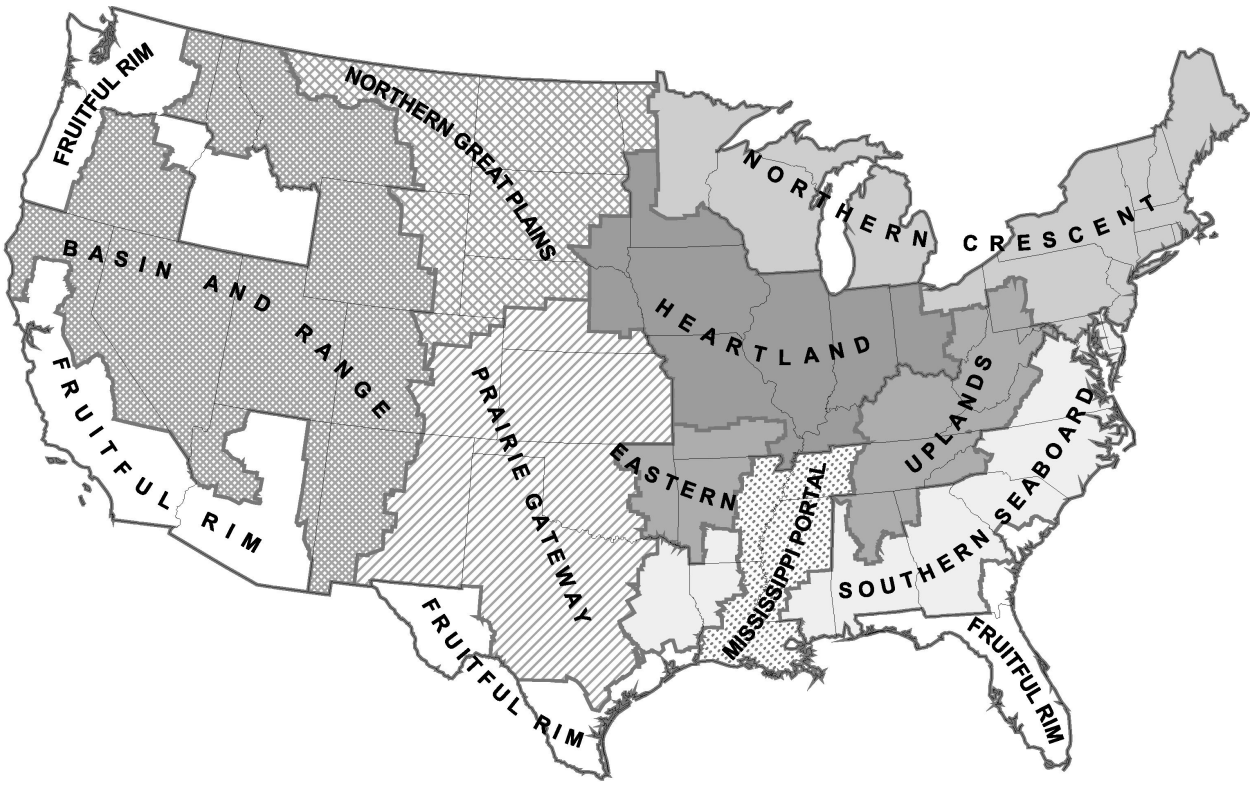


Figure 3

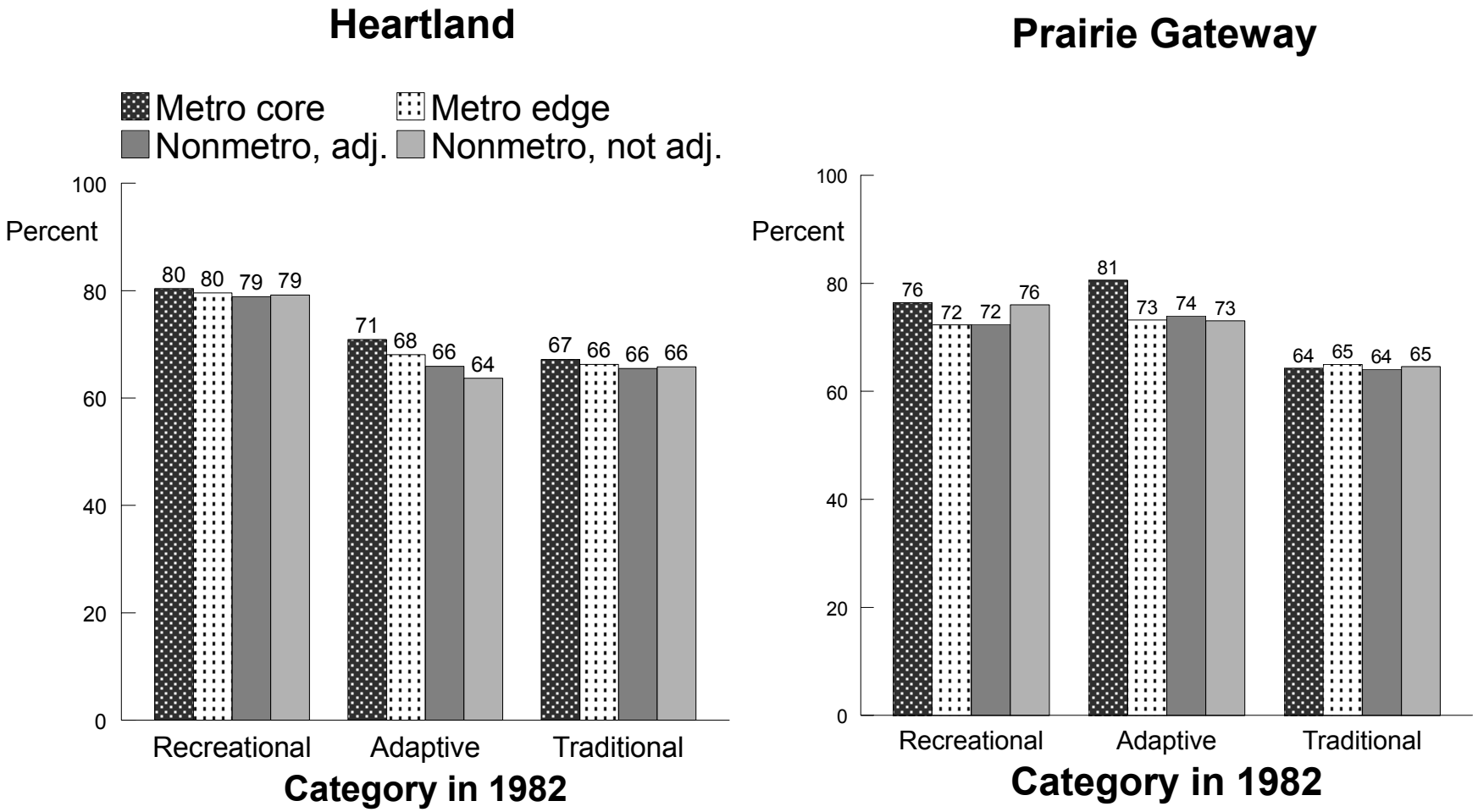
U.S. Farm Resource Regions

Farm resource regions are based on geographic specialization

Figure 4

Farms existing in 1982 that were out of business by 1997, by farm category and region

Long-term exit rates differed in the two regions

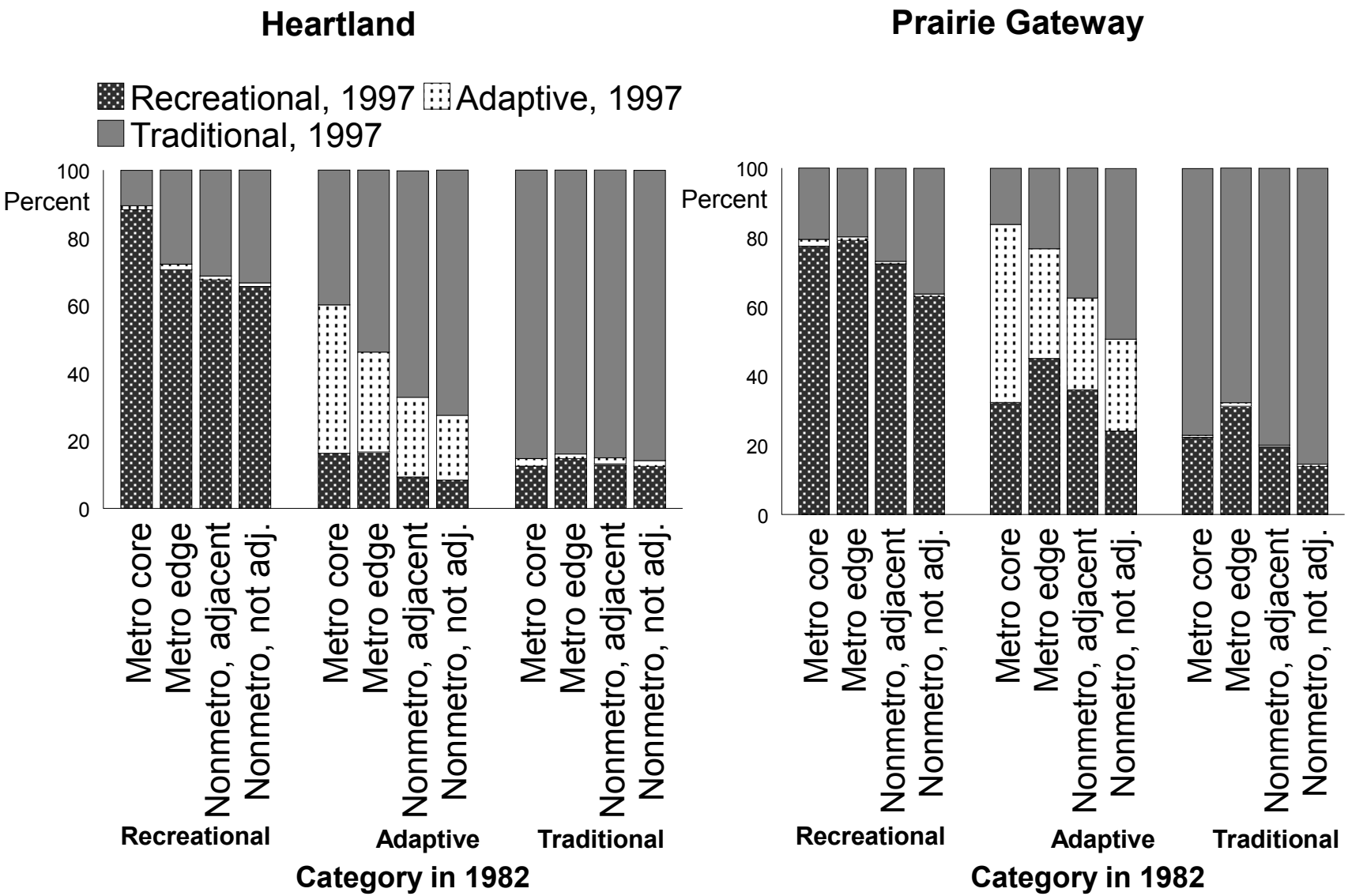


Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Figure 5

Ending classification of farms existing in 1982 that were still in business in 1997, by farm category and region

Except for adaptive farms, Heartland and Prairie Gateway farms tend to remain in the same categories



Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Table 1. Distribution of farms, by farm category and geographic area, 1997

Item	Type of farm			All farms
	Recreational	Adaptive	Traditional	
		Number of farms		
Farms	962,966	119,372	829,521	1,911,859
Metro core	233,251	65,514	134,988	433,753
Metro edge	111,789	9,217	64,372	185,378
Nonmetro, adjacent	331,587	23,782	292,505	647,874
Nonmetro, not adjacent	286,339	20,859	337,656	644,854
		Percent of farms		
Distribution of farms by area	100.0	100.0	100.0	100.0
Metro core	24.2	54.9	16.3	22.7
Metro edge	11.6	7.7	7.8	9.7
Nonmetro, adjacent	34.4	19.9	35.3	33.9
Nonmetro, not adjacent	29.7	17.5	40.7	33.7
Distribution of farms by category	50.4	6.2	43.4	100.0
Metro core	53.8	15.1	31.1	100.0
Metro edge	60.3	5.0	34.7	100.0
Nonmetro, adjacent	51.2	3.7	45.1	100.0
Nonmetro, not adjacent	44.4	3.2	52.4	100.0

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Table 2. Selected farm characteristics, by farm category and geographic area, 1997

Item	Type of farm			All farms
	Recreational	Adaptive	Traditional	
		Acres per farm		
Average farm size	134	247	932	487
Metro core	89	188	702	295
Metro edge	88	179	443	215
Nonmetro, adjacent	126	306	708	395
Nonmetro, not adjacent	199	395	1,311	788
		Dollars		
Average sales per acre	23	1,370	199	211
Metro core	32	2,084	303	431
Metro edge	34	1,216	325	291
Nonmetro, adjacent	25	934	242	226
Nonmetro, not adjacent	16	716	148	142
Average sales per farm	3,050	338,807	185,027	102,970
Metro core	2,822	392,637	212,684	127,011
Metro edge	3,020	217,738	143,959	62,636
Nonmetro, adjacent	3,137	286,346	171,076	89,355
Nonmetro, not adjacent	3,145	283,046	193,885	112,073
Average value of land and buildings per acre	1,373	3,249	771	933
Metro core	2,552	4,855	1,304	1,847
Metro edge	2,249	2,964	1,527	1,766
Nonmetro, adjacent	1,332	2,379	929	1,036
Nonmetro, not adjacent	832	1,661	534	587
Average value of land and buildings per farm	183,549	794,594	710,304	449,748
Metro core	223,064	903,120	909,970	538,937
Metro edge	197,240	521,491	662,675	374,518
Nonmetro, adjacent	166,123	724,875	649,071	404,134
Nonmetro, not adjacent	166,198	650,873	692,696	457,215

Note: Data on the value of land and buildings are based on a sample of farms.

Table 3. Selected characteristics of farm operators, by farm category and geographic area, 1997

	Type of farm			All farms
	Recreational	Adaptive	Traditional	
		Years		
Average age of operator	55	53	53	54
Metro core	56	54	53	55
Metro edge	55	52	54	55
Nonmetro, adjacent	55	53	53	54
Nonmetro, not adjacent	55	51	53	54
		Percent of operators		
Operator reports a nonfarm occupation	70.2	34.9	28.0	49.7
Metro core	70.9	35.8	29.4	52.7
Metro edge	71.2	38.9	32.6	56.2
Nonmetro, adjacent	70.4	35.1	29.2	50.5
Nonmetro, not adjacent	69.1	30.3	25.5	45.0

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Table 4. Selected characteristics of recreational farms existing in 1982, sorted by status in 1997

Item	Unit	Farms existing in 1982 and 1997			Farms exiting in--			Total
		Category in 1997			1987	1992	1997	
		Recreational	Adaptive	Traditional				
Farms	No.	150,819	6,299	48,343	434,250	194,305	108,855	942,871
Distribution	Pct.	16.0	0.7	5.1	46.1	20.6	11.5	100.0
Characteristics in 1982								
Farms by sales class: 1/								
Less than $10,000	Pct.	100.0	100.0	100.0	100.0	100.0	100.0	100.0
$10,000-$99,999	do.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
$100,000-$249,999	do.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
$250,000 or more	do.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Occupation of operator:								
Farming	Pct.	23.7	29.3	29.3	29.6	33.1	34.0	29.9
Other	do.	76.3	70.7	70.7	70.4	66.9	66.0	70.1
Tenure:								
Full owner	do.	76.5	78.4	62.5	78.8	79.3	79.3	77.7
Part owner	do.	18.8	14.2	24.7	12.3	14.3	15.3	14.7
Tenant	do.	4.7	7.4	12.8	9.0	6.4	5.4	7.5
Average age of operator	Years	50	46	46	53	54	54	52
Age of operator:								
Under 35 years old	Pct.	10.7	17.2	21.9	13.5	10.6	9.1	12.4
35 to 44 years old	do.	22.8	28.8	25.1	20.2	18.0	15.7	19.9
45 to 55 years old	do.	28.7	27.6	25.4	20.3	20.3	21.5	22.1
55 to 65 years old	do.	25.4	18.7	18.8	20.8	23.8	27.7	22.8
65 years and over	do.	12.3	7.8	8.8	25.2	27.3	26.0	22.7
Characteristics in ending year								
Ending year		1997	1997	1997	1982	1987	1992	NA
Farms by sales class: 1/								
Less than $10,000	Pct.	100.0	0.0	0.0	100.0	84.0	79.6	NA
$10,000-$99,999	do.	0.0	87.3	90.4	0.0	15.4	19.1	NA
$100,000-$249,999	do.	0.0	8.1	5.7	0.0	0.5	0.9	NA
$250,000 or more	do.	0.0	4.7	4.0	0.0	0.1	0.3	NA
Occupation of operator:								
Farming	Pct.	42.3	57.9	57.0	29.6	36.3	45.2	NA
Other	do.	57.7	42.1	43.0	70.4	63.7	54.8	NA
Tenure:								
Full owner	do.	80.1	78.5	52.4	78.8	82.0	82.0	NA
Part owner	do.	17.4	17.7	42.3	12.3	12.6	13.7	NA
Tenant	do.	2.5	3.8	5.4	9.0	5.4	4.3	NA
Average age	Years	63	60	59	53	58	63	NA
Age of operator:								
Under 35 years old	Pct.	0.8	1.2	1.9	13.5	5.9	2.7	NA
35 to 44 years old	do.	5.1	9.5	13.9	20.2	15.4	9.1	NA
45 to 55 years old	do.	18.3	25.2	23.3	20.3	19.8	16.4	NA
55 to 65 years old	do.	27.2	29.4	26.3	20.8	22.7	21.8	NA
65 years and over	do.	48.6	34.7	34.6	25.2	36.1	50.0	NA
Location:								
Metro core	do.	24.1	54.4	16.3	27.1	25.7	24.4	25.7
Metro edge	do.	13.0	8.9	10.6	11.7	11.6	12.2	11.9
Nonmetro, adjacent	do.	35.5	21.0	37.8	32.9	33.8	34.9	33.9
Nonmetro, not adjacent	do.	27.4	15.8	35.3	28.2	28.8	28.6	28.5

NA = Not applicable.
1/ 1997 dollars.

Source: Compiled by ERS from the 1997 Census Longitudinal File

Table 5. Selected characteristics of adaptive farms existing in 1982, sorted by status in 1997

Item	Unit	Farms existing in 1982 and 1997			Farms exiting in--			Total
		Category in 1997			1987	1992	1997	
		Recreational	Adaptive	Traditional				
Farms	No.	4,276	16,014	4,651	36,926	18,978	12,057	92,902
Distribution	Pct.	4.6	17.2	5.0	39.7	20.4	13.0	100.0
Characteristics in 1982								
Farms by sales class: 1/								
Less than $10,000	Pct.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
$10,000-$99,999	do.	89.0	54.3	35.7	67.6	63.8	60.8	63.0
$100,000-$249,999	do.	7.4	21.5	32.3	16.9	19.2	19.6	18.8
$250,000 or more	do.	3.6	24.2	32.0	15.5	16.9	19.6	18.1
Occupation of operator:								
Farming	Pct.	55.8	75.8	86.7	67.2	70.7	72.7	70.5
Other	do.	44.2	24.2	13.3	32.8	29.3	27.3	29.5
Tenure:								
Full owner	do.	73.1	60.1	32.3	67.2	66.5	64.0	63.9
Part owner	do.	21.2	30.4	52.0	19.7	23.2	27.0	24.9
Tenant	do.	5.8	9.5	15.7	13.1	10.3	8.9	11.2
Average age of operator	Years	52	49	44	51	52	52	51
Age of operator:								
Under 35 years old	Pct.	8.3	14.2	24.2	14.1	11.5	10.5	13.4
35 to 44 years old	do.	21.5	25.2	28.2	20.7	18.0	17.9	21.0
45 to 55 years old	do.	26.8	27.4	25.5	22.3	23.5	26.7	24.3
55 to 65 years old	do.	29.4	23.3	17.5	25.9	29.0	28.2	26.1
65 years and over	do.	14.0	9.9	4.6	17.0	18.0	16.7	15.2
Characteristics in ending year								
Ending year		1997	1997	1997	1982	1987	1992	NA
Farms by sales class: 1/								
Less than $10,000	Pct.	100.0	0.0	0.0	0.0	21.9	23.7	NA
$10,000-$99,999	do.	0.0	43.4	45.1	67.6	44.3	39.8	NA
$100,000-$249,999	do.	0.0	21.3	26.5	16.9	17.7	17.1	NA
$250,000 or more	do.	0.0	35.4	28.4	15.5	16.0	19.5	NA
Occupation of operator								
Farming	Pct.	53.6	81.0	84.5	67.2	67.6	71.8	NA
Other	do.	46.4	19.0	15.5	32.8	32.4	28.2	NA
Tenure:								
Full owner	do.	85.1	63.6	34.6	67.2	69.8	69.1	NA
Part owner	do.	11.2	29.4	56.5	19.7	20.0	22.7	NA
Tenant	do.	3.7	7.0	8.9	13.1	10.2	8.3	NA
Average age	Years	65	59	57	51	56	59	NA
Age of operator								
Under 35 years old	Pct.	0.9	1.4	1.4	14.1	6.9	3.0	NA
35 to 44 years old	do.	4.3	10.2	15.5	20.7	16.4	12.5	NA
45 to 55 years old	do.	17.4	24.4	27.0	22.3	20.0	19.4	NA
55 to 65 years old	do.	24.3	28.9	29.3	25.9	29.3	27.1	NA
65 years and over	do.	53.1	35.1	26.9	17.0	27.4	38.0	NA
Location:								
Metro core	do.	52.4	63.0	26.6	59.9	58.7	56.5	57.7
Metro edge	do.	9.7	6.3	6.9	7.1	6.6	6.8	6.9
Nonmetro, adjacent	do.	21.2	16.0	32.4	17.2	18.1	19.2	18.4
Nonmetro, not adjacent	do.	16.7	14.7	34.1	15.7	16.6	17.5	16.9

NA = Not applicable.
1/ 1997 dollars.

Source: Compiled by ERS from the 1997 Census Longitudinal File

Table 6. Selected characteristics of traditional farms existing in 1982, sorted by status in 1997

Item	Unit	Farms existing in 1982 and 1997			Farms exiting in--			Total
		Category in 1997			1987	1992	1997	
		Recreational	Adaptive	Traditional				
Farms	No.	57,344	6,348	262,521	335,333	191,863	134,148	987,557
Distribution	Pct.	5.8	0.6	26.6	34.0	19.4	13.6	100.0
Characteristics in 1982								
Farms by sales class: 1/								
Less than $10,000	Pct.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
$10,000-$99,999	do.	88.3	50.4	61.3	73.5	71.0	67.9	69.7
$100,000-$249,999	do.	9.3	28.7	27.4	18.8	20.5	22.5	21.4
$250,000 or more	do.	2.4	21.0	11.3	7.7	8.5	9.6	8.8
Occupation of operator:								
Farming	Pct.	65.4	84.7	82.6	76.8	79.3	81.5	78.9
Other	do.	34.6	15.3	17.4	23.2	20.7	18.5	21.1
Tenure:								
Full owner	do.	50.8	30.5	30.8	45.3	44.6	42.6	41.2
Part owner	do.	42.0	53.4	54.0	38.1	42.6	45.8	44.6
Tenant	do.	7.2	16.1	15.1	16.6	12.7	11.6	14.2
Average age of operator	Years	51	43	45	50	52	51	49
Age of operator:								
Under 35 years old	Pct.	11.1	27.5	22.4	18.7	14.2	13.5	17.7
35 to 44 years old	do.	18.1	27.2	25.5	18.1	16.0	15.7	19.4
45 to 55 years old	do.	27.0	24.7	26.9	19.8	21.1	26.3	23.3
55 to 65 years old	do.	31.1	16.0	19.1	26.0	30.3	28.2	25.5
65 years and over	do.	12.8	4.6	6.1	17.5	18.3	16.3	14.1
Characteristics in ending year								
Ending year		1997	1997	1997	1982	1987	1992	NA
Farms by sales class: 1/								
Less than $10,000	Pct.	100.0	0.0	0.0	0.0	19.9	20.1	NA
$10,000-$99,999	do.	0.0	38.7	56.0	73.5	54.6	50.5	NA
$100,000-$249,999	do.	0.0	21.7	25.0	18.8	17.5	19.1	NA
$250,000 or more	do.	0.0	39.6	19.0	7.7	8.0	10.3	NA
Occupation of operator								
Farming	Pct.	54.9	84.8	83.9	76.8	74.2	78.1	NA
Other	do.	45.1	15.2	16.1	23.2	25.8	21.9	NA
Tenure:								
Full owner	do.	78.0	40.7	36.6	45.3	51.9	52.2	NA
Part owner	do.	17.5	50.8	55.8	38.1	36.1	37.9	NA
Tenant	do.	4.6	8.5	7.6	16.6	12.0	9.8	NA
Average age	Years	64	56	58	50	55	59	NA
Age of operator								
Under 35 years old	Pct.	1.2	1.8	1.4	18.7	9.6	4.4	NA
35 to 44 years old	do.	6.7	17.8	14.0	18.1	15.6	13.5	NA
45 to 55 years old	do.	16.0	29.0	24.8	19.8	18.0	16.6	NA
55 to 65 years old	do.	22.3	26.4	27.6	26.0	28.6	26.3	NA
65 years and over	do.	53.7	25.0	32.1	17.5	28.1	39.2	NA
Location:								
Metro core	do.	17.1	29.0	15.8	17.9	17.4	16.9	17.1
Metro edge	do.	10.1	7.2	7.5	8.2	8.1	8.0	8.1
Nonmetro, adjacent	do.	36.8	31.5	35.4	35.1	35.2	35.7	35.3
Nonmetro, not adjacent	do.	36.0	32.3	41.3	38.7	39.4	39.4	39.4

NA = Not applicable.
1/ 1997 dollars.

Source: Compiled by ERS from the 1997 Census Longitudinal File

Table 7. Survival and entrance rates, by farm category, geographic areas, and intercensus period

Item	Intercensus period					
	1982-87		1987-92		1992-97	
	Survival 1/	Entrance 2/	Survival 1/	Entrance 2/	Survival 1/	Entrance 2/
	Percent					
All areas:						
Recreational	53.9	34.5	55.2	33.9	57.8	53.1
Adaptive	60.3	44.1	61.0	35.1	63.0	42.2
Traditional	66.0	24.5	68.6	22.3	68.2	24.9
Metro core:						
Recreational	51.9	37.1	53.2	35.4	56.6	50.4
Adaptive	59.0	45.5	59.7	34.0	62.2	42.0
Traditional	64.7	25.3	67.3	22.7	67.6	24.8
Metro edge:						
Recreational	54.5	34.1	56.9	32.0	58.5	51.0
Adaptive	58.9	45.5	61.4	38.5	63.1	48.3
Traditional	65.5	23.1	69.1	21.6	68.8	23.8
Nonmetro, adjacent:						
Recreational	55.0	32.8	56.4	33.3	58.4	53.4
Adaptive	62.4	43.2	62.4	36.8	63.6	42.2
Traditional	66.2	24.0	68.9	22.2	68.4	24.5
Nonmetro, not adjacent:						
Recreational	54.3	34.3	54.7	34.2	57.8	56.0
Adaptive	62.9	39.8	64.0	35.8	64.6	40.3
Traditional	66.6	24.9	68.7	22.5	68.2	25.6

1/Farms classified at beginning of each period. Calculated as the percentage of farms in the group at the beginning of period that still exist (in any category) at the end of the period. Exit rates are not presented here since they are equal to 100% minus the survival rate.
2/Farms classified at end of each period. Calculated as the percentage of farms in the group at the end of a period that did not exist at the beginning of the period. The base for calculating the percentage is the number of fams in the category at the beginning of the period.

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.

Table 8. Distribution of Heartland and Prairie Gateway farms, by farm category and geographic area, 1997

Item	Type of farm			All farms
	Recreational	Adaptive	Traditional	
Heartland:		*Number of farms*		
Farms	118,057	16,420	285,678	420,155
Metro core	21,264	4,778	39,274	65,316
Metro edge	11,071	1,386	20,150	32,607
Nonmetro, adjacent	45,086	5,385	107,914	158,385
Nonmetro, not adjacent	40,636	4,871	118,340	163,847
		Percent of farms		
Distribution of farms by area	100.0	100.0	100.0	100.0
Metro core	18.0	29.1	13.7	15.5
Metro edge	9.4	8.4	7.1	7.8
Nonmetro, adjacent	38.2	32.8	37.8	37.7
Nonmetro, not adjacent	34.4	29.7	41.4	39.0
Distribution of farms by category	28.1	3.9	68.0	100.0
Metro core	32.6	7.3	60.1	100.0
Metro edge	34.0	4.3	61.8	100.0
Nonmetro, adjacent	28.5	3.4	68.1	100.0
Nonmetro, not adjacent	24.8	3.0	72.2	100.0
Prairie Gateway:		*Number of farms*		
Farms	120,368	9,841	146,973	277,182
Metro core	22,673	3,140	14,633	40,446
Metro edge	15,484	1,191	6,849	23,524
Nonmetro, adjacent	47,022	2,775	46,423	96,220
Nonmetro, not adjacent	35,189	2,735	79,068	116,992
		Percent of farms		
Distribution of farms by area	100.0	100.0	100.0	100.0
Metro core	18.8	31.9	10.0	14.6
Metro edge	12.9	12.1	4.7	8.5
Nonmetro, adjacent	39.1	28.2	31.6	34.7
Nonmetro, not adjacent	29.2	27.8	53.8	42.2
Distribution of farms by category	43.4	3.6	53.0	100.0
Metro core	56.1	7.8	36.2	100.0
Metro edge	65.8	5.1	29.1	100.0
Nonmetro, adjacent	48.9	2.9	48.2	100.0
Nonmetro, not adjacent	30.1	2.3	67.6	100.0

Source: Compiled by ERS from the 1997 Census of Agriculture Longitudinal File.