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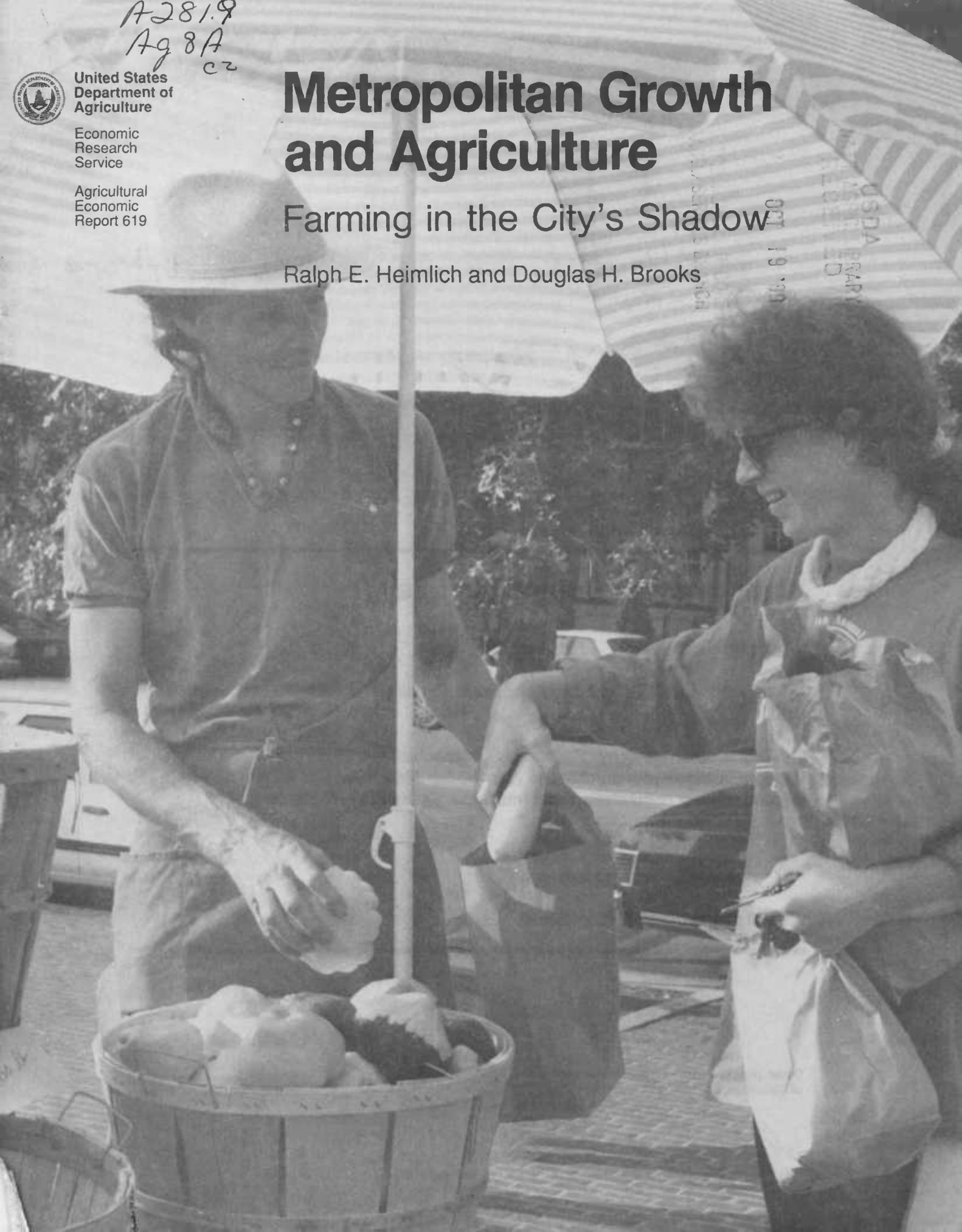
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Metropolitan Growth and Agriculture

Farming in the City's Shadow

Ralph E. Heimlich and Douglas H. Brooks



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Metropolitan Growth and Agriculture: Farming in the City's Shadow. By Ralph E. Heimlich and Douglas H. Brooks. Resources and Technology Division, Economic Research Service. U.S. Department of Agriculture. Agricultural Economic Report No. 619.

Abstract

Farmland acreage in metropolitan counties rose by nearly half between 1974 and 1982 as metropolitan areas were redefined and additional counties were designated as metro. Metro farms are generally smaller, more land intensive in their production, more diverse, and more focused on high-value production than farms elsewhere. As of 1982, metro farms accounted for 29 percent of the U.S. total, 30 percent of total U.S. farm sales, and 16 percent of U.S. cropland.

Keywords: metropolitan, agriculture, land use, farmland, adaptation, commodity programs, urbanization, growth.

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Summary

The amount of farmland in metropolitan counties rose by nearly half between 1974 and 1982 as metro areas were redefined and additional counties were designated as metro. Metro farms are generally smaller, more land intensive in their production, more diverse, and more focused on high-value production than other farms.

- Metro areas are 16 percent of U.S. land area, but they contain 29 percent of U.S. farms and account for 30 percent of farm sales, almost 20 percent of harvested cropland, but only 16 percent of land in farms.
- The average metro farm has less than half the acreage of nonmetro farms, but has higher sales per acre and a higher value of land and buildings per acre.
- Metro farms specialize in high-value crops, producing more than two-thirds of vegetable and fruit sales and more than three-fourths of nursery and greenhouse crop sales. Almost 40 percent of dairy sales and 50 percent of specialty livestock sales are also produced in metro counties.
- Metro farms account for 60 percent of direct sales to consumers, but only 15-29 percent of government commodity loans.
- Family farms make up almost 90 percent of metro agriculture, yet more than 40 percent of nonfamily corporate farms are in metro areas as well.
- Less than half of metro farmers list farming as their principal occupation and more than 40 percent work off the farm more than 200 days each year.

Emerging trends in metro agriculture present these farmers with new opportunities. They are favored by some forms of environmental awareness, such as concern for food quality and safety, distrust of "factory" agriculture, and interest in farmland protection. Many consumers now seek out freshness and quality in their foods, particularly fruits and vegetables. These preferences provide market opportunities for metro farmers ranging from U-pick operations to farmer-restaurant cooperatives.

Another advantage of metro farming is that rising metro land values have increased metro farmers' equity. Higher land values have resulted in less financial distress for metro farmers than for those in the broader farm economy. The U.S. Department of Agriculture and State departments of agriculture have begun small-farm and alternative agricultural programs to help farmers make necessary adaptations for success in the city's shadow.

Metropolitan Growth and Agriculture: Farming in the City's Shadow

By Ralph E. Heimlich and Douglas H. Brooks

Introduction

Farming in metropolitan areas comprises a dynamic segment of U.S. agriculture. New patterns in the development of metro areas since 1970 have put more of our agriculture within the city's reach. While these new patterns threaten increased loss of farmland, they also make agricultural adaptation to metro settings increasingly possible. Trends in environmental awareness, lifestyle, consumer preferences, and State and Federal agricultural policy favor many of the changes farmers have made to accommodate urbanization.

Researchers at the Economic Research Service (ERS) have been tracking the development of metro agriculture for more than a decade (Heimlich and Anderson).¹ An early report combined data from the population and agricultural censuses with natural resource inventory data to profile metro land use and agriculture and highlight metro farmers' contributions to national agricultural production (Otte). Later work by Gustafson and Bills combined demographic and ownership data, which focused on the structure of farm ownership in metropolitan areas of varying size.

Growth and Change in Metro America

Farmers in metro areas have had to adapt to a changing pattern of urban development and growth. The dominant pattern of settlement in the 1950's and 1960's was the metro area, with one or more highly urbanized centers, a fringe of suburban communities providing residential and retail services, and associated outlying areas which were essentially rural, but socially and economically integrated with the central city by flows of commuters, goods and services, and finances (Clawson; Gottman; Leven, 1978). Growth was concentrated in suburbs adjacent to the central urban areas and spread outward in concentric waves linked by the connection between suburban residences and urban employment and commerce. There was little room for agriculture

to continue in the face of this homogeneous wave of development.

New Settlement Patterns

By the mid-1970's, new development was occurring beyond the existing metropolitan fringe in areas with no urban centers comparable to the growth nodes of earlier decades. And unlike the earlier development pattern, which took land out of farm use, the new development patterns allowed more land to be kept in farms.

Preference for a less urban lifestyle has been shown in numerous studies (Beale, 1988; Zuiches; Roseman and Williams; Gallup). A proliferation of terms have been used by various authors to describe this new development pattern, including "countrified cities" (Doherty), the "new heartland" (Herbers), and "penturbia" (Lessinger). Development has been moving away from the cities in a dispersed, low-density pattern that spreads a network of residences, retail stores, and industrial and office parks across a broad area (Heimlich, 1989). This type of development is populated partly by commuters able to live farther from urban centers because of improved transportation systems, but increasingly by people who live, work, and shop away from the urban core. In contrast to older suburban development patterns, the new development does not border central urban areas and can often preserve open spaces, farmland, and existing small towns by encompassing, but not replacing, them. Space remains for agriculture in this new settlement pattern, although some changes in existing farm operations may be required.

Metro Redefinition

Some understanding of the geographic terms used in census statistics on urbanization is needed to see how agriculture fits into the changing metro environment. The older Standard Metropolitan Statistical Areas (SMSA's) were renamed Metropolitan Statistical Areas (MSA's) and redefined to take account of the results of the 1980 census (see box). Criteria for designation of

¹ Full titles of citations are listed in the References.

MSA's and urbanized areas were liberalized to include some of the more developed areas being settled in the diffuse pattern typifying much of the new development, a pattern more accommodating to continued farming. The number of MSA's increased 32 percent between the 1960 and the 1985 definitions (table 1). Metro areas defined in 1960 contained 63 percent of the Nation's 1960 population. New counties added in successive metro area redefinitions expanded metro population to more than 75 percent of total U.S. population. The redefinitions, which take into account the new development pattern, also increased the metro land area by 85 percent, which expanded from 8.7 to 16 percent of total U.S. land area, encompassing more of U.S. farming (U.S. Dept. of Commerce, April 1986).

In addition to actual growth, changes in the MSA definition resulted in compositional changes in the population of metro areas. The population of urbanized areas within metro areas decreased from 84 percent of total metro population in 1960 to 81 percent in 1980, while urban fringe populations increased from 33 percent of total metro to 42 percent. Rural population within metro areas increased from 12 to 14 percent of total

metro population. Forty percent of the U.S. rural population now live in metro areas, as defined in 1985. Accounting for both definitional change and actual population growth, rural population, including farmers, is the fastest growing metro population component, growing twice as fast as total metro population.

The more liberal rules of definition result in MSA's that are less urban than those previously defined. The new patterns of metro development are also less urban, since they blend elements of both urban and rural land uses. Relationships between development and the concepts of "urban" and "rural" are becoming more difficult to reconcile. Redefinition reflects increasing recognition by the Bureau of the Census that the new development pattern is straining the metro concept.

Metro Density

The new settlement pattern is characterized by low gross population density, which is the number of inhabitants per acre within defined political boundaries. At the

Metropolitan Geography

The four most common area delineations distinguished by geographers at the Bureau of the Census serve quite different purposes, but are often confused in common usage and the public mind. For census purposes, the concepts are defined (in U.S. Dept. of Commerce, Bureau of the Census, 1986a) as follows:

Metropolitan Statistical Area (MSA)—Geographic area consisting of a large population nucleus (a census-defined urbanized area) together with adjacent communities that have a high degree of economic and social integration. The MSA's are designated by the Office of Management and Budget, following a set of official standards published in 1983. MSA's replace the former Standard Metropolitan Statistical Areas (SMSA's). MSA's can be defined which include no urbanized area of over 50,000 people, as long as the total population of the area exceeds 100,000 persons. Each MSA has one or more central counties with outlying counties that have close economic and social relationships, including specified levels of commuting and minimum metropolitan characteristics. In New England, MSA's are defined in terms of cities and towns instead of counties, but an alternate definition called New England County Metropolitan Areas (NECMA's), based on county boundaries, is officially defined and used in this report. Terms such as "metro" and "metropolitan" used in this report refer to MSA's.

Urbanized Areas—Urbanized areas are defined by the Bureau of the Census according to specific criteria designed to include the entire densely settled area around each large city. An urbanized area must have a minimum 50,000 population and a defined area with population density of at least 1,000 persons per square mile, but may include less dense urban development if it is adjacent to or included within dense urban development. Under liberalized rules, urbanized areas no longer must have a central city of 25,000 or more persons, but must still meet the population density requirement. Urbanized areas are within MSA's.

Urban Areas—Urban areas are incorporated or unincorporated places of 2,500 or more inhabitants outside Urbanized Areas. Urban areas may be inside or outside MSA's.

Rural—All areas outside urbanized or urban areas, including the nonurban parts within MSA's.

The opposite of the concept "metropolitan" is not "rural", but "provincial" or "nonmetropolitan", even though for much of our history, the outer boundary of metropolitan areas marked the beginning of rural areas (Leven, 1987). Metropolitan areas defined by the Bureau of the Census always contained both urban and rural areas.

Table 1—Number, land area, and population of MSA's as defined at specified dates, 1960–85

Metropolitan definition	MSA's	Land area	Population			
			1960	1970	1980	1984
	<i>Number</i>	<i>Sq. miles</i>	<i>Million persons</i>			
1960	212	309,112	112.9¹	131.0	140.8	146.3
1970	243	386,886	119.6	139.5	151.7	157.9
1980	318	566,157	131.3	153.7	169.4	177.0
1985	280	570,933	132.9	155.7	172.2	179.9

¹ Entries on the highlighted diagonal are the actual population corresponding to the MSA definition at each date. Entries off the diagonal are earlier or later populations corresponding to the MSA definition at each date.

Source: Bureau of the Census, April 1986.

same time, new housing development has occurred at higher net density than in the past, using less land for the “footprint” of the house and the house lot. The new settlement pattern of compact development clusters scattered across an essentially rural landscape offers more room for agriculture to coexist with urbanization.

As less urbanized areas have been included in the MSA definition, there has been a corresponding decrease in gross density in metro areas. The 291 new metro counties added since 1970 had an average of 0.18 people per acre in 1980, about a third the population density of metro areas overall. The 117 counties added as parts of new MSA's had an even lower gross density of 0.15 people per acre.

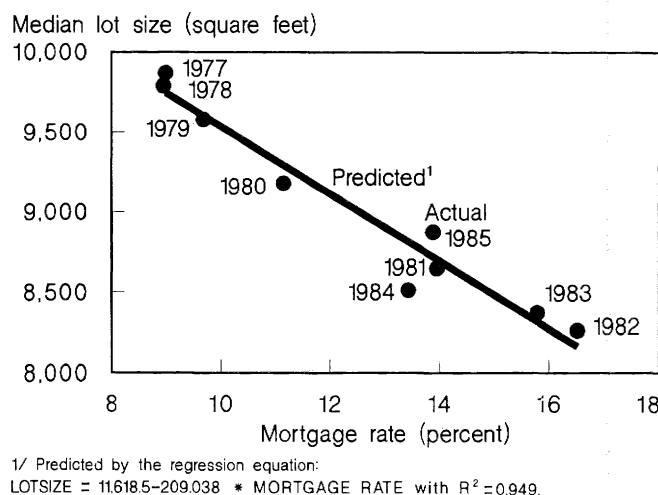
These low gross population densities have often occurred in the face of higher net development densities. That is, the actual land area used to house people was smaller as condominium, town house, and small-lot developments replaced the more extensive suburban housing of the 1960's in response to escalating land prices and home mortgage rates. Median lot size of new one-family houses sold in the United States dropped from 9,870 square feet to 8,265 square feet between 1977 and 1982, a decline of approximately 209 square feet for each 1-percent increase in mortgage interest rates (fig. 1).

Agricultural Adaptation to the Metro Environment

The increasingly metropolitan character of the United States presents agriculture with both problems and opportunities. Problems for agriculture that accompany urbanization have been well documented (Coughlin and others; AFT, 1986; Berry, 1978). They include direct conversion of farmland to nonfarm uses as well as indirect effects, such as increased vandalism, restrictions on spraying and farm odors, higher land values, and decreases in feed, seed, and fertilizer dealers supplying

Figure 1

Median lot size of new single-family homes is related to mortgage interest rate



farmers. Receiving less recognition are the opportunities for agriculture inherent in the metro environment, including access to specialized markets and off-farm employment, higher farm equity, and political support for farmland retention measures.

Growth of metro areas has profound effects on agriculture, exercised primarily through markets in which farmers buy or sell, and through local government institutions, which exercise control over land use (fig. 2). Many of these influences have both negative and positive aspects, which simultaneously bring pressure on farmers to adapt and offer them opportunities for change.

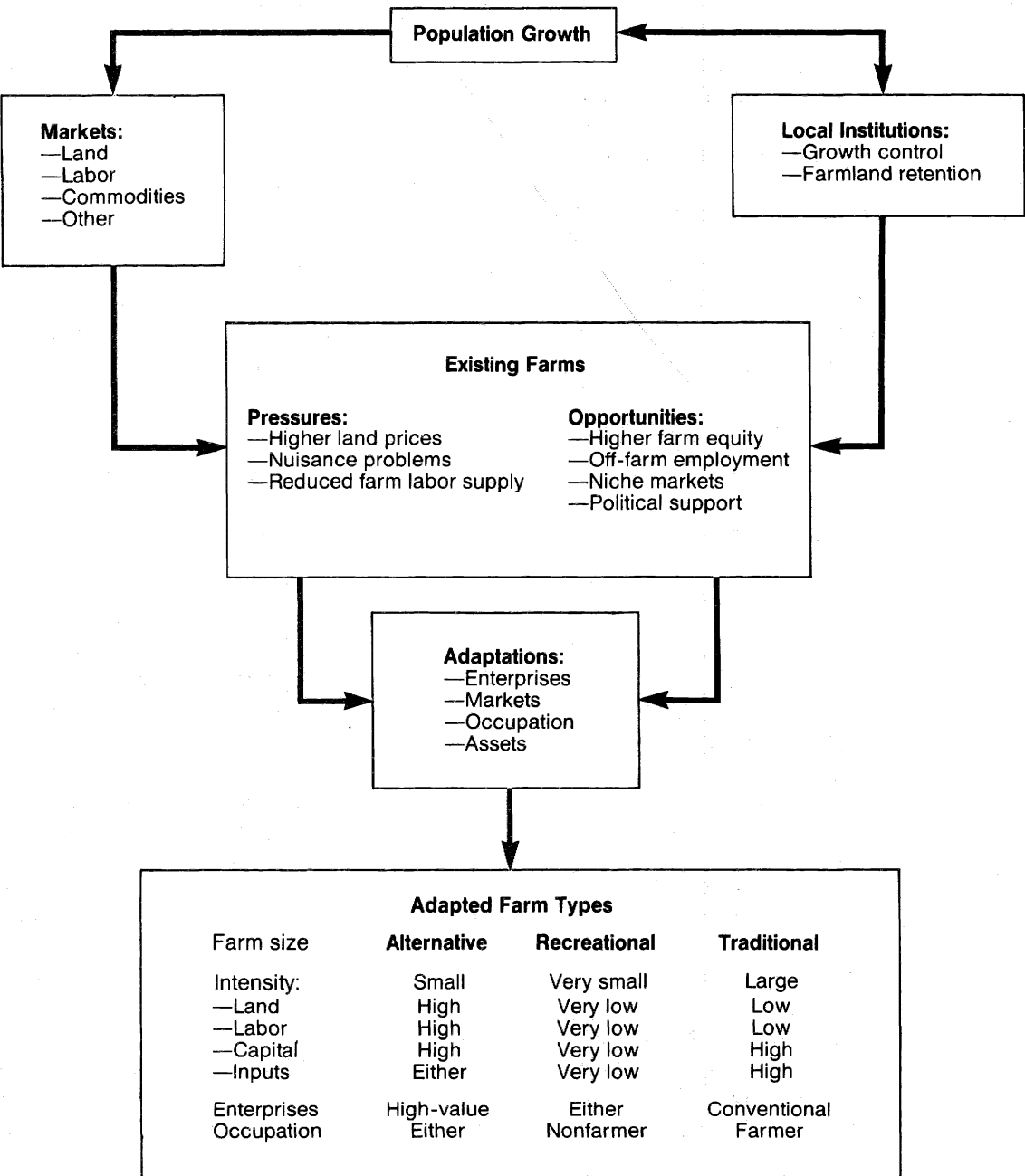
New development to support growing suburban populations competes with agriculture in the land market, by bidding up land prices. Property taxes increase, which raises the cost of keeping farmland in agriculture. These pressures can force farm operators to seek enterprises and markets that offer higher net returns commensurate with those from development. Landowners may also adjust their mix by selling off less productive woodlot

and pastureland and large or inappropriate machinery, while intensifying production on remaining cropland. Higher land values support changes in investment through increases in farm equity that support higher levels of debt.

Growing populations provide opportunities to grow new crops and market them in new ways. High-value crops, such as fresh fruits and vegetables, can be sold through specialized market niches such as restaurants and gourmet grocery outlets, or directly to consumers in road-

Figure 2

A conceptual model of agricultural adaptation to urbanization



side stands, farmers' markets, or U-pick operations. Marketing channels for traditional dairy products or field crops are reduced as milk collection routes are curtailed and grain elevators go out of business. U-pick farms may market recreational experiences such as hay rides, picnics, and farm-pond fishing as much as the high-value produce. Specialty livestock operations, such as horse boarding, breeding, and training facilities, or cattle stock farms may replace more extensive dairy farms and cow-calf operations.

Suburban neighbors provoke change through complaints about farm odors and chemical spraying, and force farmers to turn to enterprises that produce fewer negative side effects. Yet, many suburban residents support growth controls and farmland retention programs aimed at preserving the rural landscape to which they were initially attracted. These programs can provide relief from nuisance actions, while also providing property tax reductions or financial help for metro farmers.

Employment opportunities stemming from urban growth may reduce available farm labor, particularly seasonal or part-time help. Off-farm employment opportunities for the farmer or his family may help support the farming operation. Off-farm employment also provides a transition to part-time farming, particularly if enterprise changes are undertaken that reduce full-time labor needs on the farm. Opportunities from urban employment run in both directions. People working in urbanizing areas may start recreational farms that eventually develop into full-time, part-time, or retirement businesses.

A variety of farm types exist side by side in metro areas. Farms with less than \$2,500 in sales are termed minifarms, corresponding to hobby or recreational farms, while those with \$2,500 to \$20,000 in annual sales are small farms (Brooks, 1985). Stuart Smith identifies two types of farming found near cities. "Production" farmers improve returns by increasing production volumes using conventional methods to grow traditional crops on larger acreage obtained through purchase or lease. "Value" farming is achieved through a combination of increasing unit output value, substituting one's own management and labor for purchased inputs, and supplemental farm or off-farm income. Smith stresses the positive aspects of a bimodal agricultural structure in which smaller farms have unique characteristics differentiating them from larger farms, rather than simply being less efficient sizes of a homogeneous agriculture.

Any one-dimensional representation of farm types, however, fails to account for the character of metro farming. A conceptual typology of metro farms based on acreage, input intensity, enterprise mix, and operator

characteristics is shown in the box labeled "Adapted Farm Types" in figure 2 that displays factors differentiating metro farms within U.S. agriculture.

Traditional farms are largely remnants of previously existing farms in metro areas. They operate larger farmland acreages than the other farm types, although much of this land may be pasture or woodland. Land use intensity (the value of production per acre) is low. The ratio of labor to output is low because of mechanization; consequently, amounts of capital and purchased inputs per dollar of output are high. Traditional farms engage in conventional field crop and livestock enterprises, such as grain corn, soybeans, wheat, hogs, beef cattle, poultry, and dairy production. The traditional farm operator is a farmer and spends most of his or her time working on the farm.

Alternative farms may be either new operations or traditional farms that have adapted to the metro environment. Alternative farms use less farmland than traditional operations. Most of the land used is harvested cropland with pasture and woodland sold off to competing urban users. Sales per acre are high, with intensive management and production. Labor per unit of output is high since many of the crops grown are not amenable to mechanization and require hand pruning and harvesting. Capital inputs per dollar of output are low, and purchased inputs can be either low, using organic or low-input cultivation methods, or high, in the case of more conventional fertilizer and pesticide technology. Enterprises are distinguished by the high value of output per acre necessary to succeed on land competing with urban uses. The alternative farm operator may think of himself (or herself) as a farmer or simply as a small business entrepreneur. Some alternative farm operators may combine farming with off-farm employment, but the most successful are full-time operators.

Recreational farms preserve rural lifestyles for farmers who devote most of their time to off-farm jobs or urban employees who want to experience rural living. They consist of very small acreages with a mix of cropland, pasture, and woodland. Land use intensity is low and use of all categories of inputs (labor, capital, and purchased inputs) is very low. Enterprises engaged in by recreational farmers can be either conventional or high-value crops and livestock, but preclude such activities as dairy farming that cannot easily be pursued on a part-time basis. Recreational farmers have nonfarm occupations and devote most of their time to off-farm employment.

Agricultural adaptation results from pressures on existing farm operations caused by urbanization and the new opportunities created. Opportunities for metro agriculture appear to be increasing as a result of the

convergence of emerging trends in environmental awareness, lifestyle and consumer preferences, and the agricultural economy.

Environmental Awareness

Environmental concerns resulted in passage of the National Environmental Policy Act (NEPA) in 1969. While some perceive a lessening of commitment by the public to environmental causes recently, residual environmental awareness has replaced the former indifference with which much of the public viewed resource topics before NEPA (Udall). This environmental awareness extends to several agricultural issues, including farmland protection, food quality and safety, and "factory" agriculture.

New residents in the most rapidly growing fringes of metropolitan areas combine political and economic sophistication with the desire to retain rural land uses around their new homes. They favor an integrated mixture of higher density housing developments surrounded by rural landscapes, including agriculture. Lessinger refers to residents of the newly developed areas as "caring conservers," who support environmental protection, historic preservation, and farmland retention in reaction to the suburban mass consumption values of previous decades. Metro residents surveyed in Iowa expressed more concern about land use problems, were more receptive to spending tax monies on these problems, and were more positive about expanded land use planning than were farm operators (Bultena, and others). New rural residents have been among the most vocal and effective proponents of legal and program initiatives to protect farmland at the local and State level (Anderson). While farmland protection initiatives were enacted as early as 1956 in the Northeast, stronger, more sophisticated approaches to farmland protection, such as purchase and transfer of development rights, agricultural zoning, and land trusts, have emerged since 1970.

Environmental awareness has prompted greater concern about the agricultural chemicals used in food production, especially pesticide residues that may contaminate food (Clancy, Knox). Whether these concerns are scientifically valid or not, they can influence consumer demands. Concern for food safety is one reason why organically grown fruits and vegetables are in demand. Consumers have misgivings about large "factory" farms that use highly mechanized monoculture or confined-livestock practices (C. Johnson). Concern over diet-related diseases has altered food consumption patterns. Red meat consumption per person since 1970 registered a 7.4-percent decline, while fresh vegetable and fruit consumption rose 23 and 19 percent (USDA, ERS June, August, November 1988). The Food and Drug Administration and National Institutes of Health found that 62

percent of surveyed consumers had made major changes in their diets to reduce risk of heart disease and cancer. Thirty-six percent had cut down on meat intake and 38 percent of the respondents were eating more fruits and vegetables (Briggs).

Lifestyle and Consumer Preferences

In addition to increased environmental awareness, new metro residents have demonstrated lifestyle and consumer preferences that are distinct from those prevalent in earlier waves of suburbanization. Emphasis on quality in food consumption stresses freshness and flavor both in food consumed at home and at restaurants (Watkins). Locally grown produce, sold at a premium through gourmet grocery shops or direct from the grower in farmers' markets, roadside stands, or U-pick farms, caters to the demand for freshness and flavor (Sugarman). The quality and selection of the produce department has become the most important factor when consumers choose a supermarket (McLaughlin and others). Perceived freshness and quality were cited by 84 percent of Massachusetts consumers who shopped at locally oriented food markets (Lockeretz). Jokes about "plastic tomatoes" and "rubber chicken" can translate into serious consumer preferences that favor smaller, local growers using different production methods.

Consumption of fresh fruits and vegetables is projected to increase 84 and 72 percent over 1980 levels by 2020, compared with an increase of only 62 percent for all food eaten at home (Blaylock and Smallwood). In supermarkets, the average number of items in produce departments increased from 65 in the mid-1970's to 135 in the early 1980's (McLaughlin and others). Restaurants featuring a lighter cuisine using fresh produce are capitalizing on these consumer preferences. Such examples range from high-priced nouvelle cuisine to salad bars in fast-food restaurants (Richman, Basu, Kraus).

Metro farmers are in the best position to exploit these markets, but must adapt their operations to provide the high quality and freshness demanded. Farmers have to devote more time and effort to develop and service these markets than for traditional crops and marketing channels. Production of fruits and vegetables is particularly well suited to metro farms with small acreage, intensive production, and the need to generate high revenue per acre.

Agricultural Economy and Policy

Metro agriculture generally has not specialized in grains or other export-oriented field crops. The drop in export demand for these commodities and subsequent dependence on government commodity and income support

programs has not affected metro farms as much as non-metro farms. Since they are less dependent on government commodity programs, metro farmers have more flexibility to adapt to new opportunities and are not required to maintain planted acreage in particular crops to qualify for government payments.

The importance and viability of small farms using alternative production methods have received little attention in government programs in the past. USDA's new Office for Small-Scale Agriculture was instituted in partial recognition of the vitality of small farms (Sinclair). USDA is also beginning a new effort to make information on alternative agricultural production methods available to farmers. The Appropriate Technology Transfer for Rural Areas (ATTRA) program, mandated by the Food Security Act of 1985, is a component of USDA's Extension Service and is managed by the National Center for Appropriate Technology (NCAT) located in the National Agricultural Library.

States have been quicker than the Federal Government to recognize metro agriculture's potential contribution to their agricultural and general economic development (Nothdurft and others). Policies and programs to encourage alternative enterprises, improve product quality, increase marketing opportunities, and reduce production costs for metro farms have been considered in numerous State and regional studies of agriculture's future (Blueprint Commission, Bailey and others, New York Agriculture 2000, Northeast Regional Council, Virginia Agricultural Futures Study, Nothdurft). These studies recognize and document the loss of agricultural land to urbanization, but also point out agricultural adaptations within the urban context. After demonstrating farmland losses, New Jersey's Blueprint Commission concluded:

Yet it is striking to note that most of our remaining farmers are better managers, their farms are larger, more capital is used, mechanization is replacing hand labor, and outdated methods are being discarded. The new breed of New Jersey farmer makes wise use of his resources, of which his land is paramount. He is also looking at farm production to meet the demands of his urban and suburban neighbors, growing acceptable commodities he can sell at his farm gate. (Blueprint Commission, p. 8)

The Massachusetts Agricultural Viability Study recognized that losses in farm numbers were concentrated in traditional enterprises.

Certain farm enterprises, however, have fared better than others. Fruit, vegetable, other field crops, and other livestock farms all increased their shares

of total agricultural output from 1959 to 1978. On the other hand, the dairy and poultry enterprises account for the bulk of the decline in number of farms and land in farms throughout Massachusetts. (Bailey and others, p. 85)

In Virginia, the Agricultural Futures Report noted favorable short-term trends for poultry, nursery stock, and some specialty products, but was particularly encouraged by the longrun prospects for changing production and marketing practices to cope with urban pressures. The study concluded that:

Continued population and urban growth will have an impact on agriculture, forestry, and the food industries. In the urban corridor, traditional agricultural and forestry production will decline. However, the proximity of producers to large population centers in the corridor will offer new opportunities. Expanding markets for specialty foods, natural foods, fresh vegetables, turfgrass, fruits, flowers, ornamentals, and similar commodities will exist. . . . In sum, agriculture in the urban corridor is entering an era marked by change, adaptation and innovation. (Virginia Agricultural Futures Report, p. 13)

Much of the focus of these studies is on farmers' adapting enterprises and production methods to conditions in the metropolitan environment in order to remain profitable, rather than relying on government price support programs. Report recommendations are limited to government activities that can help ease the transition from traditional enterprises. Programs to protect farmland from development are being coupled with initiatives for research and marketing programs to foster new farm enterprises. State agricultural marketing programs display a new aggressiveness on entrepreneurial marketing initiatives suited to urban agriculture (Nothdurft).

The New York Agriculture 2000 project combined ongoing agricultural district and use-value assessment programs and a proposed statewide purchase of development rights program with creation of an agricultural product quality and market development program, an electronic product marketing effort, an institutional purchase program, a product marketing study for new market penetration, and several initiatives for agricultural research and technology development (Butcher, 1986). The Virginia Agricultural Futures Report combined four recommendations regarding zoning and assessment practices designed to protect farmland with six recommendations for developing alternative enterprises oriented toward metropolitan markets, and with six recommendations for marketing in urban areas (Virginia Agricultural Futures Report). These studies and the re-

sulting State policies and programs provide a more favorable climate in which metropolitan agriculture can adapt by reducing urban pressure for conversion of farmland, assisting farmers and agricultural businesses to make the necessary transitions, and by reducing the uncertainty surrounding investments in new agricultural enterprises.

Metro Land Use

Metro areas are about 10 percent urban and 90 percent rural (table 2). The degree of urbanization varies from almost 16 percent in the heavily developed Northeast to only 3 percent in the Mountain region. Northeastern

MSA's have the largest amount of urban area, while MSA's in the Northern Plains have the smallest amount.

Rural portions of metro areas are about evenly divided between cropland, pasture and rangeland, forestland, and other land uses. Cropland makes up more than half of rural land within MSA's in the extensively farmed Corn Belt and Northern Plains regions, but only 8 percent in the Mountain region. The "other" category includes minor land uses such as farmsteads, barren land, small built-up areas, rural transportation uses, and small streams and water bodies not accounted for by census areal measurement. MSA's of the Mountain and Pacific regions include large amounts of federally owned land that were not inventoried in the 1982 National Resources Inventory (USDA, SCS-ISSL, 1984).

Table 2—Land use within MSA's by region, 1982¹

Region	Total area ²	Urban part ³	Rural part				
			Total rural	Cropland	Pasture/ range	Forest- land	Other ⁴
<i>Million acres</i>							
Northeast	47.3	7.4	39.9	8.8	4.0	23.0	4.1
Lake	25.8	2.7	23.1	10.5	2.4	6.1	4.1
Corn Belt	38.8	5.2	33.6	20.8	4.5	5.2	3.1
Northern Plains	9.6	.6	9.0	5.1	2.9	.2	.8
Appalachian	28.5	3.0	25.5	5.0	4.7	12.7	3.1
Southeast	41.6	4.5	37.1	5.0	6.8	18.0	7.3
Delta	15.5	1.1	14.4	3.0	2.0	6.3	3.1
Southern Plains	37.2	3.7	33.5	8.6	18.8	3.3	2.8
Mountain	45.1	1.4	43.7	3.9	17.4	1.3	21.1
Pacific	74.9	4.2	70.7	10.0	14.6	12.9	33.2
278 MSA's	364.3	33.8	330.5	80.6	78.2	89.1	82.6
48 States	1,895.7	46.9	1,848.8	420.7	537.3	391.7	499.1
<i>Percent</i>							
Northeast	100	15.5	84.5	18.6	8.5	48.7	8.7
Lake	100	10.5	89.5	40.7	9.3	23.6	15.9
Corn Belt	100	13.3	86.7	53.7	11.6	13.4	8.0
Northern Plains	100	4.4	95.6	54.2	30.8	2.1	8.5
Appalachian	100	10.3	89.7	17.6	16.5	44.7	10.9
Southeast	100	11.0	89.0	12.0	16.3	43.2	17.5
Delta	100	6.5	93.5	19.5	13.0	40.9	20.1
Southern Plains	100	10.3	89.7	23.0	50.4	8.8	7.5
Mountain	100	3.1	96.9	8.6	38.6	2.9	46.8
Pacific	100	5.6	94.3	13.3	19.5	17.2	44.3
278 MSA's	100	9.4	90.6	22.1	21.4	24.4	22.7
48 States	100	2.5	97.5	22.2	28.3	20.7	26.3

¹ 1985 MSA definition.

² Excludes Alaska, Hawaii, and District of Columbia. Detail may not add to totals due to rounding.

³ 1982 NRI data.

⁴ Includes Federally owned land not inventoried in NRI, primarily in the Mountain and Pacific regions.

Sources: U.S. Dept. of Commerce, Bureau of the Census, April 1986; 1982 National Resources Inventory.

Metro Land Quality

It has been suggested that urbanization directly affects agricultural productivity by converting the best farmland for development and indirectly affects productivity by driving remaining agriculture onto poorer quality land. Two measures of land quality are the SCS land capability class system and the USDA prime farmland definition (Klingebiel and Montgomery; USDA, SCS, 1975). Land capability classes I-III are rated as suitable for cultivated agriculture, while classes IV-VIII are progressively less suitable. The USDA prime farmland definition is based on soil characteristics such as capacity to hold moisture, temperature, acidity, frequency of flooding, erodibility, and size of rock fragments. Prime soil has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops.

Otte found that 15 percent of U.S. land in land capability classes I-III was located within SMSA's in 1970, which was slightly more than proportional to all SMSA land in the United States. Thus, metro areas had slightly better than average land resources. A similar analysis for MSA's defined in 1985 shows that more than 20 percent of all class I-III land in the United States is located in MSA's (table 3). Since MSA's cover about 21 percent of the U.S. nonfederal land area, metro areas now have about the same proportion of land suitable for cultivation as other areas.

Metro areas have 25 percent of class I land, which is the land most suited for crop production. Class I land is more than proportionally represented in metro cropland. Prime land in MSA's is just over 22 percent of all U.S. prime land, which is about proportional to the 21 percent of U.S. nonfederal land area within MSA's. A slightly higher than proportional amount of metro cropland is prime than for the Nation as a whole. At the other extreme, the proportion of metro cropland least suited for cultivation (classes VII and VIII) is also higher than average. About 20 percent of this land is in orchards and other horticultural crops that can use land less suited to cultivation.

Based on this evidence, concerns about the effect of urbanization on farmland quality do not appear to be valid. Metro areas have amounts of the best quality land in proportion to their total area. More than proportional amounts of the best quality land are used as cropland in metro areas despite urban development. Urbanization does not appear to drive agriculture onto poorer quality land.

Agriculture in the City's Shadow

Metro areas are commonly viewed as urban because of their large populations, yet most land in metropolitan areas is rural. Metropolitan agriculture represents a sur-

Table 3—Distribution of MSA land by land capability classification and USDA prime land definition, 1982¹

Classification	Crop-land	Pasture-land	Range-land	Forest-land	Other land	MSA land ²
<i>Percent metro of U.S. total</i>						
I	24.7	31.8	13.5	28.7	24.3	25.3
II	20.5	25.2	9.1	24.9	29.4	21.2
III	17.0	23.5	12.1	25.5	38.5	19.4
I-III ³	19.5	24.5	11.3	25.3	33.5	20.6
IV-VI ⁴	16.8	22.3	10.5	21.6	26.9	16.7
VII-VIII ⁵	25.3	16.8	13.4	21.6	29.0	18.3
Prime farmland ⁶	21.6	26.4	12.9	25.1	28.0	22.2
Not prime	16.1	21.9	11.6	22.3	27.0	17.6
MSA land area	19.1	23.2	11.7	22.6	29.7	21.3

¹ 1985 MSA definition.

² Excludes urban, rural transportation, and small water uses not classified for land capability or prime farmland.

³ Suitable for cultivation.

⁴ Generally not suitable for cultivation without treatment to overcome soil and water limitations.

⁵ Not suited for cultivation.

⁶ The USDA prime farmland definition is based on nine physical and morphological characteristics of a soil unit, including moisture supply, temperature, acidity, water table, conductivity, flooding, erodibility, permeability, and size of rock fragments (USDA, SCS, 1975).

Source: 1982 National Resources Inventory.

prisingly large and important segment of our agricultural economy. Metro farmers' decisions concerning land use, ownership, choice of products, production and marketing techniques, reliance on government programs, and off-farm employment are all influenced by the nearby urban environment. Agriculture in metro areas consequently takes on a different character from that in nonmetro areas. Metro farms use land more intensively, produce higher valued output with a different input mix and less government involvement, and take advantage of nearby marketing and employment opportunities.

Farms and Farmland

MSA counties studied here account for 16 percent of total U.S. land area and the same proportion of total U.S. farmland, yet 29 percent of U.S. farms are in these counties (table 4). Alternative demands for metro land drive up its value compared with similar nonmetro land. Metro farms are less than half the size of nonmetro farms. Despite smaller farm sizes, the average value of land and buildings per farm is higher in metro counties and the average value per acre is more than twice as high as that of nonmetro farms.

The agricultural recession of the 1980's has affected metro agriculture less than nonmetro parts of the industry. Farmland values declined 8 percent in rural areas of the United States between 1985 and 1986, but values increased 6 percent in urban fringe counties (Greene and Barnard). Much of the financial distress experienced by farmers is related to decreases in land values. Farm equity has fallen \$200 billion since 1982, primarily as a result of continuing declines in real estate val-

ues (J. Johnson and others). ERS estimates that lenders' losses on agricultural loans in the 1980's would be 60 percent lower if land prices had not declined (USDA, ERS, 1987). Only 4 percent of metro farm households were financially vulnerable in 1987, defined as having debts totaling more than 40 percent of assets and negative cash household income from farm and nonfarm sources. This compares with 7 to 9 percent of farm households rated financially vulnerable in nonmetro counties (Ahearn and Banker, 1988).

While MSA's are thought of as being primarily urban and residential, they contain more than their share of total U.S. cropland, harvested cropland, and woodland on farms. Competition for land from other uses causes metro farmers to respond by working their land more intensively to increase returns per acre to levels commensurate with returns from urbanization. Cropland accounts for more than 50 percent and harvested cropland for 40 percent of land in metro farms compared with 44 and 32 percent for land in nonmetro farms. Sixteen percent of metro farms (7 percent of metro farmland) are irrigated versus 11 and 5 percent in the rest of the country, another indication of higher production intensity. High-value crops require more irrigation than field crops grown by traditional farm types. The additional expense is justified by higher returns.

Smaller farm size, more intensive farmland use, and easier access to markets lead to production of higher valued output on higher valued metro farmland. The higher cost of holding land in urbanizing areas leads farmers to operate smaller farms more intensively to produce the maximum revenue per acre and yield returns comparable with those from development. At the

Table 4—Land in farms and use of farmland by metro status, 1982

Item	Unit	Metro ¹			Nonmetro
		Old	New	Total	
Land in farms	mil. acres	102	57	159	828
Number of farms	thousand	407	236	643	1,598
Average farm size	acres/farm	249	242	247	518
Area in farms	percent	41.1	43.6	43.6	43.6
Value of land and buildings	dollars/acre	1,541	1,232	1,429	661
Value of ag. products sold	dollars/acre	260	213	243	113
<i>Percent of farmland operated</i>					
Use of farmland:					
Harvested cropland		41.3	37.5	39.9	31.8
Other land in farms		58.7	62.5	60.1	68.2
Irrigated land		7.6	6.2	7.1	4.6

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

same time, development opens market opportunities for the high-value produce that can generate such returns. According to the 1982 Census of Agriculture, metro farms account for 29 percent of total sales and 33 percent of crop and nursery product sales using just 18 percent of total cropland. Average metro farm sales are \$243 per acre, more than twice as high as for nonmetro farms. Sales per farm are 3 percent greater than the nonmetro average despite the 52-percent-smaller average size.

These trends toward compact, intensively farmed agriculture are more pronounced the longer counties have been metropolitan. Farms in old metro areas (those defined before 1970) use only 11 percent of U.S. farmland, but account for 13 percent of harvested cropland and 16 percent of irrigated farmland. Harvested cropland and irrigated land make up larger proportions of farmland in old metro areas than in new (defined since 1970). Old and new metro farms are, on average, about the same size, but the value of land and buildings per farm in old metro areas is 29 percent higher than in new metro areas. Farms in old metro counties have sales 22 percent higher per acre and sales per farm 26 percent higher than farms in newer metro counties.

Agricultural Census Data

Unless otherwise noted, figures cited in this section of the report are drawn from the 1982, 1978, and 1974 Censuses of Agriculture, while the geographic regions correspond to the census of population and reflect urban influences. These figures are not strictly comparable with those from the 1969 and earlier Censuses of Agriculture due to a change in the census definition of what constitutes a farm. Consistent data for the 1974-82 period could not be derived for Anchorage, AK, which, due to redefinition of included territory, gained approximately 20 million acres. The cities of St. Louis, Baltimore, Washington, DC, and New York (Manhattan) had insignificant agricultural activity. Some of the independent cities of Virginia, for which agricultural census statistics are included with neighboring counties, also did not have census data. Consequently, these areas are included in the nonmetro statistics in this report, but their inclusion as metro areas would not significantly change the results. MSA counties, for purposes of this section of the report, refer to the 711 counties with consistent data. Old metro counties include 444 defined as Standard Metropolitan Statistical Areas (SMSA's) in 1970. New metro counties are the 267 added to metro definitions since 1970.

The distribution of farm sizes is different in metro and nonmetro counties, and between old and new metro counties (table 5). Fifty-eight percent of metro farms are less than 100 acres in size, compared with less than 40 percent of nonmetro farms. More than 38 percent of total U.S. farms of less than 100 acres in size are in metro counties. At the other extreme, only about 9 percent of metro farms (but 75 percent of metro farmland) are larger than 260 acres. Nineteen percent of nonmetro farms and almost 90 percent of nonmetro farmland is included in such large farms.

Almost 60 percent of farms in old metro counties are less than 100 acres in size, compared with 56 percent of farms in metro counties added since 1970. Almost 15 percent of farms in old metro counties are less than 10 acres in size compared with only 10 percent of farms in new metro counties. About the same proportions of larger farms (more than 260 acres) occur in both old and new metro counties. Metro areas support more small farms than nonmetro areas because high-value production and part-time farming make for viable enterprises on small acreage. The trend toward small farm size is more pronounced the longer an area has been metro. However, the proportions of large farms are apparently unaffected by metro development since as many large farms are in old as in new metro areas.

Farm Sales and Distribution

Metro farms specialize in high-value crops. They contribute more than 75 percent of total nursery and greenhouse sales and more than 67 percent of sales of vegetables, sweet corn and melons, fruits, nuts, and berries (table 6). A higher proportion of extensive pasture and grain crops are grown in nonmetro areas, but almost half the sales of hay, silage, and field seeds occur in metro counties. Farms with more row crop enterprises are proportionally represented in metro counties, contributing 20 percent of grain crop sales on about the same percentage of the Nation's harvested cropland.

Table 5—Distribution of farms by farm size and metro status, 1982

Farm size	Metro ¹			Nonmetro
	Old	New	Total	
<i>Acres</i>				
1 to 9	14.7	10.6	13.2	6.4
1 to 99	59.8	56.0	58.4	37.9
260 or greater	9.1	8.6	8.9	19.3
2,000 or greater	1.3	1.1	1.2	3.6
<i>Percent of farms</i>				

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

Thirty-eight percent of dairy products and 48 percent of other livestock and products sales (horses, ponies, and other livestock not listed separately) come from metro counties, reflecting the importance of proximity to urban consumers in those enterprises. These enterprises also produce greater sales per acre than other livestock enterprises. Livestock operations raising cattle and calves for sale represent a poor use of most metro land, and the odors and noises of hogs are unpopular with suburban neighbors. Such livestock operations are less than proportionally represented in metro counties.

High-value crop sales are more concentrated in older metro counties where farmers have more completely adapted to urban environments (fig. 3). Farms in older metro counties depend on crops for 57 percent of sales, compared with only 47 percent of sales on farms in newer metro counties. Older metro farms count on high-value crops for 28 percent of sales, compared with only 18 percent for farms in newer metro counties. Yeates noted a similar pattern in Canadian agriculture. The 12 percent of Canada's farmland in the core of the "urban heartland," along the Windsor-Quebec City axis, produces over one-third of the farm cash receipts. Farms in newer metro counties sell more livestock products, particularly dairy products and cattle and calves.

A large number of small metro farms account for only a small portion of total sales, while a small number of large farms account for a large portion of metro farm

sales. Over 30 percent of metro farms have less than \$2,500 in farm sales each year, compared with only 20 percent in nonmetro areas. Almost 60 percent of metro county farms had sales under the \$10,000 cutoff for commercial farms in 1982, versus only 46 percent of nonmetro farms. However, the largest farms (more than \$250,000 in sales) account for 57 percent of metro farm sales, compared with only 43 percent of nonmetro sales.

Figure 3

Value of agricultural products sold by metro status

Percent of total sales

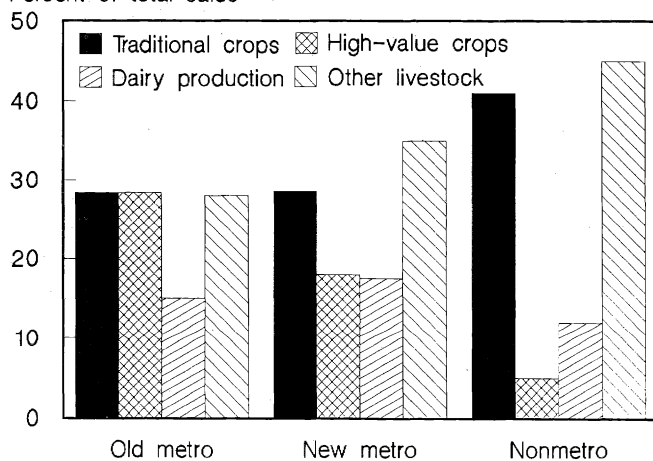


Table 6—Value of agricultural products sold by metro status, 1982

Category	Metro ¹			Nonmetro
	Old	New	Total	
Percent of total U.S. sales				
Crop and nursery	24.1	9.2	33.3	66.7
Grains	13.7	6.1	19.8	80.2
Cotton and seed	29.6	5.4	35.0	65.0
Tobacco	9.0	14.9	23.9	76.1
Hay, silage, seed	33.6	15.3	49.0	51.0
Vegetables, sweet corn, melons	59.2	9.8	69.0	31.0
Fruits, nuts, berries	44.3	24.0	68.3	31.7
Nursery and greenhouse	64.6	11.4	76.0	24.0
Other crops	18.7	10.3	29.0	71.0
Livestock and poultry	16.3	9.2	25.5	74.5
Poultry and products	17.9	10.6	28.6	71.4
Dairy products	24.7	13.3	37.9	62.1
Cattle and calves	11.3	6.7	18.0	82.0
Sheep, lambs, wool	12.6	10.3	22.8	77.2
Hogs and pigs	10.8	5.5	16.3	83.7
Other livestock	29.6	18.3	47.9	52.1
Total sales	20.0	9.2	29.3	70.7

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

Metro farmers directly market their produce to nearby consumers more than do nonmetro farmers. Pick-your-own farms, roadside stands, farmers' markets, and direct sales to grocery stores or restaurants all provide ways to take advantage of the higher population densities in metro areas (Lockeretz, Toensmeyer and German). Metro farmers grow produce that can be marketed directly to consumers. A tenth of metro farms participate in direct marketing, which accounts for 44 percent of all farms that do so, and for nearly 60 percent of total direct sales. This does not include direct sales of greenhouse and nursery products, which would raise the proportions even higher. Older metro counties have 30 percent of farms engaged in direct farm sales, accounting for 46 percent of total direct sales.

Only 4.3 percent of metro farms received Commodity Credit Corporation (CCC) loan payments in 1982, compared with 10.1 percent of nonmetro farms. CCC loans to metro farmers (14.4 percent of total CCC loans) were less than proportional to metro farm numbers. The number of farmers who participate and the proportion of farmland set aside in Federal farm programs in metro counties is lower than for nonmetro counties. However, a geographic accounting of Federal funds in 1985 showed that metro counties received 29 percent of expenditures for agricultural assistance, which is proportional to the number of metro farmers and the value of metro sales (Dubin). Metro counties received 29 per-

cent of expenditures for commodity programs, 47 percent of emergency funds, such as crop insurance subsidies and emergency loans, and 16 percent of subsidized loans for farm ownership, facilities, and operations.

Crop mix, need for flexibility in adapting to urban markets, and high opportunity cost of idling metro farmland may account for metro farmers' lower program participation. One hundred and thirteen metro counties produce high-value crops for national markets (Heimlich, 1988). These farmers probably participate in cooperative marketing orders such as for citrus, deciduous fruits, cranberries, nuts, and winter vegetables. However, 509 metro counties produce high-value crops primarily for local markets and are probably not participating in such large-scale cooperative marketing efforts.

Farm Operator and Organization Characteristics

Farm tenure and farmer characteristics in metro areas differ from those in nonmetro areas because of the availability of off-farm opportunities as well as smaller average farm size, higher farmland values, and different production decisions (Oliver and Gibson). Eighty percent of metro farmers responding to the 1982 census survey lived on the farm operated, but less than half listed farming as their principal occupation (table 7).

More profitable production methods help maintain on-

Table 7—Characteristics of farm operators by metro status, 1982

Item	Metro ¹			Nonmetro
	Old	New	Total	
<i>Percent of farm operators</i>				
Farmer occupation	47.0	48.3	47.5	58.2
Days of work off-farm:				
None	34.6	35.2	34.8	39.9
Any	58.6	57.3	58.1	50.9
200 or more	41.3	40.1	40.9	32.0
Tenure:				
Full owner	63.0	65.6	63.9	57.2
Part owner	25.9	25.0	25.6	30.8
Tenant	11.2	9.4	10.5	12.0
<i>Percent of farmland operated</i>				
Owner operated:				
Full owner	34.5	40.3	36.1	34.4
Part owner	21.1	22.9	21.6	27.8
Subtotal	56.6	63.2	57.7	62.2
Renter operated:				
Part owner	30.0	26.5	28.4	26.7
Tenant	14.4	10.3	12.8	11.3
Subtotal	44.4	36.8	41.2	38.0

¹ Includes 711 counties in MSA's; 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

farm employment. While employment in primary industries (agriculture, forestry, fishing, and mining) for the United States declined by 33 percent during the 1960's and increased 14 percent during the 1970's, the metro decline was less (22 percent) and the metro increase was greater (23 percent) (McGranahan and others). A similar situation exists in Canada, with 45 percent of the labor force employed in primary activities residing in the Windsor-Quebec City urban axis (Yeates). Metro farmers are more likely to take advantage of off-farm employment opportunities than nonmetro farmers. Almost 60 percent of metro farmers report some off-farm work, compared with only half the nonmetro farmers. The high proportion of metro farmers reporting more than 200 days of off-farm work per year reflects the fact that most have nonfarm occupations, and that most metro farms are small (in terms of both acreage and sales).

The smaller average metro farm size has led to a higher share of farms operated by full owners than in nonmetro areas, while fewer are operated by part owners and tenants. Owner-operated farms tend to be more financially sound, because of the owner's potential for capital gains, than farms that are tenant run or part owned (Jensen, Hatch, and Harrington). In metro areas, the potential for capital gains per acre is higher than in nonmetro areas due to the additional competition for land.

Organization patterns of metro farms also differ from those in nonmetro areas. Almost 90 percent of metro farms are family owned (including family-held corporations) or owned by an individual. At the same time, more than 40 percent of the Nation's nonfamily corporate farms are in metro areas. The higher proportion of cropland held in small parcels by nonfarmers and by nonfamily corporations may lead to a decline in productivity and could foreshadow the conversion to other uses (Gustafson and Bills, Yeates). Land owned by speculators waiting for urban or residential development and leased back to farmers and land in recreational farm types owned by former urbanites seeking a more pastoral lifestyle may not be maintained or operated as efficiently as land owned by dedicated farmers. On the other hand, farmers leasing fields may be subsidized by landowners charging rents below the market levels based on the land's development potential. Landowners anticipating development would only extract agricultural rents. They are usually satisfied with small contributions to cash-flow while waiting for an opportune time to develop. They may also be eligible for lower property taxes under agricultural use-value assessment if they lease the land for farming rather than leave it idle (Tremblay and others).

Farm operators in older metro counties identify themselves less as farmers and spend more of their time

working off the farm than operators in newer metro counties. However, larger proportions of farms and farmland in newer metro counties are wholly owned by the operator than in older metro counties, which reflects increased transfer of land to nonfarm owners as urbanization progresses.

Farm Production Costs

Metro agriculture is more intensive than nonmetro in terms of the inputs used to produce crops as well as the higher value crops grown (table 8). Metro farmers spend almost twice as much on inputs per harvested acre as nonmetro farmers, but only about 17 percent more per dollar of sales.

Metro farmers, obliging urban neighbors concerned about pesticide use, may cater to niche markets for organically grown produce. Metro fertilizer use per dollar of sales is 12 percent lower than nonmetro use, while agricultural chemical use per dollar of sales is approximately equal. However, because of the kinds of crops grown on metro farms, metro farmers spend 1.6 times more for commercial fertilizers and other agricultural chemicals per acre of harvested cropland than nonmetro farmers. Nationally, vegetable and melon, fruit and nut, and horticultural specialty farms apply two to four times more fertilizer, by dollar value, and five to six times more agricultural chemicals per harvested cropland acre than farms in general. Metro areas have three to five times as many of these kinds of farms as nonmetro areas, so fertilizer and chemical inputs per acre should be higher.

Table 8—Farm production expenditures by metro status, 1982

Item	Metro ¹			Nonmetro
	Old	New	Total	
<i>Dollars per 1,000 acres of harvested cropland</i>				
Commercial fertilizer	32.99	31.68	32.55	21.40
Other ag. chemicals	21.80	18.06	20.53	11.34
Subtotal	54.79	49.74	53.08	32.74
Hired farm labor	68.13	46.98	60.97	17.41
Contract labor	11.30	9.16	10.57	1.65
Subtotal	79.43	56.14	71.54	19.06
Custom work, machine hire and rental	10.08	8.74	9.63	5.38
Interest expense	47.87	46.59	47.44	32.95
Total	192.17	161.21	181.69	90.13

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

Although metro farmers do respond to urban pressures for reduced-input farming methods, they still use more of these inputs per acre than nonmetro farmers.

Metro farms use almost four times as much labor per acre as nonmetro farms. Forty-six percent of hired farm labor and 60 percent of contract labor is used on farms in MSA counties which have only 16 percent of total U.S. farmland. Twice as much custom work and machinery and equipment hire per acre is done on metro farms as on nonmetro farms. Machinery investment in metro areas, however, is only \$37,100 per farm, compared with \$43,900 per farm in nonmetro areas. The mix of enterprises engaged in by metro farmers and the intensity of production account for the higher use of these inputs. High-value crop enterprises are more labor intensive than other crops and use three to seven times as much custom and rental machinery as other enterprises because of seasonal demand for machinery operations.

The higher value of land in metro counties accounts for reported interest expenses 1.5 times higher per acre than in nonmetro areas. However, interest expenses per dollar of sales are 16 percent lower than for nonmetro farms.

Newer metro counties have 16-percent-lower production expenses per acre than older metro counties, but only 7-percent-lower expenses per dollar of sales. Older metro areas use slightly more fertilizer and chemicals per acre, but one and a half times as much hired labor as newer metro counties. Interest expenses per acre are almost equal between old and new metro areas.

Changes in Metro Agriculture During the 1970's

While similarities and differences between metro and nonmetro farms in 1982 are revealing, they provide only a static picture. Some of the most important distinctions between metro and nonmetro agriculture occur in the adaptations metro farmers have made to their situation over time. It is necessary to see how the changing patterns of urbanization have been influencing agriculture in metro areas to understand the dynamic impacts of urbanization and conversion expectations on agriculture.

Farms and Farmland

While nonmetro farmers have been hurt by declining land values in recent years, the development potential of metro farmland has mitigated these effects for metro farmers. Metro farmland increased 49 percent between 1974 and 1982 because of new counties being designated "metro". Yet demand for farmland by alternative

uses has also taken a toll on metro agriculture. Land in farms in currently defined MSA's decreased 4 percent, from 165 million acres in 1974 to 159 million acres by 1982, at a time when the number of MSA farms increased (table 9).

The number of farms in currently defined metro areas increased 4 percent between 1974 and 1982 as nonmetro farms decreased 6 percent. Metro farms grew from 27 percent of all farms in 1974 to 29 percent in 1982. Changes in metro definition added to the growth in farms within old metro areas and increased the proportion of total farms in metro areas from 17 percent in 1969 to 29 percent in 1982. Redefinition and growth resulted in a 66-percent increase in metro farms.

Even while land in farms in currently defined metro areas declined, production intensified on the remaining farmland. In response to rising development pressures on the value of farmland, farmers intensified production by increasing cropland harvested and reducing other uses of farmland. The amount of cropland pasture declined by almost a fourth and woodland on farms by almost a tenth between 1974 and 1982. Irrigated land increased substantially in the mid-1970's, but lost part of the gain before 1982 as urbanization pressures increased and unsustainable irrigation systems were shut down. The proportion of metro farms under 50 acres rose by a third, from 32 percent in 1974 to 42 percent in 1982. Farms under 100 acres now account for almost 60 percent of all metro farms.

Table 9—Change in land in farms and use of farmland by metro status, 1974–82

Item	Metro ¹		
	Old	New	Total
<i>Percent change</i>			
Land in farms	-4.4	-2.3	-3.7
Number of farms	4.9	2.1	3.9
Average farm size	-9.1	-4.4	-7.1
Value per acre of land and buildings	133.3	130.9	132.2
Value per acre of ag. products sold	70.3	73.7	71.3
Use of farmland:			
Harvested cropland	4.1	9.1	5.8
Other land in farms	-9.6	-8.1	-9.0
Irrigated land	3.0	18.8	7.5

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

Farm Sales and Distribution

Metro farm sales increased 65 percent between 1974 and 1982, growing faster than total U.S. farm sales (table 10). Metro areas (as defined in 1985) accounted for 29.3 percent of total farm sales in 1982, up from 28.7 percent in 1974 despite urban growth in these counties. Changes in metro definition between 1970 and 1985 and agricultural adjustments within metro areas increased metro agriculture's share of total farm sales from 19.9 percent in 1974 to 29.3 percent in 1982.

Metro crop sales grew more slowly than livestock sales between 1974 and 1982, but sales of nursery and greenhouse products grew twice as fast as total sales. Sales in newer metro areas grew more rapidly than sales in older ones, and livestock sales grew faster than crop sales in the newest metro counties. Farm numbers increased more than sales in metro areas, particularly in older metro counties, so that average farm sales grew more slowly than total farm sales.

Nursery and greenhouse sales contributed a fifth of the total sales increase as farms producing these products benefited from growing urban and suburban demand. The number of farms reporting livestock, poultry, and products sales declined slightly from 1974 to 1982, while the value of those sales rose 68 percent.

In a study of the Middle Atlantic States, Berry found that the uncertainties of urbanization influenced dairying more than any other type of agriculture because of the long-term nature of dairy investments. This effect appears to be holding true in the metro counties. The percentage of farms with livestock, poultry, and livestock product sales has fallen, but dairying remains an important segment of agriculture in the highly urbanized Northeast. Metro counties account for more than their share of dairy operations, since they benefit from

Table 10—Change in value of agricultural products sold by metro status, 1974–82

Item	Metro ¹		Total
	Old	New	
	<i>Percent change</i>		
Total sales	63.1	69.6	65.1
Average sales per farm	55.5	66.1	58.9
Crop and nursery	64.0	60.0	62.9
Nursery and greenhouse	114.2	126.3	115.9
Livestock and poultry	62.0	79.6	68.0

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

easier delivery to customers and reduced competition that result from marketing orders which restrict inter-regional movement of fluid milk.

Farm Operator and Organization Characteristics

The number and proportion of metro farmers who list farming as their principal occupation have declined since 1974. They now make up less than half of all metro farmers. This is confirmed by increasing proportions of metro farmers with off-farm work since 1974. At the same time, the fastest growing segment of metro farm operators is that of operators less than 35 years old, which indicates that recreational farming is being pursued by metro residents whose primary employment is in other careers. An alternative explanation is that operators starting out in metro farms use off-farm income to supplement their developing farm enterprise. This is a pattern familiar in startups of many small businesses.

The number of metro farm operators reporting farming as their principal occupation decreased between 1974 and 1982, even as the number of metro farms increased (table 11). The greatest growth in the number of metro farms was in farms part-operated by owners. This is the only category of metro farmland to have increased. Tenant-farmed acreage declined the most. This pattern could reflect the urbanization process as farmland is purchased for development and initially leased to farm-

Table 11—Change in characteristics of farm operators by metro status, 1974–82

Item	Metro ¹		Total
	Old	New	
	<i>Percent change in farm operators</i>		
Farmer occupation	– 7.6	– 9.3	– 8.3
Days of work off-farm:			
None	11.5	10.5	11.1
Any	25.0	19.5	22.9
200 or more	24.2	19.3	22.4
Tenure:			
Full owner	4.4	– 1.6	2.1
Part owner	8.3	12.3	9.7
Tenant	– 16.0	– 11.6	– 14.8
	<i>Percent change in farmland operated</i>		
Owner-operated:			
Full owner	– 8.0	– 8.2	– 8.1
Part owner	2.2	– 1.6	.9
Renter-operated	– 16.0	– 11.6	– 14.8

¹ Includes 711 counties in MSA's: 444 counties in former SMSA's designated before 1971 and 267 counties designated between 1971 and 1985.

ers before the actual development occurs. Looking at the change from 1974 to 1982, the number of full owners increased more slowly than part owners as more farmers leased additional land to continue or expand their operations.

The trend toward part-time farming by metro farmers is evident in that the number of farmers reporting off-farm work grew faster than the number of farms. The number of part-time metro farmers increased twice as fast as full-time farmers, with the greatest growth occurring among operators who worked 100–200 days off the farm.

Farmers in newer metro areas gave up farming as a principal occupation at a higher rate than in older metro areas. Full ownership by farmers in new metro areas actually decreased between 1974 and 1982, with a corresponding increase in part owners. Land in all tenure categories decreased in newer metro counties, while part-owner operations increased in older metro counties. The largest percentage increase in the number of full owners was in older metro counties. This increase suggests that operators of smaller farms may seek to control their land as urbanization progresses.

Conclusions

In the past, interest in agricultural issues has focused on nonmetro areas and traditional farm crops and livestock. Officially designated metro areas have expanded rapidly since 1970 as a result of a new, more diffuse settlement pattern of dense urban areas within the less densely settled rural fringes of major cities. The trend toward higher net density development in fringe counties with lower gross population density will continue if housing costs continue to rise and transportation costs do not increase dramatically. Metro areas now encompass a substantial portion of the farm sector that, far from disappearing, has adapted to survive in an environment characterized by competition for land, environmental constraints on production practices, and poorly developed markets.

Many of the perceived weaknesses of nonmetro agriculture are advantages for metro agriculture. Consumers' continuing awareness of environmental issues leads them to question the safety of their food, pesticide and nutrient contamination of air and water, the effect of monocultures (such as continuous row crops) on our ecosystems, and other features of "factory" agriculture. These concerns make some consumers ready to embrace smaller, more environmentally sensitive, locally oriented, organic agricultural operations. Perceived differences in produce freshness and quality favor a return to locally grown fruits and vegetables over transconti-

ental shipping and transseasonal storage. Demand for homesites in rural areas competes with agriculture for land, but also provides support for farmland protection programs and right-to-farm laws. Competition for land, which increases the value of land, provides indirect support for higher farmer equity than can be supported by agricultural demand alone. Metro farms are not dependent on export markets for commodities heavily supported by government farm programs. Metro farms produce a diverse product mix, which is oriented toward local markets and is often marketed directly to consumers.

Continuation of the decentralized growth pattern typical of emerging metro areas implies an increasing urban influence on land use and agriculture that is more than proportional to population increases. More U.S. farmers will be operating in metro environments in the future. Characteristics of existing metro farms indicate that the number of farms, the value of their products, and acreage of harvested cropland will grow more than proportionally to the expansion of metro areas.

If emerging environmental and consumer trends continue, metro farms will increasingly adopt high-value enterprises, reduced-input or organic production methods, and innovative and direct marketing strategies to meet the constraints and exploit the advantages of metro environments. Traditional farm types and production methods will probably decline in importance in metro areas as existing operations adapt and new alternative farm operations emerge.

Growth in metro farming has policy implications for Federal, State, and local governments. The increasing agricultural production taking place in metro areas is largely unaffected by farm programs. Dairy programs and marketing orders for fruits, nuts, and vegetables apply to some metro farms, but are directed at more traditional enterprises, such as dairy farming, or large-scale operations, such as citrus producers. Metro agriculture is becoming too important to be ignored, as it was in the past, and deserves extension, research, and marketing programs targeted specifically to it.

In light of metro farmers' continued financial health, largely tied to maintenance of land values, State and local governments may want to rethink such farmland protection measures as purchase and transfer of development rights that are intended to separate agricultural use and development components of farmland value. Financing for farms with land restricted to agricultural use may be less forthcoming because of reduced appreciation in value and could restrict farmers' ability to invest in new enterprises to adapt to changing urban markets. Other measures, such as right-to-farm ordi-

nances, preferential assessment, and agricultural zoning, that do not affect land values as much may be more desirable. Research and extension efforts at both Federal and local levels could develop programs aimed at the problems and opportunities facing metro farmers and at the process of transition to new, better adapted enterprises.

The growth, distribution, and changing structure of metro areas have important implications for metro farms, which now comprise 30 percent of the farm sector. Urban demand for land poses a threat to metro agriculture, but it also stimulates a healthy adjustment in enterprises, production methods, and farm types. Farming in metro areas should be recognized as a vital and dynamic part of our agricultural economy.

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